### Approval and authorisation

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| Accepted on behalf of Roads and Maritime Services by: | Ryan De Carteret  
Project Manager |
| Signed: | ![Signature] |
| Dated: | 31/07/2018 |
Executive summary

The proposal

Roads and Maritime Services (Roads and Maritime) proposes to widen about 1.7 kilometres of the Golden Highway extending through Denman Gap from about 4.7 kilometres west of Saddlers Creek Bridge to about 1.2 kilometres east of Duggans Road, at Ogilvies Hill (the proposal). This section of the Golden Highway at Ogilvies Hill is currently a single lane highway with narrow shoulders, non-compliant clear zones and limited overtaking opportunities. This results in heavy and oversize vehicles travelling slowly over Ogilvies Hill which impacts on average travel speeds and decreases the productivity of the highway.

The proposal forms part of the Golden Highway Corridor Strategy (Transport for NSW, 2016) to provide an efficient and sustainable corridor that caters for increasing growth and improves safety along the Golden Highway corridor. The Golden Highway carries substantial freight volumes servicing the surrounding mining and agricultural activities. The major objective of the proposal is to provide climbing lanes to improve road safety and freight efficiency.

Key features of the proposal are:

- Provision of a 1.3 kilometre long westbound climbing lane
- Provision of a one kilometre long eastbound climbing lane
- Road widening to provide 3.5 metre wide lanes and two metre shoulders
- Earth works to allow for the climbing lanes and widening existing lanes
- Provision of three metre wide shoulders for 30 metres on the approach either side of property accesses
- Culvert extension or replacement including scour protection
- Provision of new roadside drainage comprising table drains and concrete dish drains
- Provision of new or rebuilt road surface along the length of the proposal
- Installation of safety barriers along the eastbound and westbound lanes where required
- Property acquisitions where required
- Installation of up to five construction sediment basins
- Four temporary construction ancillary facilities, including construction compounds, construction stockpiles sites and erosion and sedimentation measures.

Construction of the proposal would be expected to start in late 2018, and would take about 12 months to complete.

Need for the proposal

This section of the Golden Highway is currently a single lane highway with narrow shoulders, non-compliant clear zones and limited overtaking opportunities. This results in heavy and oversize vehicles travelling slowly which impacts on average travel speeds and decreases productivity of the highway. The proposal would improve road safety and traffic efficiency for road users including the freight industry and for oversized vehicles using the Golden Highway.

Proposal objectives and development criteria

The proposal is part of a broader strategy to upgrade the Golden Highway. The objectives of the proposal include:

- Provide safe and efficient travel by providing climbing lanes in each direction as well as wide paved shoulders
- Preserve and improve the condition of structures, cuttings and embankments
• Improve travel efficiency by providing a route with improved overtaking opportunities, signage and delineation
• Reduce fuel consumption and vehicle operating costs by providing consistent road conditions
• Cater for higher productivity vehicles including up to performance based standards (PBS) Class 2B of up to 30 metres in length
• Maintain and improve the ability to cater for over dimension and over mass loads
• Minimise impacts to the area’s natural environment, heritage and local communities.

Options considered

Three options were considered to address issues associated with a single lane highway with narrow shoulders, non-compliant clear zones and limited overtaking opportunities. The three options are as follows:

Option 1 – ‘Do Nothing’
The do nothing option would result in the Ogilvies Hill section of the Golden Highway remaining in its current state with narrow shoulders, non-compliant clear zones and limited overtaking opportunities. Normal road maintenance would continue to be carried out.

Option 2 – Road widening with a one metre wide centre median
This option would include minor realignment of the road geometry through widening to accommodate climbing lanes, two metre wide road shoulders and a one metre wide painted centre median.

Option 3 - Road widening with no centre median
This option would include minor realignment of the road geometry through widening to accommodate climbing lanes, two metre wide road shoulders with no centre median.

Preferred Option
The preferred option for the proposal is Option 2 – Road widening with a one metre wide centre median as it would:
• Improve safety due to increased separation between east and westbound lanes
• Provide safe and efficient travel by providing climbing lanes in each direction as well as wide paved shoulders
• Preserve and improve the condition of structures, cuttings and embankments
• Improve travel efficiency by providing a route with improved overtaking opportunities, signage and delineation
• Reduce fuel consumption and vehicle operating costs by providing consistent road conditions
• Cater for higher productivity vehicles including up to performance based standards (PBS) Class 2B of up to 30 metre in length
• Maintain and improve the ability to cater for over dimension and over mass loads
• Allow safer easier staging during construction phase
• Be a cost effective way of improving sight distances for non-conforming horizontal and vertical alignment.
Statutory and planning framework

Clause 94 of State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) permits development, on any land, for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal meets the definitions of ‘road infrastructure facilities’ provided for by clauses 93 and 94(2) of the ISEPP, and is being carried out by Roads and Maritime, it is permissible without consent under ISEPP. As a result, it can be assessed under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act). Development consent is not required.

A review of environmental factors (REF) has been prepared as part of the assessment process.

Community and stakeholder consultation

Local communication has been managed as part of the community and stakeholder engagement strategy for the wider program to upgrade the Golden Highway corridor which connects the Hunter region with the Central West region. Consultation for the proposal has been ongoing since 2016, as part of the broader Golden Highway Corridor Strategy.

A Communications Engagement Plan (CEP) (Roads and Maritime, 2016) was prepared and implemented for the both Ogilvies Hill (the proposal) and Winery Hill projects, which is part of the Golden Highway Corridor Strategy package of work. The CEP describes the communication and consultation approach and activities for the proposal and the proposed communications approach and to keep key stakeholders and the community informed during the work.

Roads and Maritime have consulted with property owners directly impacted by the proposal in relation to the proposal including property acquisitions and access arrangements.

Notifications would be placed in local print media before the start of construction. Directly affected (including adjacent) property owners would be advised by mail.

Environmental impacts

The proposal would have some adverse impacts during construction and operation which would be managed by the implementation of mitigation measures and safeguards as described in Section 7 and are summarised below.

Traffic and access

The proposal would cause temporary disruptions to traffic, including reduced speed limits, potential changes to property accesses and increased heavy vehicle movements on the existing road network during the construction.

As the proposal is part of a wider program of work to upgrade the Golden Highway, the construction of the proposal would overlapping with the construction of a number of other projects along the Golden Highway. The potential highest average cumulative delay along the Golden Highway between the New England Highway and Dubbo, due to multiple construction works sites being operational at the same time, would potentially be up to about 31 minutes at peak construction time (about August 2019).

The proposal would improve road safety and travel efficiently along the corridor by providing climbing lanes, minimum two metre wide road shoulders and new road pavement.

Aboriginal heritage

The study area contains evidence of past Aboriginal occupation and behaviour in the form of low and high density artefact scatters, potential archaeological deposits and isolated artefacts. It is also recognised as a culturally significant landscape for the Wonnarua people.
Fourteen sites previously recorded on the Aboriginal Heritage Information Management system (AHIMS) and ten previously unrecorded Aboriginal archaeological sites (Ogilvies Hill Site 1 -10) were recorded during four separate surveys of the study area between August 2016 and September 2017.

The proposal would have the potential to impact on three Aboriginal heritage sites, (Ogilvies Hill 7,8 and 9), as such an Aboriginal Heritage Impact Permit (AHIP) would be required to impact on these sites.

**Biodiversity**

Some small areas of native vegetation along the road side are consistent with the definition of an endangered ecological community listed under the Threatened Species Conservation 1995 (TSC Act) as endangered (Footslopes Slaty Gum Woodland) and a critically endangered under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Central Hunter Valley eucalypt forest and woodland).

No threatened flora species were recorded in the study area during the field surveys carried out in August 2016, however the TSC Act listed threatened Cymbidium canaliculatum is moderately likely to occur as suitable habitat is present. The Speckled Warbler (Chthonicola sagittata), was the only threatened species confirmed by August 2016 field surveys.

The proposal would remove about 5.67 hectares of vegetation of which up to 5.53 hectares comprises of two overlapping endangered ecological communities (EEC) including about:

- 4.08 hectares of Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion listed as endangered under the TSC Act
- 5.53 hectares of Central Hunter Valley eucalypt forest and woodland listed critically endangered under the EPBC Act. A total of 1.59 hectares of this community in ‘moderate / good’ condition would be impacted by the proposal.

The 4.08 hectares of remnant vegetation meeting the description of TSC Act Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion does not trigger the need for offsets. However, this woodland vegetation also applies to the EPBC Act listed endangered Central Hunter Valley eucalypt forest would be impacted by the proposal and will require offsetting.

Assessments of significance were carried out for threatened species and ecological communities that would be likely to occur in the proposal area. With appropriate safeguards, the proposal would be unlikely to have a significant impact on any listed threatened species, populations or ecological communities.

**Landscape, visual amenity and urban design**

Visual and landscape impacts would occur during construction and operation. Construction impacts would include a changed visual environment from construction plant, equipment, and temporary ancillary facilities. Local landscapes would also be altered by earthworks and vegetation clearing creating a wider road corridor, potentially changing sight lines and the relationship between the road corridor and surrounding land.

Once the proposal is built, there would be permanent visual and landscape changes throughout the proposal area. The main visual changes would be due to the widening of the Golden Highway and associated vegetation removal.

**Socio-economic and property issues**

The proposal has the potential for both wider regional and local positive benefits in the medium to long term through improved road safety and freight efficiency. However, during construction, the community would experience cumulative temporary traffic delays, and noise and visual amenity impacts. The proposal would also require partial acquisition of four private properties.
There would be minor impacts associated with water quality and hydrology, soils, and air quality. These impacts would be managed using the safeguards and mitigation measures included in this REF.

**Noise and vibration**

The closest residential property is located about 780 metres from the proposal. The noise and vibration assessment determined that during construction, noise levels at surrounding receivers are unlikely to exceed day, evening or night time noise management levels during all phases of construction assessed, or sleep disturbance guidance values.

The proposal is not expected to result in road noise levels increasing by more than 2 dB(A) relative to existing road operations at surrounding receivers. Therefore, no specific operational mitigation measures would be necessary.

**Justification and conclusion**

The proposal is consistent with national, state and local strategies and plans to improve the efficiency and safety of the Golden Highway for road users including the freight industry.

While there would be some environmental impacts as a consequence of the proposal, such as temporary traffic delays, amenity impacts, vegetation clearing and property acquisitions, they have been avoided or minimised wherever possible through design and site-specific safeguards. The beneficial effects are considered to outweigh the mostly temporary adverse impacts and risks associated with the proposal.

The proposal is subject to assessment under Part 5.1 of the EP&A Act. This REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.2 of the EP&A Act. A Species Impact Statement is not required. The proposal is subject to assessment under Part 5.1 of the EP&A Act. Consent from Council is not required. In addition, the proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the EPBC Act A referral to the Australian Department of the Environment and Energy is not required.
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1. Introduction

This chapter introduces the proposal and provides the context of the environmental assessment. In introducing the proposal, the objectives and project development history are detailed and the purpose of the report provided.

1.1 Proposal identification

Roads and Maritime Services (Roads and Maritime) proposes to widen about 1.7 kilometres of the Golden Highway extending through Denman Gap from about 4.7 kilometres west of Saddlers Creek Bridge to about 1.2 kilometres east of Duggans Road, at Ogilvies Hill (the proposal). This section of the Golden Highway at Ogilvies Hill is currently a single lane highway with narrow shoulders, non-compliant clear zones and limited overtaking opportunities. This results in heavy and oversize vehicles travelling slowly over Ogilvies Hill which impacts on average travel speeds and decreases the productivity of the highway.

The proposal forms part of the Golden Highway Corridor Strategy (Transport for NSW, 2016) to provide an efficient and sustainable corridor that caters for increasing growth and improves safety along the Golden Highway corridor. The Golden Highway carries substantial freight volumes servicing the surrounding mining and agricultural activities. The major objective of the proposal is to provide climbing lanes to improve road safety and freight efficiency.

The location of the proposal is shown in Figure 1-1 and an overview of the proposal is provided in Figure 1-2. The proposal is described in more detail in Section 3.

The features of the proposal are:

- Provision of a 1.3 kilometre long westbound climbing lane
- Provision of a one kilometre long eastbound climbing lane
- Road widening to provide 3.5 metre wide lanes and two metre shoulders
- Earth works to allow for the climbing lanes and widening existing lanes
- Provision of three metre wide shoulders for 30 metres on the approach either side of property accesses
- Culvert extension or replacement including scour protection
- Provision of new roadside drainage comprising table drains and concrete dish drains
- Provision of new or rebuilt road surface along the length of the proposal
- Installation of safety barriers along the eastbound and westbound lanes where required
- Property acquisitions where required
- Installation of up to five construction sediment basins
- Four temporary construction ancillary facilities, including construction compounds, construction stockpiles sites and erosion and sedimentation measures.

Construction of the proposal would be expected to start in late 2018, and would take about 12 months to complete.

The proposal would require the use of four temporary ancillary facilities during construction. These sites would be used for stockpiling materials, storing plant and equipment, site offices and erosion and sedimentation measures. An asphalt batch plant would potentially be located at one of the ancillary facilities. Further details about ancillary sites are provided in Section 3.4.

Construction of the proposal would be staged to enable work to be completed safely while maintaining traffic flows at all times. Construction would generally involve building one lane at a time, and moving traffic between the lanes to keep the traffic flows for the duration of work. Further details on the construction staging are provided in Section 3.3.
Definitions

For the purposes of this review of environmental factors (REF) the following definitions have been used:

- The ‘proposal’ refers to all the activities and ancillary sites associated with the widening of the 1.7 kilometre section of the Golden Highway at Ogilvies Hill
- ‘Overtaking lane’ and ‘climbing lane’ are interchangeable terms for a lane which allows traffic to pass slower moving vehicles
- The ‘proposal area’ refers to the area that would be directly and indirectly impacted by construction activities. It also includes the areas of property acquisitions, ancillary site, and any other areas that would be temporarily disturbed. Not all vegetation within in this footprint would be removed as plant and machinery would manoeuvre around native vegetation where possible. The proposal area is shown in Figure 1-2
- The ‘construction footprint’ refers to maximum area that would potentially be directly impacted by the proposal and includes all areas of construction access tracks and boundary fencing realignments. It includes the 100 per cent concept design with a 10 metre buffer, and includes ancillary sites, sediment basins and any other areas that would be temporarily disturbed. The construction footprint is contained within the road corridor and property acquisition boundary and is shown in Figure 1-2
- The ‘study area’ refers to the proposal area and the wider area that may be indirectly impacted by the proposal and varies for specialist studies
- ‘The locality’ encompasses the area in a 10 kilometre radius of the study area.
Figure 1-1 | Location of the proposal
Figure 1-2a | The proposal
Legend

- Proposal area
- Construction footprint
- Concept design
- Chainage point
- Culvert
- Basin

Figure 1-2b | The proposal
Legend

- Proposal area
- Concept design
- Culvert
- Construction footprint
- Chainage point
- Basin

Figure 1-2c | The proposal
Figure 1-2d | The proposal

Legend
- Proposal area
- Construction footprint
- Concept design
- Ancillary site
- Chainage point

Scale: 1:3,000 @ A4
Legend

- Proposal area
- Construction footprint
- Concept design
- Ancillary site

Figure 1-2e | The proposal
Figure 1-2f | The proposal

Legend

- Proposal area
- Construction footprint
- Concept design
- Ancillary site

1:3,000 @ A4
1.1.1 Surrounding land

As shown Figure 1-1, the proposal is located about 4.5 kilometres east of Denman within the Muswellbrook local government area (LGA). The proposal is surrounded by agricultural land which is predominantly grazing land and cleared of native vegetation. Rural residential properties are scattered along the highway.

There are several small areas of native vegetation that are consistent with the definition of an endangered ecological community listed under the Threatened Species Conservation 1995 (TSC Act), (Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions) and a critically endangered ecological community listed under the Australian Government’s Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)(Central Hunter Valley eucalypt forest and woodland). Refer to Section 6.3 for further details.

Fourteen Aboriginal heritage archaeological sites are located near the proposal area. This includes nine sites recorded on the Aboriginal Heritage Information Management system (AHIMS) and two isolated scatters and two potential archaeological deposits (PADs). Refer to Section 6.2 for further details.

1.2 Purpose of the report

This REF has been prepared by Jacobs on behalf of Roads and Maritime. For the purposes of this proposal, Roads and Maritime is the proponent and the determining authority under Division 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

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

The description of the proposed work and assessment of associated environmental impacts has been carried out in the context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the factors in Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979 (Is an EIS required? guidelines) (DUAP, 1995/1996), Roads and Related Facilities EIS Guideline (DUAP 1996), the TSC Act, the Fisheries Management Act 1994 (FM Act), and the Australian Government’s Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

In doing so, the REF helps to fulfil the requirements of section 5.5 of the EP&A Act including that Roads and Maritime examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the TSC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, to make a referral to the Australian Government Department of the Environment and Energy for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.
2. Need and options considered

This chapter describes the need for the proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

2.1 Strategic need for the proposal

2.1.1 Strategic need for the proposal

The Golden Highway is the subject of a program of improvements for which funding of $133 million was announced in 2015. Climbing lanes at Ogilvies Hill are part of an integrated package of works under the Regional Freight Pinch Point and Safety Program (RFPPSP) and Heavy Vehicle Safety and Productivity Program (HSSVP) respectively.

The Golden Highway extends for a distance of about 313 kilometres between the New England Highway south of Singleton and Dubbo. The highway is a state road under the care and control of Roads and Maritime and passes through six LGAs including Singleton, Muswellbrook, Upper Hunter, Warrumbungle, Wellington and Dubbo.

The Golden Highway provides for regional freight distribution linking the Port of Newcastle to the Upper Hunter, Dubbo, central western and far western NSW. There are currently only a limited number of overtaking lanes along the length of the Golden Highway. Excluding four lane sections in Dubbo, there are only four westbound overtaking lanes and five eastbound overtaking lanes along the highway.

This section of the Golden Highway at Ogilvies Hill is currently a single lane highway with narrow shoulders, non-compliant clear zones and limited overtaking opportunities. This results in heavy and oversize vehicles travelling slowly which impacts on average travel speeds and decreases productivity of the highway. Within this context, the proposal is required to improve road safety and traffic and freight efficiency for oversized vehicles using the highway.

2.1.2 Strategic planning and policy framework

A number of Commonwealth and State strategic plans refer to the need for improving safety and efficiency in roads in the State, including the Golden Highway. The proposal is consistent with these strategic plans, which are discussed in below.

Golden Highway Corridor Strategy

The Golden Highway Corridor Strategy (Transport for NSW, 2016) outlines a 20 year vision for the Golden Highway corridor. The strategy sets out the vision, objectives, current performance, current and future challenges and the NSW Government’s strategic response to managing the Golden Highway corridor over the long term.

The vision for the Golden Highway has been developed to explain what actions should be achieved over the next 20 years in order to improve the performance of the Golden Highway and meet the specific corridor objectives. The vision includes:

- Boost productivity, support the development of agricultural and mining activities and operate as a critical freight route by enabling access for Performance Based Standards (PBS) Class 2B high productivity vehicles (up to 30 metres in length) across the Great Dividing Range from western NSW to the Hunter region and the Port of Newcastle
- Provide safe and efficient travel for all road users by providing a “2+1” lane arrangement east of Denman Road, and two lanes each way with an increased number of overtaking/climbing lanes west of Denman Road, and by addressing high risk crash locations
Improve road network reliability and access by reducing the impact of flooding.

To address some of the challenges associated with road safety, freight productivity and sustainable asset management, a number of short-term priorities (zero to five years) have been identified for the Jerrys Plains to Denman Road corridor along the Golden Highway.

The short term priorities relevant to the proposal include:

- Road widening with clear zone work to address run-off road crashes east of Denman
- Measures to enable safe access for higher productivity vehicles and improve safety at level crossings
- Overtaking lanes at more highly trafficked locations to improve traffic efficiency and reliability improving safety for motorists, and supporting the productive movement of freight
- Carry out accelerated road rebuilding.

The Golden Highway Corridor Strategy has been divided into 11 sections which include:

- Section 1: Belford to Mt Thorley
- Section 2: Mt Thorley to Jerrys Plains
- Section 3: Jerrys Plains
- Section 4: Jerrys Plains to Denman
- Section 5: Denman (township)
- Section 6: Denman to Merriwa
- Section 7: Merriwa (township)
- Section 8: Merriwa to Dunedoo
- Section 9: Dunedoo (township)
- Section 10: Dunedoo to Dubbo
- Section 11: Dubbo (urban area).

The proposal forms part of Section 4 Jerrys Plains to Denman to improve safety, traffic efficiency, network reliability and freight access and funded through the RFPPSP and HSSVP as part of a four year package of upgrades.

**NSW State Plan 2021: The Plan to Make NSW Number One**

The *NSW State Plan 2021: A Plan to Make NSW Number One* (Department of Premier and Cabinet, 2011) identifies priorities and targets for delivering services for NSW. The Hunter Regional Action Plan supports the NSW State Plan 2021 with regional specific priorities including investing in critical infrastructure and integrated transport. Where the region’s existing infrastructure including the port, airport, and road and rail transport network would be strengthened, as well as the links between mining and broader infrastructure needs would be considered for coal community towns including Scone, Muswellbrook, Singleton and Maitland.

The priority of investing in critical infrastructure and integrated transport aims to support future population and employment growth, improve access to services hubs, increase the share of commuter trips made by public transport and to improve travel efficiency and road safety. The proposal would support these aims as it would improve traffic /freight efficiency and improve road safety.

**Infrastructure NSW State Infrastructure Strategy 2012 (Update 2014)**

The *NSW State Infrastructure Update 2014* (Infrastructure NSW, 2014) is a strategy to plan and fund the infrastructure that the NSW Government delivers. For regional transport the strategic objective is to improve regional producer’s access to markets through investments supporting freight productivity. The key challenges for meeting the strategic objectives include:
Managing a growing regional freight task efficiently
Improving road freight productivity, particularly on major road freight corridors
Tackling constraints and ‘pinch points’ on the local road network
Making passenger transport investments that match the needs of a growing regional population.

The NSW Government’s strategic priorities for regional and interstate transport that are relevant to the Golden Highway Strategy include:

- Safer, more efficient road freight corridors
- Remove constraints on the local road network
- Keep pace with regional population growth.

The strategy recognises the Golden Highway as a priority corridor under the Regional Road Freight Corridor Program. It also identifies the need to improve the connectivity of the Hunter Valley to the Central West. The proposal would assist in meeting the key challenges of the infrastructure priorities of the State Infrastructure Strategy by improving road access into the region to support the growing NSW economy as well as improve the connectivity between the Hunter Valley and central west.

**NSW Long Term Transport Master Plan**

The *NSW Long Term Transport Master Plan* (LTTMP) (Transport for NSW 2012) was released by the NSW Government in December 2012. It is a 20 year plan which responds to key transport challenges and identifies the priorities needed to create a transport system that meets a range of needs. It also sets the framework for the NSW Government to deliver an integrated, modern transport system that puts the road user first.

The LTTMP has two themes that specifically reference upgrades to the Golden Highway, which is identified as servicing key mining, industry and agricultural centres in the Hunter. These themes include:

- Providing essential access for Regional NSW
- Supporting an efficient and productive freight industry.

The LTTMP also identifies significant investment to address pinch points on the Golden Highway. The proposal would support these themes by improving connectivity and travel time reliability, thereby reducing operating costs for heavy vehicles on the Golden Highway.

On a regional basis, a key aim of the LTTMP is to provide essential access for regional NSW. It outlines a commitment to provide accessibility and equity to people in the Western region by supporting good transport access to Broken Hill, Dubbo, Sydney and Newcastle for goods and services. The proposal supports this objective by planning for the improvement of the highway, addressing asset condition, road safety, traffic efficiency and freight access.

**Hunter Regional Transport Plan**

The *Hunter Regional Transport Plan* (Transport for NSW, 2015) supports the LTTMP and identifies specific transport actions for the Hunter region. The plan looks at population changes in the Hunter region and considers the fact that it has the largest regional workforce in NSW, with more than 80 per cent of the population living in the towns and cities of the Lower Hunter.

The broad actions identified in this plan, are under three themes:

- Better transport services
- Ensuring effective regulation
- Improving transport infrastructure.
To support these actions, the plan targets opportunities to invest in the road network to improve transport connections and efficiency. The plan specifically references the Golden Highway which is expected to become a critical freight corridor, with inbound mining freight flows forecast to exceed the levels currently seen on the New England Highway by 2031.

The plan identifies two potential future improvements for the Golden Highway including regrading or realignment of Ogilvies Hill (around 2.5 kilometres east of Dalswinton Road, Denman) and Winery Hill (at Edderton Road, Jerrys Plains).

The proposal would help in meeting the requirements of the plan, as it would improve transport infrastructure on the Golden Highway at Ogilvies Hill.

**The NSW Freight and Ports Strategy**

The aim of the *NSW Freight and Ports Strategy* (Transport for NSW, 2015) is to provide a transport network that allows the efficient flow of goods to their market. The strategy outlines freight specific objectives which reflect the importance of the freight transport network for a competitive and productive NSW economy, as well as the need to integrate freight transport with other productive and non-productive activities and land uses. The strategies objectives include:

- Delivery of a freight network that efficiently supports the projected growth of the NSW economy
- Balancing of freight needs with those of the broader community and the environment
- The proposal would help in meeting the requirements of the strategy as it would provide a safer and more reliable road freight network on the Golden Highway.

**The NSW Road Safety Strategy 2012-2021**

The NSW Road Safety Strategy 2012-2021 sets the direction of road safety in NSW. The NSW State Government is committed to at least a 30 per cent reduction in fatalities and serious injuries by 2021.

This strategy is underpinned by the safe system approach to improving road safety. This takes a holistic view of the road transport system and interactions among the key components of that system – the road user, the roads and roadsides, the vehicle and travel speeds. It recognises that all these components have a role to play in helping to keep road users safe.

This strategy supports road safety infrastructure improvements such as overtaking lanes, wider clear zones, wider sealed shoulders and lanes, as well as behavioural campaigns to reduce the number and severity of crashes along the corridor, in particular crashes relating to speed and driver fatigue. The proposal would help in meeting the requirements of the strategy by helping provide safe and efficient travel for road users along the Golden Highway.

### 2.2 Existing infrastructure

**Road infrastructure**

The Golden Highway extends for a distance of about 313 kilometres between the New England Highway south of Singleton and Dubbo. The Golden Highway is also a vital connection between mines, surrounding towns and villages, the Lower Hunter and Newcastle (via the New England Highway and the Hunter Expressway). The Golden Highway within the proposal area consists of a single lane in each direction with non-compliant clear zones and limited overtaking opportunities. There are no intersections within the proposal area and the posted speed limit is 100 kilometres per hour. The horizontal and vertical geometry do not meet current Austroads guidelines due to substandard curve radius with poor sight distances and clear zones. The existing road pavement is in poor condition. The existing lane widths of the Golden Highway within the proposal area are about 3.5 metres with narrow shoulders on both sides of the highway. Refer to *Photo 2-1 and Photo 2-2*. 
The proposal area has a steep grade which causes heavy vehicles to travel slowly. There are also limited overtaking opportunities and no existing formal pedestrian or cyclist facilities within the proposal area.

Property accesses along both sides of the Golden Highway within the proposal area include formal driveways to access residential buildings, as well as sheds and gates through the roadside fences for access to rural holdings. The Golden Highway is an existing bus route, however, the buses do not stop within the proposal area.

**Drainage**

The existing drainage network within the proposal area includes six single culverts (refer to Photo 2-3) and a mix of open channels and swales that discharge untreated stormwater into the Hunter River catchment. A box multi cell culvert is located just outside the proposal area, refer to Photo 2-4. The culvert location and type is summarised in Table 3-2.
2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The proposal is part of a broader strategy to upgrade the Golden Highway. The objectives of the proposal include:

- Provide safe and efficient travel by providing climbing lanes in each direction as well as wide paved shoulders
- Preserve and improve the condition of structures, cuttings and embankments
- Improve travel efficiency by providing a route with improved overtaking opportunities, signage and delineation
- Reduce fuel consumption and vehicle operating costs by providing consistent road conditions
- Cater for higher productivity vehicles including up to PBS Class 2B of up to 30 metre in length
- Maintain and improve the ability to cater for over dimension and over mass loads
- Minimise impacts to the area’s natural environment, heritage and local communities.

2.4 Alternatives and options considered

Roads and Maritime considered a number of strategic design options for the implementation of climbing lanes (both eastbound and westbound) through Ogilvies Hill. Several of these contained significant improvement to the geometry but resulted in large earthworks quantities, high cost and were ultimately rejected as offering poor value for money. The preferred strategic option utilises the existing alignment and comprises of a climbing lane for each direction.

2.4.1 Methodology for selection of preferred option

Following the identification of the need and objectives for the proposal and the preferred strategic option, three options were considered to address issues associated with a single lane road with narrow shoulder, non-compliant clear zones and limited overtaking opportunities.

As part of the Roads and Maritime planning process, a Value Management and Risk Management (VMRM) workshop for the 20 per cent concept design was held on 20 October 2016. The objectives of the workshop were to:

- Obtain a common understanding of the project and its current position
- Review the design options at each location and recommend a preferred direction for the median width as well as highlighting issues, concerns and potential improvements associated with various aspects of the proposal
- Highlight the key hazards and risks associated with the design and activities in developing the project and for those determined as critical, identify solutions or steps to address them
- Identify a way forward to make the design robust as it is progressed.

Suggested improvements and recommendations for consideration as the proposal is progressed were also considered.

The VMRM workshop resulted in a preferred option which best meets the proposal objectives as listed in Section 2.3.1 and suggested improvements for consideration to meet the intent and maintain functionality and reducing cost as the design is progressed.

The findings from the *Golden Highway Ogilvies Hill and Winery Hill Climbing Lanes Value Management and Risk Management Workshop Report* (Roads and Maritime, 2016) are summarised below.
2.4.2 Identified options

Three options were considered for the proposal as follows:

**Option 1 – ‘Do Nothing’**

The do nothing option would result in the Ogilvies Hill section of the Golden Highway remaining in its current state. Normal road maintenance would continue to be carried out.

**Option 2 – Road widening with a one metre wide centre median**

This option would include minor realignment of the road geometry through widening to accommodate climbing lanes, two metre wide road shoulders and a one metre wide painted centre median.

**Option 3 - Road widening with no centre median**

This option would include minor realignment of the road geometry through widening to accommodate climbing lanes, two metre wide road shoulders within no centre median.

2.4.3 Analysis of options

**Option 1 – Do Nothing Option**

When considering the Do Nothing option against the proposal objectives, it was found that this option would not:

- Provide safe and efficient travel by providing climbing lanes in each direction as well as wide paved shoulders
- Improve the condition of structures, cuttings and embankments
- Improve travel efficiency by providing a route with improved overtaking opportunities, signage and delineation
- Reduce fuel consumption and vehicle operating costs by providing consistent road conditions
- Cater for higher productivity vehicles including up to PBS Class 2B of up to 30 metre in length
- Maintain and improve the ability to cater for over dimension and over mass loads
- Minimise impacts to the area’s natural environment, heritage and local communities.

This option would not meet the proposal objectives outlined in Section 2.3.1 and it does not present a solution to the strategic need. Accordingly, this option was rejected.

**Option 2 - One Metre Median and Option 3 No Median**

Table 2-1 and Table 2-2 outline the advantages and disadvantages of Option 2 and Option 3 respectively as developed in the VMRM workshop.

**Table 2-1: Option 2 - One Metre Median**

<table>
<thead>
<tr>
<th>Potential benefits</th>
<th>Disadvantages/ implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Improves safety due to increased separation between east and westbound lanes</td>
<td>• Larger footprint potentially increases environmental impacts compared to option 3</td>
</tr>
<tr>
<td>• Improves safety due to wider shoulders</td>
<td>• Increased road surface area generates higher ongoing maintenance costs compared to option 3</td>
</tr>
<tr>
<td>• Provides climbing lanes in both directions</td>
<td>• Greater land acquisition requirements</td>
</tr>
<tr>
<td>• Improves safety due to wider shoulders and greater median separation of oncoming traffic</td>
<td></td>
</tr>
</tbody>
</table>
Potential benefits | Disadvantages/ implications
--- | ---
- Potential to put in central barrier in median in future | - Greater earthworks volumes (questionable)
- Allows more flexibility, safer/easier staging during construction phase | - Doesn’t improve vertical or horizontal alignments
- Caters for higher productivity vehicles including up to PBS Class 2B of up to 30 metre in length | - Increased cost due slightly larger footprint for property acquisitions, road surface and earthworks.
- Maintains and improves the ability to cater for over dimension and over mass loads |  
- Improves drainage structures, cuttings and embankments.

Table 2-2: Option 3 - No Median

<table>
<thead>
<tr>
<th>Potential benefits</th>
<th>Disadvantages/ implications</th>
</tr>
</thead>
</table>
- Provides climbing lanes in both directions | - Reduces cross section which will impact on staging during construction |
- Improves safety due to wider shoulders | - Less safe due to separation distances between lanes, than the one metre median option particularly at the merges of the climbing lanes |
- Lower ongoing maintenance costs compared to option 2 | - Doesn’t improve vertical or horizontal alignments |
- Smaller footprint has reduced environmental impact compared to option 2 | - Requires land acquisition. |
- Minimises land acquisition requirements compared to option 2 | |
- Minimises potential Aboriginal cultural impacts compared to option 2 |  
- Caters for higher productivity vehicles including up to PBS Class 2B of up to 30 metre in length |  
- Maintains and improves the ability to cater for over dimension and over mass loads |  
- Improves the stability the cuttings and embankments.

2.5 Preferred option

The preferred option for the proposal is Option 2 - Road widening with a one metre wide median centre median as it would:

- Provide safe and efficient travel by providing climbing lanes in each direction as well as wide paved shoulders
- Improve safety due to increased median separation between oncoming traffic
- Potential to put in central barrier in median in future
- Allows more flexibility, safer/easier staging during construction phase
- Preserve and improve the condition of structures, cuttings and embankments
- Improve travel efficiency by providing a route with improved overtaking opportunities, signage and delineation
- Reduce fuel consumption and vehicle operating costs by providing consistent road conditions
- Cater for higher productivity vehicles including up to PBS Class 2B of up to 30 metre in length
- Maintain and improve the ability to cater for over dimension and over mass loads.
2.6 Design refinements

2.6.1 Road pavement refinements

The road pavement options considered are described in HW27 Golden Highway –Ogilvies Hill Pavement Option report (Jacobs, 2107) and the following has been summarised from that report.

In the constructability workshop held on 2 November 2016, Roads and Maritime indicated preference for widening options commonly used in the Hunter region including full depth asphalt, thick asphalt over heavily bound material (plant mixed), and thin asphalt over heavily bound material (insitu stabilised). Roads and Maritime also indicated preference for full depth and thick asphalt options in areas where the longitudinal grade exceeds seven per cent. Accordingly, these options were developed further. Road pavement options including heavy duty granular with asphalt surfacing and heavy duty granular with bituminous surfacing were later considered inappropriate and discarded as the entire alignment at Ogilvies Hill has a longitudinal grade exceeding seven per cent.

Two options were considered for road widening and one option was considered for road rebuilding. These are as follows:

- Widening design Option A – Full depth asphalt
- Widening design Option B - Thick asphalt over heavily bound material
- Rebuilding Option C – Asphalt overlay.

The selection of the preferred option combination was based on cost and constructability assessments. The adopted road pavement for the 80 and 100 per cent concept design is the combination of Option A and Option C. Refer to Section 3.2.3 for further details.

2.6.2 Alignment refinements

The strategic design anticipated utilisation of the existing alignment. Review of the 20 per cent concept design with the survey data identified the presence of crown land under a native title claim next to the road reserve, which required a change to the alignment of the road.

Pavement investigations have confirmed that reconstruction of all existing road pavement is required. To stabilise the road pavement on grades over seven per cent, the preferred pavement will involve deep lift asphalt overlay to the existing pavement and deep lift overlay over select material for the widened areas. The target grade line for the new pavement would be 230 millimetres above the existing pavement which compares with the 190 millimetres used in the 20 per cent concept design.

As a result, the alignment and grade of the proposal was completely revised to move the proposal footprint away from the crown land, to lift the grade further above the existing pavement and to shift new pavement construction to one side of the existing alignment. The proposal would no longer interfere with adjacent communications infrastructure on the cutting on the south side of the highway at the crest of the hill. In addition, the proposal would be moved further from Aboriginal artefacts (Ogilvies Hill 1, Ogilvies Hill 2 and Ogilvies Hill 3) identified during heritage surveys and some further alignment improvements were possible on the western side of the crest (refer to Section 6.2).

Other improvements and refinements been made for the 80 per cent concept design. These include:

- Horizontal transitions have been included
- Much of the alignment has been shifted to the north, so that widening of the existing road is occurring on the northern side of the Golden Highway
- Location of eastbound merge taper has been pushed east to provide stopping sight distance
• Alignment has been shifted right between chainages 71240 and chainages 71500 to avoid impact on crown land
• Runout areas have been provided on eastbound and westbound merges
• The design refinements above collectively influenced the alignment for the 80 per cent concept design. The 80 per cent design has been modified to avoid impact on Crown Land, Aboriginal heritage (where possible) and to move construction to predominantly one side of the current road alignment.
3. Description of the proposal

This chapter describes the proposal and provides descriptions of existing conditions, the design parameters including major design features, the construction method and associated infrastructure and activities.

3.1 The proposal

Roads and Maritime proposes to widen about 1.7 kilometre of the Golden Highway extending through Denman Gap from 4.7 kilometres west of Saddlers Creek Bridge to about 1.2 kilometres east of Duggans Road, at Ogilvies Hill (the proposal). The proposal is shown in Figure 1-2.

Key features of the proposal are:

- Provision of a 1.3 kilometre long westbound climbing lane
- Provision of a one kilometre long eastbound climbing lane
- Road widening to provide 3.5 metre wide lanes and two metre shoulders
- Earth works to allow for the climbing lanes and widening existing lanes
- Provision of three metre wide shoulders for 30 metres on the approach either side of properties accesses
- Culvert extension or replacement including scour protection
- Provision of new roadside drainage comprising table drains and concrete dish drains
- Provision of new or rebuilt road surface along the length of the proposal
- Installation of safety barriers along the eastbound and westbound lanes where required
- Property acquisitions where required
- Installation of up to five construction sediment basins
- Four temporary construction ancillary facilities, including construction compounds, construction stockpiles sites and erosion and sedimentation measures.

Construction of the proposal would be expected to start late 2018, and would take about 12 months to complete.

Construction of the proposal would be staged to enable work to be completed safely while maintaining traffic flows at all times. Construction would generally involve building one lane at a time, and moving traffic between the lanes to keep the traffic flows for the duration of work. Further details on the construction staging are provided in Section 3.3.

The proposal would require the temporary use of four sites for ancillary facilities during construction and these are outlined in Section 3.4.

The proposal has been developed to a concept design phase and would be further refined during the detailed design phase. The concept design of the proposal is described in HW27 Golden Highway – Ogilvies Hill 80% Concept Design Report (Jacobs, 2107) and the following has been summarised from that report.

3.2 Design

The following sections provide a description of the design criteria, major design features and engineering constraints of the proposal. These features have been based on the concept design and would be subject to refinement during detailed design.
3.2.1 Design criteria

The road design has been carried out in accordance with the following guidelines and standards:

- *Austroads Guide to Road Design* (Austroads, 2009) and Roads and Maritime supplements to the Austroads Guide
- Austroads Road Safety Audit Manual (Austroads, 2009)
- Roads and Maritime’s Delineation Guidelines (Roads and Maritime, undated)

The adopted design criterion for the proposal is in Table 3-1, and the typical cross sections of the proposal are shown in Figure 3-1 and Figure 3-2.

### Table 3-1 Design Criteria

<table>
<thead>
<tr>
<th>Specification</th>
<th>Criteria</th>
<th>Design criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road design</td>
<td>Design speed</td>
<td>50 to 100 kilometre per hour</td>
</tr>
<tr>
<td></td>
<td>Posted speed</td>
<td>100 kilometres per hour</td>
</tr>
<tr>
<td></td>
<td>Design vehicle</td>
<td>30 metre B-Double</td>
</tr>
<tr>
<td></td>
<td>Checking vehicle</td>
<td>30 metre B-Double</td>
</tr>
<tr>
<td></td>
<td>Lane widths</td>
<td>3.5 metres</td>
</tr>
<tr>
<td></td>
<td>Auxiliary lane widths</td>
<td>3.5 metres</td>
</tr>
<tr>
<td></td>
<td>Shoulder width (including SO kerb)</td>
<td>2 metres</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>One metre - painted</td>
</tr>
<tr>
<td>Drainage</td>
<td>Channels and open drains</td>
<td>Minimum ARI 5 years</td>
</tr>
<tr>
<td></td>
<td>Culverts where surcharge is allowable</td>
<td>Minimum ARI 50 years</td>
</tr>
<tr>
<td></td>
<td>Nil width of flow spread onto traffic lanes</td>
<td>Minimum ARI 10 years</td>
</tr>
<tr>
<td></td>
<td>Major storm event</td>
<td>Minimum ARI 100 years</td>
</tr>
<tr>
<td>Road pavement</td>
<td>Design life</td>
<td>20 years</td>
</tr>
</tbody>
</table>
Figure 3-1 Typical cross sections of the proposal showing eastbound and westbound climbing lanes at about chainage 71050

Figure 3-2 Typical cross sections of the proposal showing eastbound climbing lanes at about chainage 71820
3.2.2 Engineering constraints
The design and construction of the proposal need to consider a number of issues and constraints. The main issues and constraints include:

- Existing alignment: Tie-ins to the existing road and steep topography
- Access: Private property owners and residents would need to access their premises during construction
- Utilities: The underground communication cable would need to be protected
- Existing road connections: Woodlands Road and Edderton Road intersects with the Golden Highway. These intersections would need to be adjusted to tie in with the proposal
- Staging of the proposal: The proposal would generally be constructed on the same alignment as the existing highway. This would pose staging challenges to maintain traffic flows (including oversized vehicles and over mass floats moving thought the proposal area) in both directions and access to local roads and properties. The proposal would most likely be constructed concurrently with a number of other upgrades along the Golden Highway.

3.2.3 Major design features
The major design features include the centreline shift associated with road widening works, increased shoulder and verge widths. The road pavement design and drainage features are described below.

**Major design feature 1: Golden Highway cross section**
The cross section for the proposal was adopted with lanes 3.5 metres wide separated by a one metre painted median with two metre road shoulders. The road shoulder is widened to three metres at entry points to private property for a distance of 30 metres on the approach side of the entry. The road verge is typically one metre wide. The typical cross sections are shown in Figure 3-1 and Figure 3-2.

**Major design feature 2: Pavement design**
The pavement would be a combination of two profiles over the length of the proposal. In areas of road widening, the pavement would consist of a full-depth asphalt and for pavement constructed over the existing pavement, an asphalt overlay would be directly applied on top. The two property accesses within the proposal area would remain unsealed. All pavement wearing surface asphalt layers would contain high friction aggregate. Pavements would be designed to balance material costs and construction time. The materials would be milled and re-used where suitable for both permanent and temporary work. Recycled pavement material would be re-used, where suitable.

**Major design feature 3: Drainage**
The culverts within the proposal area were generally found to be in good condition and would suitable for reuse where they can be extended to accommodate the proposal. The proposal would require the following changes to the culverts:

- Two new culverts would be required under property accesses
- One existing culvert would be removed
- Two culverts would be demolished and replaced
- Three culverts would be retained and extended.

The culvert location, type and proposed modification is summarised in Table 3-2.
Table 3-2: Location of culverts and proposal modifications

<table>
<thead>
<tr>
<th>Culvert ID</th>
<th>Chainage</th>
<th>Culvert size and type (mm diameter)</th>
<th>Proposed modifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>318134</td>
<td>70455</td>
<td>450 diameter precast concrete culvert drain</td>
<td>Remove and replace</td>
</tr>
<tr>
<td>318135</td>
<td>70655</td>
<td>600 diameter precast concrete culvert drain</td>
<td>Remove and replace</td>
</tr>
<tr>
<td>318136</td>
<td>70845</td>
<td>750 diameter precast concrete culvert drain</td>
<td>Retain and extend</td>
</tr>
<tr>
<td>N/A</td>
<td>71075</td>
<td>450 diameter precast concrete culvert drain</td>
<td>Remove</td>
</tr>
<tr>
<td>318137</td>
<td>71355</td>
<td>450 diameter precast concrete culvert drain plus 1200 x 1200 and two metre deep collection pit</td>
<td>Retain and extend</td>
</tr>
<tr>
<td>318138</td>
<td>71530</td>
<td>450 diameter precast concrete culvert drain</td>
<td>Remove and replace</td>
</tr>
</tbody>
</table>

For roadside drainage, a combination of concrete dish drains (SO kerbs) and open channels would be included at the base of the cut batters to control and direct surface water. The SO kerb reduces the proposal area and protects the edge of the paved shoulder. Longitudinal pipe drainage would be required between CH 70940 and CH 71020 to supplement the capacity of the SO kerb.

**Major design feature 4: Safety barriers**

Safety barriers would be provided to protect against roadside hazards, typically the presence of roadside cuttings, steep batters and culvert headwalls.

### 3.3 Construction activities

This section 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 confirmed following completion of the detailed design.

The actual construction method may vary from the description in this chapter as a result of factors such as identification of on-site conditions during pre-construction activities, ongoing refinement of the design and consultation with property owners.

#### 3.3.1 Work methodology

Construction activities would be guided by a Construction Environmental Management Plan (CEMP) to ensure work is carried out to Roads and Maritime specifications within the specified work area. Detailed work methodologies would be identified by the construction contractor.

The staging of construction would be sequenced so as to complete construction within the minimum possible timeframe, while maintaining traffic flow through the work zones at all times. The general approach would be to begin preliminary work as an early priority, before the main roadwork would begin.

**Early work**

The proposed scope of early work includes:

- Identification and marking of sensitive areas as identified in this REF and the CEMP
- Establishment of temporary fencing and exclusion zone fencing, and clear demarcation of clearing limits
Installation of temporary environmental controls including erosion, sediment and water quality controls
Installation of drainage infrastructure to keep off site separate from site water
Establishment of ancillary sites including main site compounds and stockpile areas
Property adjustment work
Installation of traffic management measures, such as safety barriers in accordance with the traffic control plan
Vegetation clearing and grubbing including tree removal where necessary
Relocation or protection of utilities as required.

**Construction of the proposal**

The construction of climbing lanes would be generally constructed offline with a reduction in speed (40 kilometres per hour) through the work area. The road rebuilding and shoulder widening would be carried out on half the road at a time. The Golden Highway would operate with a single lane available using temporary traffic control signals to manage the traffic. Work would be carried out in about 500 metre sections with each section taking about four months to construct. It is likely each section would be constructed in four main stages. However, the construction contractor may elect to vary this. The four stages are as follows:

- **Stage one** would involve construction of as much of the widened new road as possible off line along the northern side of the highway, refer to Figure 1-2. Stage one would most likely be carried out during standard work hours, while maintaining two way traffic on the existing alignment. No lane closures would be required, however the eastbound shoulder would be closed. Traffic on the Golden Highway would be reduced to a speed of 40 kilometres per hour during any construction work adjacent to the highway.

- **Stage two** would involve moving the traffic to the newly constructed road on the northern side of the highway and then the rebuilding of the existing road.

- **Stage three** would involve the tie in work at the road shoulders at either end of the proposal. The work would be carried out during standard work hours with the occasional need for night and weekend work. Traffic would be centrally located on the existing lanes with lane closures in place while a widened shoulder is constructed on either side. Traffic would change lanes to keep the traffic flow for the duration of the stage.

- **Stage four** would involve rebuilding the existing road at the tie in work at either end of the proposal along the centre of the highway, refer to Figure 1-2. The work would be carried out at night with lane closures. Traffic would change lanes while the road is rebuilt to tie into existing road levels.

The typical sequence of work during these stages would involve the following tasks:

- Delineate the work area from traffic on the Golden Highway
- Install traffic management controls
- Stripping, stockpiling and managing of topsoil and unsuitable material
- Culvert extension or replacement
- Carrying out bulk earthworks
- Import and compact select material
- Construction of road pavement (this would include demolition of existing road pavement where required; and compaction of select fill)
- Installation of kerbs and gutters where required
- Asphalt road resurfacing
- Replace topsoil and stabilise embankments
Carrying out finishing work (this would include installation of safety barriers, fencing, line marking, signposting, road furniture and street lights)

- Restore ancillary sites and construction basins
- Site clean-up.

### 3.3.2 Construction workforce

The construction workforce would fluctuate, depending on the stage of construction and associated activities. The workforce would be expected to be between about 35 and 40 personnel at any given time during the construction period. The final number of construction workers would be identified by the construction contractor.

### 3.3.3 Construction hours and duration

As detailed in Section 1.1, construction work would be expected to start towards the end of 2018 and take about 12 months to build. The majority of construction work would generally be carried out during standard work hours, as follows:

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

To minimise disruption to traffic along the Golden Highway, it is anticipated that out of hours work would be required at night and on Saturday afternoon and Sunday. For example, Saturday work would most likely be between 7am and 5pm or as allowable in accordance with road occupancy licence (ROL) requirements. During scheduled night work, potentially impacted sensitive receivers would be consulted and kept informed of construction progress to minimise any impacts. In addition, management and mitigation measures detailed within the CEMP would be implemented as required to further mitigate any construction impacts. This includes the development of an out-of-hours work protocol which would govern the management of work outside standard work hours.

The work would be carried out in accordance with the *Noise Criteria Guidelines* (Roads and Maritime, 2015) and *Construction Noise and Vibration Guideline* (Roads and Maritime 2016). Prior advice would be given to the community regarding work hours, and any planned construction work that is proposed to be carried out outside standard work hours.

### 3.3.4 Plant and equipment

An indicative list of plant and equipment that would be required is provided below. Additional equipment that would likely to be used would be identified during detailed design by the construction contractor.

- Excavator
- Scrapers
- Water carts
- Pulvi-mixers (Stabilisers)
- Bobcats
- Bitumen-sprayer Trucks
- Truck-mounted Lime Spreaders
- Bitumen-sprayer Trucks
- Bulldozers
- Rollers
- Trucks (Tippers)
- Graders
- Loaders
- Backhoes
- Aggregate Spreader Trucks
- Light vehicles
- Aggregate Spreader Trucks
- Asphalt batch plant
3.3.5 Earthworks

The proposal would involve earthworks, with the overall aim of maximising the re-use of material on site or between projects along the Golden Highway. The area of largest earthworks would be associated with:

- Widening the existing road to provide the climbing lanes
- The fill embankments, with the largest of about 340 metres long, up to about 25 metres wide and two metres deep on the eastern side of Denman Gap
- The construction of a cutting up to about 10 metres high near the top of Denman Gap
- A long fill embankment of about 15 metres wide along the northern side of the highway on the western side of Denman Gap.

The estimated quantities of materials associated with earthworks are provided in Table 3-3. The estimates may change depending on the actual quality of material, the depth to bedrock, and the suitability of the material for re-use in construction. Earthwork requirements would be confirmed during detailed design. It is expected that there would be a shortage of about 13,000 cubic metres of fill over cut and therefore fill materials would need to be imported. There would be the potential to source the additional fill from the excessive cut material expected at the Winery Hill upgrade or other construction projects along the Golden Highway.

<table>
<thead>
<tr>
<th>Material</th>
<th>Volume (m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation (cut) volume</td>
<td>35,400</td>
</tr>
<tr>
<td>Fill volume</td>
<td>44,900</td>
</tr>
</tbody>
</table>

3.3.6 Source and quantity of materials

About 8,200 cubic metres of addition fill and about 10,000 cubic metres of asphalt would be required for the proposal. For earthworks, about 7,000 cubic metres of select material zone (SMZ) fill would be imported during construction.

Materials would be sourced from other projects along the Golden Highway and / or appropriately licensed facilities. Wherever possible, materials would be sourced from commercial suppliers in nearby areas or other viable sources such as other nearby infrastructure projects. None of the materials proposed to be used are considered to be in short supply.

If additional fill material is required that cannot be sourced from the proposal area or other projects along the Golden Highway, would be imported from a suitably licensed nearby quarry. The amount of water that would be required during construction is unknown at this stage and would depend on material sources and methodologies applied by the contractor. Water for the work would be sourced from authorised off site sources including potable water, recycled or reused water and extraction of water from the Hunter River.

3.3.7 Traffic management and access

As described in Section 3.3.1, construction would be sequenced in four stages to allow the Golden Highway to remain open to traffic during construction with a reduction in speed to 40 kilometres per hour and managed oversize and over mass movements. Traffic would be moved between the lanes to preserve traffic flows for the duration of work. There would be temporary lane closures or stoppages as traffic is moved between lanes. Road traffic would be impacted throughout all four stages of construction. The worst case delay in moving though the proposal area is about 208 seconds eastbound and 178 seconds westbound (GHD, 2018). Traffic would temporarily be redirected along two alternative routes during construction activities along the Golden Highway as described below.
Vehicle movements

During construction a number of construction vehicles and machinery would require access to the proposal area. Ancillary sites would be established at eight locations along the Golden Highway (including both Ogilvies Hill and Winery Hill upgrade sections). All ancillary sites would be accessed from the Golden Highway, except for the one located at the Dalswinton Road intersection which would be accessed from Dalswinton Road. The majority of construction plant and machinery would be located at these sites (refer to Figure 3-1 for the location of ancillary sites).

Construction vehicles would access the proposal from the Golden Highway, resulting in a temporary increase in heavy vehicle movements on the highway. Construction traffic would include vehicles, light and heavy trucks, and would be greatest during the main earthworks and civil construction with vehicles transporting equipment, materials and spoil, and construction workers accessing the work site.

During normal working days about 10 to 15 heavy vehicle and 20 to 25 light vehicle movements would be required per day on and off-site. About 40 to 45 heavy vehicle movements would potentially be required per day during construction. If the staging of the proposal has two construction fronts occurring simultaneously, there could be over 100 heavy vehicle movements per day. Heavy vehicles would be used to deliver construction material and to transfer construction materials to nominated stockpile sites.

During construction it would be necessary to move a large amount of onsite excavated materials from cuttings to fill areas. Any haulage movement across or along the Golden Highway would be in accordance with an approved Traffic Management Plan (TMP), refer further to mitigation measures included in Section 6.1.

As a proportion of the required fill material would be sourced from outside of the proposal area, major material truck haulage routes would be required between the proposal area and the sourced material using the existing highway and main road network. This would be detailed in the TMP.

Traffic management, control and signage

Where possible, construction would be programmed to minimise impact on traffic using the Golden Highway. Short traffic delays may occur as a result of construction and would be managed via the TMP (refer to Section 6.1).

Standard traffic management measures would be employed to minimise short-term traffic impacts that could be expected during construction (refer to Section 6.1.3). These measures would be identified in a TMP. The TMP would also require management measures for oversize and over mass floats moving through the construction site and along the Golden Highway. These management measures would most likely be addressed in an overarching Golden Highway TMP for all the Golden Highway upgrades that would be occurring concurrently. The TMP would be developed and carried out in accordance with Roads and Maritime’s Traffic Control at Works Sites Manual (RTA 2010) and Roads and Maritime G10 Specification for Traffic Management (Roads and Maritime 2011).

The TMP would detail traffic management requirements during construction, to ensure that traffic flow (including oversize and over mass floats) along the Golden Highway is maintained throughout construction. Further details on the management of vehicles during construction are provided in Section 6.1.

Access

There are two direct property accesses within the proposal area. Access to affected properties would be maintained during construction and temporary property access would be provided if required. The management of property access would be considered by the construction contractor and detailed as part of the final staging plan for the proposal.
Temporary traffic diversions

Some construction activities associated with the proposal would require that traffic is temporarily redirected onto other nearby roads.

Traffic would temporarily be redirected along two alternative routes during construction activities at Ogilvies Hill (the proposal) and Winery Hill along the Golden Highway. Details of the temporary bypass routes are summarised in Table 3-4 and shown in Figure 3-3. It is expected that temporary bypass 01 would reduce traffic along the Golden Highway between the New England Highway and Denman Road, such that it is expected that a smaller volume mainly comprising of local traffic would use the Edderton Road segment of temporary bypass 02.

Table 3-4 Details of temporary bypass routes

<table>
<thead>
<tr>
<th>Temporary bypass ID</th>
<th>Bypassed road segment</th>
<th>Alternative road(s)</th>
</tr>
</thead>
</table>
| 01                  | Golden Highway between New England Highway and Denman Road | • New England Highway from Golden Highway to Thomas Mitchell Drive  
|                     |                                                 | • Thomas Mitchell Drive  
|                     |                                                 | • Denman Road between Thomas Mitchell Drive and the Golden Highway.  |
| 02                  | Golden Highway between Edderton Road and Denman Road | • Edderton Road  
|                     |                                                 | • Denman Road between Edderton Road and the Golden Highway.  |
Figure 3-3 Schematic of temporary bypass routes (Image: Google Earth)
3.4 Ancillary facilities

3.4.1 Ancillary sites

Roads and Maritime identified eight ancillary sites that would potentially be used both for this proposal and the road widening works proposed at Winery Hill. The western four sites (OH1, OH2A & OH2B and the existing Roads and Maritime maintenance stockpile) are assessed as part of this REF, while the eastern four sites (WH1, WH2 A&B and WH3) would be assessed as part of the Winery Hill project. The proposal would potentially use a combination of these eight sites as material is moved between the Winery Hill project and the proposal. The Winery Hill and Ogilvies Hill projects are expected to be constructed concurrently. The locations of the eight ancillary sites are shown on Figure 3-4. The closest sensitive receivers is about 950 metres way from OHA & OHB.

Most ancillary sites would be used as stockpile and laydown areas, while one main site compound and one satellite compound would accommodate worker facilities, site offices, construction parking and plant. Table 3-5 provides the general arrangement of each ancillary site, and its use. All ancillary facilities would be required for the duration of construction of the proposal.

The exact location and proposed use of ancillary sites would be confirmed by the construction contractor before the start of construction.

Table 3-5 Ancillary sites details

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Location</th>
<th>Size (square metres)</th>
<th>Proposed activities</th>
</tr>
</thead>
</table>
| Existing Roads and Maritime stockpile location | Located within the road corridor about two kilometres from the eastern end of the proposal. Access would be from the Golden Highway. | 8,224 | Stockpile area  
Plant and equipment parking area  
Material laydown and storage area  
Chemical storage and equipment refuelling. |
| OH1 | Located to the south of the Golden Highway about 600 metres from the western end of the proposal. Access would be from the Golden Highway | 53,566 | Stockpile area  
Plant and equipment parking area  
Material laydown and storage area  
Site office, parking, first aid post, daytime deliveries  
Arrival and departure of office staff, workforce and daytime deliveries to compound  
Chemical storage and equipment refuelling  
Plant storage and construction parking  
Delivery of excavated material from site by tipper trucks  
General stockpile management and loading of final product into tipper trucks for delivery to site  
General delivery of other construction materials for storage  
Asphalt batch plant and material process activities. |
Site ID | Location | Size (square metres) | Proposed activities
--- | --- | --- | ---
OH2 A&B | This site is located at the around the intersection of Dalswinton Road within the existing road corridor. Access would be from the Golden Highway and / or Dalswinton Road. | OH2A: 2,418 OH2B 4,447 | Stockpile area
Plants and equipment parking area
Material laydown and storage area
Site office, parking, first aid post, daytime deliveries
Arrival and departure of office staff, workforce and daytime deliveries to compound
Chemical storage and equipment refuelling
Plant storage and construction parking
Delivery of excavated material from site by tipper trucks
General stockpile management and loading of final product into tipper trucks for delivery to site
General delivery of other construction materials for storage.

Ancillary facilities would predominantly be used during standard work hours however in some instances these facilities may need to be used outside of standard work hours to facilitate construction activities. In these instances, appropriate management measures would be implemented in accordance with the CEMP and consultation would occur with potentially impacted receivers to minimise impacts.

The stockpile areas would be established and managed in accordance with the Stockpile Site Management Guideline (Roads and Maritime, 2015). They would be located:

- In areas not prone to flash flooding and more than 40 metres from a watercourse
- More than 50 metres from the nearest dwelling
- In previously disturbed areas that do not require the clearing of native vegetation
- In plain view of the public to deter theft and illegal dumping
- Outside the drip line of trees and on level ground wherever possible.

All of the proposed ancillary sites are located in previously disturbed areas. Some clearing and trimming of vegetation would be required at the entry points of the ancillary sites to allow access to the sites. The proposal’s potential impacts on native vegetation, including for ancillary sites, is assessed in Section 6.3.

Where amendments or additional ancillary facilities are identified during construction, the contractor would consult with Roads and Maritime’s lead environment advisor to confirm the suitability of the proposed amendment or additional facility, and whether any additional environmental assessment is required.

Sites would be securely fenced with temporary fencing. Signs would be erected advising the general public of access restrictions and contact details in the event of emergency or incident. Upon completion of construction, the temporary site compound, work areas and stockpiles would be removed, and the sites would be cleared of all rubbish and materials and restored.

### 3.4.2 Construction sediment basins

Construction of the proposal has the potential to affect water quality through erosion of exposed or disturbed areas and subsequent sedimentation of watercourses. To mitigate these effects, up to five
Construction basins would be installed within the proposal area to trap sediments and other pollutants from disturbed areas.

The size of the basins was not determined during the concept design. However, the anticipated basin locations have been included in the construction footprint. Refer to Figure 1-2 for basin locations. The basins would be located within the proposal area on acquired land. Due to the steep road grades and the steep surrounding topography, it is not expected that temporary sedimentation basins can be further reduced in the development of the detailed design.

The design criteria for the sedimentation basins are defined in the Blue Book (Soils and Construction, 2004 and 2008 Volume 2D Main Road) which requires that sediment basins be designed for the 85th percentile, five-day rainfall depth for basins located near sensitive receiving environments, and for the 80th percentile for non-sensitive receiving environments. The sediment basins would need to provide sufficient volume for settling and storage of sediments. The settling zone volume are estimated using the appropriate design rainfall depth and catchment areas. The storage zone is estimated using the Revised Universal Soil Loss Equation (RUSLE).

Typically, the construction basins would be in the order of 250 to 300 cubic metres (water volume) with a maximum water depth of two metres and length to width ratio of 3 to 1. The basins sizes have been estimated for high runoff potential soils (Type D, as per the blue book) and other design input parameters include, soil type, rainfall erosivity (which is a function of local rainfall intensity), soil hydrologic group, volumetric runoff coefficients and soil erodibility and the Blue Book design methodology.

This final size and location of the basins would be confirmed during detail design. Additional soil and water management measures would also be developed during detailed design and included in the CEMP.
Figure 3-4 | Proposed ancillary sites
3.4.3 Mobile asphalt batch plant

Construction of the proposal would require an onsite asphalt batch plant to supply asphalt for the proposal. The batching facility would be established on land within ancillary site OH1 on private land. Site establishment work for the batching facility within the ancillary site would typically comprise the following activities:

- Installation of sediment controls
- Installation of fencing
- Levelling and grading of the site
- Construction of water quality dams to capture runoff from batching facility operations
- First flush containment system
- Placement of fill and hardstand materials to form weather-proof hardstand areas, where required
- Establishment of testing pad including amenities, car park, chemical stores and site sheds
- Installation and erection of batching facility and service connections.

The batching facility would cover an area of about 1000 square metres and accommodate the following facilities (refer to Figure 3-5):

- Asphalt batch plant
- Material stockpile areas
- Fenced testing pad area (including car park area, amenities, site shed, and chemical storages water quality basins.

Operational activities associated with the batching facility would be carried out in accordance with the project Environment Protection Licence (EPL). Any construction work outside of the approved hours would be carried out in accordance with the EPL and the Noise and Vibration Management Plan (NVMP).

![Figure 3-5 Typical batch plant site layout](image)

**Figure 3-5 Typical batch plant site layout**
3.5 Public utility adjustment

The utilities present within the proposal include:

- Ausgrid overhead power lines and poles
- Underground communication utilities.

No major utility relocations would be required as part of this proposal, the underground communication cable would need to be protected.

Any utility relocation requirements outside of the proposal area would be subject to further environmental assessment.

3.6 Property acquisition

The proposal would require partial acquisition of land from four properties, which all share a boundary with the existing road reserve of the Golden Highway. The proposal requires acquisition of only a narrow strip of land from each property to accommodate the proposed widening of the road corridor. Properties impacted by partial acquisition are listed in **Table 3-6** and shown on **Figure 3-6**.

The extent of property impacts would be refined and confirmed during detailed design in consultation with property owners. Partial acquisitions would require the development of property adjustment plans, which would be prepared in consultation with the property owners.

The land acquisitions would be subject to negotiation between each landholder and Roads and Maritime in accordance with Roads and Maritime’s Land Acquisitions Guide (Roads and Maritime, 2014) and the requirements of the Land Acquisition (**Just Terms Compensation**) Act 1991.

**Table 3-6 Proposed property acquisition**

<table>
<thead>
<tr>
<th>Area ID</th>
<th>Description</th>
<th>Total area (m2)</th>
<th>Acquisition type</th>
<th>Current owner</th>
<th>Lot and DP</th>
<th>Land use zone (LEP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Golden Highway</td>
<td>11,251</td>
<td>Partial acquisition</td>
<td>Private</td>
<td>DP752441</td>
<td>RU1</td>
</tr>
<tr>
<td>2</td>
<td>Golden Highway</td>
<td>765</td>
<td>Partial acquisition</td>
<td>Private</td>
<td>Lot 4 DP242270</td>
<td>RU1</td>
</tr>
<tr>
<td>3</td>
<td>Golden Highway</td>
<td>1073</td>
<td>Partial acquisition</td>
<td>Private</td>
<td>Lot 1 DP953903</td>
<td>RU1</td>
</tr>
<tr>
<td>4</td>
<td>Golden Highway</td>
<td>16,205</td>
<td>Partial acquisition</td>
<td>Private</td>
<td>Lot 120 DP876115</td>
<td>RU1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>acquisition</strong></td>
<td><strong>35,405</strong></td>
<td><strong>Partial acquisition</strong></td>
<td><strong>Private</strong></td>
<td><strong>Land</strong></td>
<td><strong>acquisition zone (LEP)</strong></td>
</tr>
</tbody>
</table>

Roads and Maritime would also require a part lease of one property, which would be used for ancillary site WH1. The need for lease arrangements would be confirmed by the contractor and consultation regarding agreements would be carried out with the identified landowners and Roads and Maritime before the start of work.
Legend
- Proposal area
- Construction footprint
- Culvert
- Basin
- Property acquisition
- Affected property
- Watercourse
- Cadastre

Figure 3-6 | Property acquisition
4. Statutory and planning framework

This chapter provides the statutory and planning framework for the proposal and considers the provisions of relevant state environmental planning policies, local environmental plans and other legislation.

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

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

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

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

The proposal is not located on land reserved under the National Parks and Wildlife Act 1974 and does not affect land or development regulated by State Environmental Planning Policy No. 14 - Coastal Wetlands, State Environmental Planning Policy No. 26 - Littoral Rainforests, State Environmental Planning Policy (State and Regional Development) 2011 or State Environmental Planning Policy (Major Development) 2005. Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the start of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in Chapter 5 of this REF.

State Environmental Planning Policy No 44 – Koala Habitat Protection

The Muswellbrook LGA is identified under Schedule 1 of State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44). The SEPP encourages the conservation and management of natural vegetation areas that provide habitat for koalas to ensure that permanent free living populations would be maintained over their present range.

Roads and Maritime is not bound by the provisions of SEPP 44 for Part 5.1 assessments. However, SEPP 44 is applicable to the Muswellbrook LGA and the principles of conservation would be adopted for the proposal where applicable.

The Biodiversity assessment carried out by Jacobs (Jacobs, 2018c) identified that the Koala would be unlikely to inhabit the proposal area due to no evidence of Koala habitation or population and the proposal being unlikely to contain suitable habitat, refer to Section 6.3.

4.1.2 Local Environmental Plans

Muspwellbrook Local Environmental Plan 2009

The Muswellbrook Local Environmental Plan 2009 (the Muswellbrook LEP) applies to land within the Muswellbrook LGA. The proposal area is located within the RU1 Primary Production zone. The land use objectives for the RU1 zone under the LEP and the proposal’s consistency with those objectives is detailed in Table 4-1.
### Table 4-1: Relevant zone objectives

<table>
<thead>
<tr>
<th>Zone</th>
<th>Objective</th>
<th>Consistency of the proposal with the zone objective</th>
</tr>
</thead>
</table>
| RU1 Primary Production | • 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  
• To protect the agricultural potential of rural land not identified for alternative land use, and to minimise the cost to the community of providing, extending and maintaining public amenities and services  
• To maintain the rural landscape character of the land in the long term  
• To ensure that development for the purpose of extractive industries, underground mines (other than surface works associated with underground mines) or open cut mines (other than open cut mines from the surface of the flood plain), will not:  
  a. Destroy or impair the agricultural production potential of the land or, in the case of underground mining, unreasonably restrict or otherwise affect any other development on the surface, or  
  b. Detrimentally affect in any way the quantity, flow and quality of water in either subterranean or surface water systems, or  
  c. Visually intrude into its surroundings, except by way of suitable screening  
To protect or conserve (or both):  
  d. Soil stability by controlling development in accordance with land capability, and  
  e. Trees and other vegetation, and  
  f. Water resources, water quality and wetland areas, ad their catchments and buffer areas, and  
  g. Valuable deposits of minerals and extractive materials by restricting development that would compromise the efficient extraction of those deposits. | The proposal does not conflict with these objectives as it would encourage diversity in primary industry enterprises and systems by providing a more efficient freight network, while minimising the fragmentation of land, protecting agricultural potential of rural land and maintaining the rural landscape character of the land in the long term. |

The zone provisions provide that the proposal would be permitted with consent in the RU1 zone. However, as outlined in Section 4.1.1 of this REF, under Clause 94 of ISEPP the proposal is permitted without the consent of council. Therefore, the consent requirements of the LEP do not apply and the proposal may be determined under Part 5.1 of the EP&A Act.
4.2 Other relevant NSW legislation

4.2.1 Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 (POEO Act) provides the legal framework for the management of air, noise, water and waste pollution. Under Section 48 of the POEO Act, scheduled activities (as defined in Schedule 1 of the Act) require an Environment Protection Licence (EPL).

Schedule 1 lists scheduled activities, including road construction on classified roads. The scheduled activities set out in Schedule 1 that are most relevant to Roads and Maritime include:

- Concrete works (clause 13)
- Crushing, grinding or separating materials (clause 16)
- Land-based or water-based extractive activities, such as extraction, dredging, quarrying, processing or storage (clause 19)
- Dealing with certain types of waste (see below)
- Road construction, widening or re-routing (but not maintenance or operation) where this results in four or more traffic lanes. To activate this clause, the road must be at least one kilometre to five kilometres in length depending on whether it is in a metropolitan or non-metropolitan area and on a freeway, tollway or main road (clause 35).

The proposal involves extractive activities, crushing, grinding or separating waste processing or storage. Therefore, based on the concept design, the proposal is considered a scheduled activity for the purposes of clause 19 under Schedule 1 of the POEO Act and an EPL may be required. This would be confirmed during detailed design investigations.

In addition, the POEO Act and the Protection of the Environment (Waste) Regulation 2005 are the key pieces of legislation that regulate waste in NSW. They contain the requirements for managing, storing, transporting, processing, recovering and disposing of waste. Applying waste to land in NSW (including temporary storage and reusing materials back into the construction of a road for example) may trigger various regulatory requirements such as the need to hold an environment protection licence or pay the waste and environment levy. However, a ‘resource recovery exemption’ may be applicable for the land application if it is a genuine, fit for purpose, reuse of the waste rather than another path to waste disposal.

An exemption facilitates the use of specific waste materials outside of certain requirements of the waste regulatory framework. For each exemption there is a corresponding ‘resource recovery order’ that specifies the requirements that must be met by suppliers of the material. The EPA has issued general resource recovery orders and exemptions for many materials including:

- Excavated natural material
- Excavated public road material
- Raw mulch
- Reclaimed asphalt road pavement
- Recovered aggregate.

These orders and exemptions may be used for the proposal without seeking approval from the EPA.

4.2.2 Roads Act 1993

The Roads Act 1993 (Roads Act) provides for the classification of roads. It also provides for the declaration of Roads and Maritime and other public authorities as roads authorities for both classified and unclassified roads. It also regulates the carrying out of various activities in, on and over public roads.
Under Section 138(1) of the Roads Act, consent from the road authority is required for carrying out various activities in, on and over public roads. The proposal requires construction work through a classified road 14 kilometres east of Denman within the Muswellbrook LGA, and temporary interruption to traffic on the Golden Highway. Consent to carry out work on classified roads is not required as per Schedule 2 clause 5(1) of the Roads Act. However, a Road Occupancy Permit would need to be obtained as necessary prior to construction starting.

### 4.2.3 Biodiversity Conservation Act 2016


The BC Act sets out the environmental impact assessment framework for threatened species, threatened ecological communities and Areas of Outstanding Biodiversity Value (formerly critical habitat) for Part 5 activities (amongst other types of development).

However, the transitional provisions of the Biodiversity Conservation (Savings and Transitional) Regulation 2017 apply to the proposal because the environmental impact assessment of the activity began under Part 5 of the EP&A Act before the commencement of the new Act and is pending assessment under Part 5 (clause 29(1b)). Consequently, the biodiversity assessment for the proposal has been assessed in accordance with the TSC Act.

The biodiversity assessment conducted for this proposal is documented in Section 6.3. The proposal would not have a significant impact on threatened species or ecological communities or critical habitat and therefore a SIS has not been prepared.

### 4.2.4 National Parks and Wildlife Act 1974

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

An assessment of the potential impacts on Aboriginal cultural heritage provided in the *Archaeological Survey Report – Ogilvies Hill Stage 2 PACHCI* included as Appendix D and summarised in Section 6.2, which documents that 14 previously recorded Aboriginal Heritage Information Management system (AHIMS) items are located within the proposal area. The sites surveys identified a further 10 previously unrecorded Aboriginal archaeological sites. The proposal would impact on three Aboriginal heritage sites. An AHIP would be sought for impacts to these sites.

### 4.2.5 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fisheries resources of the State for the benefit of present and future generations, including conserving fish stocks and key fish habitats and promoting ecologically sustainable development. The FM Act applies to all waters within the limits of the State, except where Commonwealth legislation applies.

Part 7A Division 4 of the Act prohibits the carrying out, without a licence, of activities that damage habitats or harm threatened species, populations or ecological communities. In determining the significance of impacts, the determining authority must consider the matters listed in Section 5A of the EP&A Act.
The proposal would not directly impact aquatic habitat or block the passage of fish, therefore notice to the Minister is not required.

4.2.6 Water Management Act 2000

The Water Management Act 2000 (Water Management Act) controls the extraction of water, the use of water, the construction of infrastructure such as dams and weirs, and any activities in or near water sources in NSW. Water use approval, water management work approval and activity approvals are required under Sections 89, 90 and 91 of the Act.


**Licensing**

Activity approvals under Section 91 of the Water Management Act are required when a certain activity is likely to affect waterfront land or interfere with an aquifer. The proposal is not expected to impact on groundwater from geotechnical investigations. However, clause 38 of the Water Management (General) Regulation 2011 provides that Roads and Maritime, as a roads authority, is exempt from requiring controlled activity approval for all controlled activities that it carries out in, on or under waterfront land. Section 56 of the Water Management Act 2000 establishes access licences for the taking of water within a particular water management area within a water sharing plan. Under section 18(1) of the Water Management (General) Regulation 2011 (Water Management Regulation), Roads and Maritime, as a roads authority, is exempt from the need to obtain an access licence in relation to water required for road construction and road maintenance. However, notification to the water owner would be required.

Section 92 of the Water Management Act 2000 sets approval requirements for water supply work. The proposed extracting water from the Hunter River (if needed) fall under the definition of water supply work and would require approval under Section 92 of the Water Management Act 2000.

**Aquifer interference policy**

In September 2012, the NSW Government released the Aquifer Interference Policy which aims to protect groundwater aquifers while balancing different water uses. The Water Management Act 2000 defines a number of aquifer interference activities including penetration of, interference with and obstruction of water flow within an aquifer. Taking and disposing water from an aquifer are also defined as being aquifer interference activities. Any activity that results in the reduction in the groundwater resource pool of three megalitres per year or more, or at an instantaneous rate of greater than five litres per second would require a groundwater extraction and aquifer interference license. The proposal is not anticipated to reduce the groundwater resource pool by three mega litres per year or at a rate of greater than five litres per seconds, and therefore a licence is not required.

4.2.7 Biosecurity Act 2015

The Biosecurity Act 2015 and its subordinate legislation commenced on 1 July 2017. The Biosecurity Act 2015 replaces wholly or in part 14 separate pieces of biosecurity related legislation including the Noxious Weeds Act 1993. Under the Biosecurity Act 2015, all plants, including weeds are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

The Biosecurity Act 2015 and Regulations provide specific legal requirements for high risk activities and State level priority weeds. The State level priority weeds and associated legal requirements relevant to the region are outlined in the Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022 (Local...
Land Services, 2017) together with the high risk priority weeds from the regional prioritisation process. As such, the two priority weeds on the site would be assessed and controlled to fulfil the General Biosecurity Duty and minimise biosecurity risks.

4.2.8 Land Acquisition (Just Terms Compensation) Act 1991

The proposal would require Roads and Maritime to partially acquire strips of private owned land in the study area to accommodate the proposal. All land acquisitions would be carried out in accordance with the Land Acquisition (Just Terms Compensation) Act 1991. Property requirements for the proposal, and the process that Roads and Maritime would follow in its dealings with affected landowners, are discussed in Section 3.6.

4.2.9 Waste Avoidance and Resource Recovery Act 2001

The purpose of the Waste Avoidance and Resource Recovery Act 2001 (WARR Act) is to develop and support the implementation of regional and local programs to meet the outcomes of a State-wide strategy for waste avoidance and resource recovery. It also aims to ‘minimise the consumption of natural resources and final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste’.

Waste generation and disposal reporting would be carried out during construction and operation of the proposal. Procedures would be implemented during construction in an attempt to promote the objectives of the Act (refer to Section 6.9).

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

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

Potential impacts to these biodiversity matters are also considered as part of Section 6.3 of the REF and Appendix A.

Findings – matters of national environmental significance

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

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

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

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

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

Roads and Maritime has formed the view that the proposal is not likely to significantly affect the environment and would not require the preparation of an Environmental Impact Statement (EIS).
5. Consultation

This chapter discusses the consultation carried out to date for the proposal and the consultation proposed for the future.

5.1 Golden Highway Corridor Strategy

As described in Section 2.1.2, the Golden Highway Corridor Strategy (Transport for NSW, 2016) is a NSW Government initiative that aims to set a planning framework for how the government will manage road transport on the Golden Highway corridor in line with the NSW Long Term Transport Master Plan (LTTMP), Hunter and Central West Regional Transport Plans, the NSW Freight and Ports Strategy and other relevant state planning frameworks.

The Golden Highway Draft Corridor Strategy was released for public comment between 30 March and 9 May 2016. Community members were encouraged to provide their feedback, leave comments and make submissions at information sessions or via mail, email or phone contact with the project team.

Consideration of the issues raised during the public submissions period has led to a number of updates to the final document. The final Golden Highway Corridor Strategy (Transport for NSW, 2016) can be viewed on the Transport for NSW website at the following address: http://www.transport.nsw.gov.au/projects-road-network-corridor-planning/golden-highway-corridor-strategy.

5.2 Consultation strategy

A Communications Engagement Plan (CEP) (Roads and Maritime, 2016) was prepared and implemented for the both Ogilvies Hill (the proposal) and Winery Hill project, which are part of the Golden Highway Corridor Strategy package of work. The CEP describes the communication and consultation approach and activities for the proposal and the proposed communications approach and to keep key stakeholders and the community informed during the work. The consultation objectives were to:

- To keep the local community and other key stakeholders regularly informed of progress
- To provide the local community and stakeholders with regular and targeted information to build awareness about the Winery Hill and Ogilvies Hill project
- To provide clear information about what we are seeking feedback on, when and why
- To ensure feedback from the local community and key stakeholders is continuously fed into communication and engagement
- To be transparent in all that we do
- To encourage participation from local community members and other stakeholders
- To listen to feedback, investigate suggestions and report back
- To engage in a manner that is collaborative, innovative, adaptive and sustainable
- To increase stakeholder understanding of the Golden Highway program of work and its objectives
- To ensure that community and stakeholder enquiries about the project are managed and resolved effectively
- To ensure that project information is distributed in an effective and timely manner.

A range of engagement tools and activities would be utilised prior to and throughout the proposal to provide information to, and receive feedback from stakeholders and the local community.
5.3 Community involvement

The communication approach will focus on targeted communication with local property owners and key stakeholders including Muswellbrook Shire Council, the freight industry, Wanaruah Local Aboriginal Land Council (LALC), Tocomwall Pty Ltd and emergency services.

Roads and Maritime has encouraged community feedback to the proposal through a combination of notifications and consultation with key stakeholders and affected property owners and residents. A summary of the community involvement activities carried out to date is provided in Table 5-1.

Table 5-1 Summary of community involvement activities

<table>
<thead>
<tr>
<th>Date</th>
<th>Community involvement activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 2016</td>
<td>Notification of investigation work required for the detailed design.</td>
</tr>
<tr>
<td>October 2016</td>
<td>Notification of investigation work required for the detailed design.</td>
</tr>
<tr>
<td>November 2016</td>
<td>Notification of investigation work required for the preparation of the REF.</td>
</tr>
<tr>
<td>December 2016</td>
<td>CEP prepared.</td>
</tr>
<tr>
<td>December 2016 to January 2017</td>
<td>Targeted communication was carried out with local property owners and key stakeholders including Muswellbrook Shire Council, the freight industry, Wanaruah LALC and emergency services.</td>
</tr>
<tr>
<td>March 2018 to April 2018</td>
<td>A project update seeking feedback and views on the proposal was delivered via mail and email to eight residents and property owners around the proposal (refer to Appendix B). The letters were also direct emailed to the freight network, businesses located in Mount Thorley industrial estate, emergency services and Muswellbrook Shire Council.</td>
</tr>
</tbody>
</table>
| 18 April 2018    | • A media release was distributed on Wednesday 18 April by Upper Hunter MP Michael Johnsen to local media outlets (refer to Appendix B)  
                  • The project webpage updated on Wednesday 18 April with the latest proposal information including the project update  
                  • A Facebook post inviting comment was published on the NSW Roads Facebook. The post linked to the webpage and encouraged readers to complete the online feedback form. |
| Prior to construction commencing | Doorknocking and targeted consultation with adjacent residents and landholders prior to construction.  
                                 Start of construction notification letter box drop a minimum of five business days prior to construction work starting. |

Roads and Maritime consulted with the community during April and May 2018 on the concept designs for the Ogilvies Hill and Winery Hill overtaking lanes. Community members were encouraged to provide their feedback and leave comments via mail, email, online feedback form or phone contact with the project team. The consultation period closed on Wednesday 9 May 2018. A Community Consultation Report (CCR) (Roads and Maritime, 2018) was prepared in to document the feedback received from the community for both the Ogilvies Hill (the proposal) and Winery Hill projects.

Roads and Maritime received 11 submissions about a range of issues. Some submissions included multiple comments and raised multiple issues. The feedback received was generally supportive of the proposed upgrades. The key concerns or issues included:

- Design of the proposed upgrades, including intersection treatments, road alignment, safety barriers, and wider road shoulders
- Location and grade of overtaking lanes
• Timing of construction.

Other issues raised included suggestions for other road improvements along the Golden Highway. Some of these suggestions are being addressed by other projects in the Golden Highway package of work.

The Facebook post raised awareness of the project with 23,888 people reached during the consultation period. The post received 464 reactions, comments and shares and 4,440 post clicks, including the webpage link. Of the reactions (eg. like/love/dislike) on the post, 100 per cent were positive. The commentary was mixed with some supportive of the proposal and others saying the priority should be given to the Golden Highway and New England Highway intersection at Belford.

Key issues about the proposed upgrades raised in the comments on the Facebook post included:

• Support for overtaking lanes at Ogilvies Hill and Winery Hill
• Support for the proposed upgrades and a request that work be completed soon.

Other issues raised but not specific to this section of work included:

• Support for overtaking lanes at Whittingham
• Building a flyover at the Golden Highway and New England Highway intersection should be the priority
• Suggestion that building the Singleton Bypass would ease congestion at Whittingham
• Concerns about congestion at Maitland roundabouts
• Concerns about quality of roadwork in other areas – New England Highway at Muswellbrook and Aberdeen
• Suggestions for upgrades needed at other intersections on the Golden Highway.

A summary of the issues and responses documented in the CCR are included in Table 5-2. The CCR is attached as Appendix B.
### Table 5-2 Summary of issues raised by the community

<table>
<thead>
<tr>
<th>Issue category</th>
<th>Number of submissions</th>
<th>Issues raised</th>
<th>Roads and Maritime response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support for the proposed upgrades</td>
<td>3</td>
<td>Support for the concept designs for the proposed upgrades on the Golden Highway at Ogilvies Hill and Winery Hill</td>
<td>Support for the proposed upgrade has been noted.</td>
</tr>
<tr>
<td>Design of proposed upgrades</td>
<td>2</td>
<td>Request for right turning lane into Hollydene Estate Winery</td>
<td>The proposed upgrade provides for a three metre widened shoulder to allow vehicles to pass by a turning vehicle.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Clarification as to whether the road is being realigned and if any improvements will be made to the grade of the eastern side of the hill</td>
<td>Roads and Maritime are maintaining existing alignments and grades.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Query as to whether dividing barriers will be provided and whether they will be wire rope or concrete for motorcyclist safety</td>
<td>Median safety barriers are not included in the proposal.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Request for wider shoulders for wide loads</td>
<td>The proposed safety barriers are standard complying barriers in accordance with relevant standards. There are no specific provisions for motorcyclists.</td>
</tr>
<tr>
<td>Overtaking lanes</td>
<td>2</td>
<td>Overtaking lanes are needed on both sides of the Gap between Denman and Hollydene</td>
<td>Overtaking lanes are being constructed in both directions at Ogilvies Hill and Winery Hill.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Suggestion for eastbound overtaking lanes at Ogilvies Hill, Daley Stud Hill and near Jerry Plains</td>
<td>Overtaking lanes are being constructed at Ogilvies Hill and Winery Hill as these were identified in the Golden Highway Corridor Strategy as priorities. For more information on the Golden Highway Corridor Strategy please visit our website at rms.nsw.gov.au.</td>
</tr>
<tr>
<td>Issue category</td>
<td>Number of submissions</td>
<td>Issues raised</td>
<td>Roads and Maritime response</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Timing of construction</td>
<td>1</td>
<td>Request for better grade of climbing lanes</td>
<td>We are maintaining existing grades for the new overtaking lanes due to the existing road alignment. Improvements include widening road shoulders, providing a widened painted median at Ogilvies Hill, improved roadside safety barriers and clear zones.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Concerned about delay in starting construction. Would like the proposed upgrades to start.</td>
<td>The proposal is on track to start in late 2018.</td>
</tr>
<tr>
<td>Suggestions for other road improvements (outside the proposal area)</td>
<td>1</td>
<td>Improvements need to be made to the Golden Highway and Denman Road intersection as this is a dangerous location.</td>
<td>Work to upgrade the Golden Highway and Denman Road intersection started on Monday 14 May 2018. Work involves:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Building a left turn and acceleration lane for westbound motorists</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Providing a right turning lane for southbound motorists. This will allow eastbound motorists travelling through to Muswellbrook to safely pass by motorists waiting to turn right.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Widening the road shoulder from the intersection to the bridge across the Hunter River.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>New lighting will be installed at the intersection to improve safety for all road users.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Request for extra truck stopping bays</td>
<td>A program of improvements to heavy vehicle stopping bays is being delivered along the Golden Highway. Seven new stopping bays are being built and three existing stopping bays are also being upgraded. Work involves resurfacing, line marking and sign posting, and installation of new picnic shelters and bins.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Concerns about safety at Collaroy Bridge over Krui River. Request to widen the bridge.</td>
<td>The Golden Highway package of works includes a program of improvements to bridge signage between Whittingham and Dubbo, including the Collaroy Bridge over Krui River.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>At the Collaroy Bridge Road and Maritime will be installing additional signage including vehicle activated signs with flashing lights. These types of signs are more visible than traditional.</td>
</tr>
<tr>
<td>Issue category</td>
<td>Number of submissions</td>
<td>Issues raised</td>
<td>Roads and Maritime response</td>
</tr>
<tr>
<td>----------------</td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Request to widen the culvert on the western side of Ogilvies Hill on the curve towards the bottom of the hill</strong></td>
<td>This culvert is located outside the proposal area. The comment has been noted and would need to be considered for future funding.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td><strong>Request to raise and straighten a corner on the western side of Ogilvies Hill</strong></td>
<td>The corner on the western side of Ogilvies Hill is outside the proposal. The comment has been noted and would need to be considered for future funding.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td><strong>Request to extend the proposal to provide turning lanes at the Dalswinton Road intersection</strong></td>
<td>The Dalswinton Road intersection is outside the proposal. The comments have been noted and would need to be considered for future funding.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td><strong>Suggestion for westbound overtaking lanes at Winery Hill, Ogilvies Hill &amp; Collaroy Hill &amp; Cassilis Hill</strong></td>
<td>Overtaking lanes are being constructed over Ogilvies Hill and Winery Hill as these were identified in the Golden Highway Corridor Strategy as priorities. For more information on the Golden Highway Corridor Strategy please visit our website at rms.nsw.gov.au.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td><strong>Concerns the overtaking lanes on Ogilvies Hill will make safety worse at the Dalswinton Road intersection</strong></td>
<td>The Golden Highway will remain as one lane in each direction past the Dalswinton Road intersection.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td><strong>Consider access to a motorcycle track on the eastern side of Ogilvies Hill</strong></td>
<td>This entrance to the motorcycle track is outside the proposal area.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td><strong>Request to reintroduce broken lines on the long straight east of Ogilvies Hill, near the stock pile site to allow overtaking</strong></td>
<td>This location is outside the proposal area and has been forwarded to our Network and Safety team for consideration. The new overtaking lanes at Ogilvies Hill will provide additional opportunities for light vehicles to pass heavy vehicles in this area.</td>
</tr>
</tbody>
</table>

The new overtaking lanes at Ogilvies Hill will provide additional opportunities for light vehicles to pass heavy vehicles in this area.
The issues and comments outside the scope of work have been noted and would need to be considered for future funding. Based on the feedback, Roads and Maritime will be proceeding with further development of the proposal.

Roads and Maritime has considered all submissions and will ensure the project team is aware of concerns raised by the community. Roads and Maritime will ensure that issues highlighted by stakeholders and the community are appropriately addressed when finalising the detailed design. Roads and Maritime will continue to keep the community informed of the project progress.

5.4 Aboriginal community involvement

Roads and Maritime is committed to effective consultation with Aboriginal communities about its activities and the potential for impact on Aboriginal cultural heritage. Roads and Maritime’s Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) was developed to provide a consistent means of effective consultation with Aboriginal communities about activities which may impact on Aboriginal cultural heritage, and a consistent assessment process for Roads and Maritime activities across NSW. A summary of the four stages of the PACHCI procedure is provided in Table 5-3.

Table 5-3: Summary of PACHCI procedure

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Initial desktop assessment to identify whether the proposal is likely to harm Aboriginal cultural heritage.</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Further assessment and site survey with Aboriginal stakeholders to assess a project’s potential to harm Aboriginal cultural heritage and to identify whether formal Aboriginal community consultation and an Aboriginal cultural heritage assessment report (ACHAR) is required.</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Where Stages 1 and 2 have led to the preliminary view that harm to Aboriginal objects or places will occur or is likely to occur, formal consultation and preparation of a CHAR must be completed. This stage may also involve archaeological test excavations.</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Implementation of assessment recommendations.</td>
</tr>
</tbody>
</table>

Aboriginal community consultation carried out to date has involved:

- A site assessment was carried on multiple days August 2016 and September 2017 in consultation with the identified Aboriginal stakeholders under Stage 2 of PACHCI. The findings from the site assessment have been documented in the Aboriginal Archaeological Survey Report Stage 2 PACHCI completed by Jacobs Pty Ltd (2017). This report details an additional ten Aboriginal archaeological sites identified near the proposal area during the site assessment. The sites comprised three artefact scatters, two potential archaeological deposits (PAD), five isolated artefacts and one (refer to Section 6.2 and Appendix D).

- In accordance with the PACHCI, the Roads and Maritime’s Aboriginal Cultural Heritage Officer provided Resource 7 (Aboriginal stakeholder cultural heritage survey report) to the Aboriginal stakeholders for completion (Aboriginal stakeholder completion of Resource 7 is optional). The purpose of Resource 7 is to determine whether any features of Aboriginal cultural significance occur within the study area, and whether they would be affected by the proposal. Information provided in Resource 7 was used to assist Roads and Maritime to determine whether further assessment and consultation is required.

- A Cultural Heritage Values Assessment (CVA) (Jacobs, 2018a) under PACHCI Stage 2 was prepared to facilitate an understanding of the wider cultural values of the Golden Highway.

- Roads and Maritime conducted formal notification of the proposed CVA and proposal through advertisements placed in the Koori Mail and Singleton Argus on Wednesday 5 April 2017 and in the
Muswellbrook Chronicle on 7 April 2017. These notices informed the community of meetings to be held at the Singleton Civic Centre on Wednesday 26 April 2017 and Denman Community Technology Centre on Friday 28 April 2017 in an attempt to identify people with cultural knowledge of the Golden Highway. These meetings provided the opportunity for local Aboriginal people to formally register their interest in the proposal and other upgrades along the Golden Highway

- As part of the CVA, Roads and Maritime presenting information on the proposed Golden Highway Corridor upgrades to the Wanaruah LALC at these meetings. As these meetings were poorly attended it was decided by Roads and Maritime and Jacobs to carry out direct contact with knowledge holders known to them in consultation with the Wanaruah LALC staff in attendance at these meetings. The CVA was prepared after interviews with the knowledge holders
- A register of Aboriginal parties (RAPs) who responded to the notification letters and advertisements was compiled and will be maintained for the proposal. Each RAP was sent a letter confirming receipt of their registration. In April 2017 there were eight RAPs for the proposal. The list of RAPs was issued to OEH, and Wanaruah LALC on 22 April 2017
- In mid-January 2018 the draft Aboriginal Archaeological Survey Report Stage 2 PACHCI (Jacobs, 2018) and archaeological methodology was issued to the RAPs and OEH for review and comment
- As the Aboriginal Archaeological Survey Report Stage 2 PACHCI (Jacobs, 2018) identified that harm to Aboriginal objects or places was likely to occur, formal consultation was commenced in accordance with Stage 3 of PACHCI (Roads and Maritime Services, 2011). On the 22 February 2018, invitations to attend the Aboriginal Focus Group (AFG) meeting were sent to OEH and all RAPs registered at the time
- On 18 April the minutes of the AFG were sent to RAPs with a copy of the CVA for comment
- The Aboriginal Cultural Heritage Assessment Report (ACHAR) was then prepared and has been provided to OEH and all RAPs for review and comment.

Refer to Section 6.2 and Appendix D for further details and the results of the consultation carried out with Aboriginal stakeholders.

5.5 ISEPP consultation

Clauses 13 to 16 of the State Environmental Planning Policy (Infrastructure) (ISEPP) specify the requirements for consultation with councils and other public authorities for infrastructure development carried out by or on behalf of a public authority. The proposal would not result in any impacts to items under clause 13 to 16 of ISEPP, therefore consultation with council was not required.

Appendix B contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been considered.

5.6 Government agency and stakeholder involvement

Roads and Maritime has consulted on an ongoing basis with key State and local government agencies as well as utility providers, bus operators, local property owners and businesses in the proposal area. This consultation was designed to ensure issues and concerns were understood, documented and addressed, and that stakeholders had an opportunity to discuss any aspect of the proposal. Consultation has included phone calls, emails, letters and face-to-face meetings. No specific issues have been raised.

The Roads and Maritime environmental team also met with the Hunter Region EPA representative on 9 April 2018, where the need for an EPL at Ogilvies Hill was discussed.
5.7 Ongoing or future consultation

Ongoing consultation would be required by the construction contractor and Road and Maritime to update local property owners, road users and councils of the proposal. Consultation activities would include:

- Consultation with Muswellbrook Shire Council, the freight industry and local bus companies would be ongoing in relation to staging plans, traffic management, and temporary road shut-downs
- Property owners identified would continue to be consulted about property acquisition and adjustment requirements
- All directly affected property owners, freight providers / industry using the highway and directly affected property owners would be consulted before the start of construction and changes to access for private properties (if required)
- Start of construction notification would be delivered via letter box drop to a number of residents around the proposal a minimum of five business days prior to the start of construction. Start of construction notification would also be provided to the local council and emergency services
- Advertisements would be placed in local print media before the start of works detailing the likely timing of the proposal, potential changes to traffic conditions and project management contact details to open communication channels to provide further details or address complaints
- Variable Message Signs (VMS) would be used along the Golden Highway to inform motorists using this road of the work and potential disruption to the road. The VMS’s would be deployed a minimum of five business days prior to the start of construction.
6. Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act

The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix A.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Traffic and transport

A summary of the potential impacts on traffic and transport are provided in this section, together with identification of measures to avoid, manage or mitigate these impacts. The potential cumulative impacts of the proposal on traffic and transport are assessed in the Golden Highway Road User Delay Traffic Management Summary Report (GHD, 2018), provided in Appendix D and summarised below.

6.1.1 Existing environment

The Golden Highway extends for a distance of about 313 kilometres between the New England Highway south of Singleton and Dubbo. The highway is a State road with a posted speed limit of 100 kilometres per hour in open areas and speed limited to 60 kilometres per hour through townships along its route. The highway carries about 3,000 vehicles per day (total in both directions) on week days based on 2015 data collected at Denman. The exceptions to this are the regional urban centres around Mount Thorley and Dubbo, which cater for more than 10,000 or 20,000 vehicles per day respectively (Cardno, 2015).

The Golden Highway provides:

- Connection for local communities between Singleton, Muswellbrook, Denman, Merriwa, Dunedoo and Dubbo
- Connection between mines, surrounding towns and villages, the Lower Hunter and Newcastle (via the New England Highway and the Hunter Expressway)
- Freight connection for goods moving west from Newcastle including supplies to mines in the east and fertiliser along the length of the corridor
- Connection for livestock and agricultural (including grain) between Dubbo, Dunedoo, Merriwa, Denman and Newcastle including the Port of Newcastle (via the New England Highway)
- Access to the Upper Hunter vineyards
- Connection to the M1 Pacific Motorway and Sydney via the New England Highway and Hunter Expressway
- Connection to southwest Queensland and central-north Victoria (via the Newell Highway) and to South Australia (via the Mitchell and Barrier highways).

The Golden Highway is an approved Higher Mass Limit (HML) B-Double route. It is one of only three east-west B-Double routes north of Sydney over the Great Dividing Range. The others routes are the New England Highway and the Gwydir Highway. The Golden Highway crosses the Great Dividing Range at an altitude about 692 metres Australian Height Datum (AHD) at Stotts Road, Cassilis. This crossing is
relatively easy in comparison to that of the routes to the south, the Great Western Highway (maximum height about 1,170 metres AHD) and Bells Line of Road (maximum height of about 1,000 metres AHD).

The Golden Highway at Ogilvies Hill is narrow and winding with narrow shoulders, non-compliant clear zones and limited overtaking opportunities. There are limited overtaking opportunities and no dedicated overtaking lanes in either direction. The road surface is tar sealed asphalt and there are no medians, footpaths, longitudinal drainage, street lights or any other traffic management features. The speed limit along the highway is 100 kilometres per hour in either direction.

The Golden Highway intersects with two privately property accesses within the proposal area. Buses use the Golden Highway, but do not stop within the proposal area.

**Crash history**

Transport for NSW Summary Crash Report (2016) data indicates that there has been a single crash in the proposal area which resulted in moderate injury. The crash was a rear end collision between eastbound vehicles.

### 6.1.2 Potential impacts

**Construction**

Construction is planned to occur over a 12 month period (weather permitting) from late 2018 (refer to Section 1.1.2). Construction traffic (comprising light vehicles, haulage trucks, concrete trucks and delivery trucks) would lead to a temporary increase in traffic on the Golden Highway.

Construction would be programmed to minimise impacts on traffic. Standard traffic management measures would be used to minimise short-term traffic impacts, and ensure that traffic flow (including oversize and over mass floats) along the Golden Highway is maintained throughout construction. These measures would be documented in a TMP for the proposal and developed in accordance with Roads and Maritime's Traffic Control at Works Sites Manual (RTA, 2010) and Specification G10 – Control of Traffic. Roads and Maritime would review the TMP before implementation.

**Transport of excavated material and fill**

The majority of construction truck movements for the proposal would be expected to be tipper trucks, which would be either single trucks (bogies) or ‘truck and dog’ trailers. During normal working days about 10 to 15 heavy vehicles would be required per day on and off-site. Between 40 to 45 heavy vehicle movements would potentially be required per day during construction. If the staging of the proposal has two construction fronts occurring simultaneously, there could be over 100 heavy vehicle movements per day. These additional movements are not expected to have a major impact on the existing traffic conditions and numbers. Heavy vehicles would be used to deliver construction material and to transfer construction materials to ancillary sites. Vehicles that are over-height, over-size or over-mass would not be expected to be required to construct the proposal. Haulage would be in accordance with the TMP.

**Local access**

Access to properties would be maintained for the duration of construction. However, there may be a need to temporarily change access to some properties to establish safe construction working areas while maintaining local through traffic. These temporary changes to local access would include changes to access arrangements for vehicles using the Golden Highway, and for property access within the proposal area.

Where temporary disruptions are required, alternative access would be identified in consultation with property owners. The need for temporary access requirements would be identified during detailed design and construction staging planning.
Increased travel times
During construction, the speed limit would be reduced to 40 kilometres per hour where required through the site. This would delay travel time across the proposal when lane closures are in place. This would be monitored throughout construction to ensure traffic flow is maintained on the highway. There would also be increased travel times due to traffic been temporarily redirected onto other nearby roads, this would also increase the volume of traffic along these roads.

The implementation of the TMP, would minimise delays to road users. The cumulative traffic impacts of other upgrade work occurring concurrently on the Golden Highway are considered in Section 6.11.

Road user delay modelling
Road user delay modelling was carried out for the Golden Highway between the intersection with the New England Highway to about 11 kilometres west of Merriwa.

The proposed construction work across 10 sections of the Golden Highway would occur between August 2017 and 2020. The program of works as part of the Golden Highway Corridor Strategy (Transport for NSW, 2016) and planned construction dates is provided in Table 6-1.

Table 6-1 Program of work along the Golden Highway within the Hunter Region (GHD, 2018)

<table>
<thead>
<tr>
<th>Project name</th>
<th>Planned start date</th>
<th>Planned finish date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mudies Creek</td>
<td>November 2019</td>
<td>December 2020</td>
</tr>
<tr>
<td>HW9 to Putty Road Segments</td>
<td>August 2018</td>
<td>December 2020</td>
</tr>
<tr>
<td>Winery Hill Climbing lane (Segments 10 – 70)</td>
<td>November 2018</td>
<td>February 2020</td>
</tr>
<tr>
<td>Ogilvies Hill Climbing Lane (Segments 110 – 130)</td>
<td>November 2018</td>
<td>February 2020</td>
</tr>
<tr>
<td>Denman Road Intersection &amp; Segment 170</td>
<td>May 2018</td>
<td>September 2018</td>
</tr>
<tr>
<td>Segments 190 and 200</td>
<td>March 2018</td>
<td>July 2018</td>
</tr>
<tr>
<td>Rosemount Road intersection, Segments 240 – 260 and HV Parking areas</td>
<td>August 2017</td>
<td>February 2018</td>
</tr>
<tr>
<td>Segment 107</td>
<td>February 2018</td>
<td>June 2018</td>
</tr>
<tr>
<td>Willy Wally rest area westbound</td>
<td>April 2018</td>
<td>June 2018</td>
</tr>
<tr>
<td>Mount Thorley HV inspection</td>
<td>June 2018</td>
<td>May 2019</td>
</tr>
</tbody>
</table>

Each section would have a reduced speed limit for the duration of the works, and some sections would require single lane operation, creating cumulative delays.

The Golden Highway Road User Delay Traffic Management Summary Report (GHD, 2018), assessed the potential road user delay on the Golden Highway as a result of all the proposed construction work along the Golden Highway between the New England Highway to Dubbo (refer to Appendix D).

As part of this assessment road user delay calculations were carried out in order to understand the individual and cumulative impacts on travel times, of the multiple construction projects on the Golden Highway. The delay was calculated for each project based on the difference in travel time between the construction and base scenarios.

The key findings of this investigation include:

- The highest average cumulative delay per trip would be about 31 minutes, which would be experienced by eastbound traffic in the afternoon peak hour. This is equivalent to about a 15 per cent increase in travel time between the New England Highway and Dubbo (about 309 kilometres). The cumulative
delay would be greatest in August 2019, due to multiple projects under construction at the same time. The highest worst case cumulative delay per trip would be about 42 minutes, which would be experienced by eastbound traffic in the afternoon peak hour.

- Potential diversion routes via Wybong Road and Denman Road offer potential travel time savings by allowing through traffic to bypass several worksites when travelling the length of the Golden Highway. This a route that traffic may choose to avoid the proposal as well as several other works sites that are been construction concurrently.

- Some potential diversion routes would not be suitable for heavy vehicles, and longer routes may need to be used by these vehicles.

- **Figure 6-1** shows a graph of the cumulative average delay per trip from New England Highway to Dubbo at various times during the construction program, noting that not all projects would be under construction at once. The peak cumulative delay is expected for about one month around August 2019, with lower delays for much of the works program.

![Figure 6-1 Golden Highway average delay (GHD, 2018)](image)

### Potential diversion routes

Six potential diversion routes between the New England Highway to Dubbo were identified in the *Golden Highway Road User Delay Traffic Management Summary Report* (GHD, 2017). The routes include:

- Ranger Road
- Putty Road
- Lemington Road
- Wybong Road
- Denman Road
- Scone/ Bunnan Road.

Only the diversion route via Denman Road would be established as a detours for the proposal (refer to Section 3.3.7). The other routes are alternative options that traffic may choose to use to avoid multiple construction projects on the Golden Highway including the proposal.

These diversion routes are applicable for through traffic only, whereas local traffic may experience longer travel times if using these routes. The majority of diversion routes would offer limited travel time savings. This would be due to the additional length and reduced speeds on some of the local roads along the diversion routes:
The Wybong Road diversion route via Thomas Mitchell Drive and the New England Highway enables vehicles to bypass eight of the construction projects, providing a travel time saving of eight minutes.

The Denman Road diversion routes via Thomas Mitchell Drive or via Muswellbrook enables vehicles to bypass five of the construction projects, providing a travel time saving of up to eight minutes.

The Range Road, Putty Road and Lemington Road routes take marginally longer than the expected travel time during construction, but may also be worth considering.

The alternative routes would need to be assessed to ensure that they are suitable for the class of vehicles and have the capacity to cope with the increased demand associated with diverted traffic. B-doubles are not currently approved for some of the diversion routes.

**Accommodation of Over Size Over Mass (OSOM) movements**

Restrictions for heavy vehicles were identified for the five potential diversion routes according to the Roads and Maritime Restricted Access Vehicles Map. Restricted access vehicles include 19 metre B-double routes (over 50 tonnes), 23 metre B-doubles and 25/26 metre B-doubles. Vehicles outside of these categories require a permit. The potential diversions routes and applicability to OSOM movements are as follows:

- Range Road, Wybong Road and Lemington Road are local roads and are not suitable for OSOM movements.
- Putty Road is a regional Road. Putty Road between Mitchell Line of Road and Heuston Lane is approved for up to 25 metre B-double vehicle types. Putty Road between Heuston Lane and Campbell Street is restricted for 25-26 metre B-Doubles, to northbound only between 3 am and 5 am, Monday to Friday. No restricted access vehicle travel is permitted on Campbell Street during 8:30-9:00 am and 3:00-4:00 pm on school days.
- Denman Road is a state road and is approved for up to 25 metre B-double vehicle types, however Thomas Mitchell Drive is unsuitable for B-doubles so heavy vehicles would need to travel via Muswellbrook.
- Scone/Bunan Road are regional roads and are approved route for up to 25 metre B-double vehicle types, however the following conditions apply: Travel not permitted 7.30 am to 9.00 am and 3.30 pm to 5.00 pm on school days.

All diversion routes use part of the New England Highway which is a National Highway and is approved for up to 25 metre B-double vehicle types.

The Denman Road diversion route via Muswellbrook would be most suitable for accommodating OSOM movements as it is approved with no conditions for heavy vehicles and offers the greatest travel time savings during construction. This potential diversion route is highlighted in Appendix C.

**Operation**

The proposal would help provide safe and efficient travel for road users along the Golden Highway by providing two metre road shoulder, an east and westbound climbing lane, improved road surface and condition of structures, cutting and embankments within the proposal area.
6.1.3 Safeguards and management measures

Safeguards and management measures for traffic and transport are presented in Table 6-2.

**Table 6-2 Safeguards and management measures – Traffic and transport**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic and transport</td>
<td>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime Traffic Control at Work Sites Manual (RTA, 2010) and QA Specification G10 Control of Traffic (Roads and Maritime, 2008). The TMP will include:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>· Confirmation of oversize haulage routes and/or detours</td>
<td>Contractor</td>
<td>Detailed design / Pre-</td>
<td>Core standard safeguard TT1</td>
</tr>
<tr>
<td></td>
<td>· Measures to maintain access to local roads and properties</td>
<td></td>
<td>construction</td>
<td>Section 4.8 of QA G36</td>
</tr>
<tr>
<td></td>
<td>· Site specific traffic control measures (including signage) to manage and regulate traffic movement</td>
<td></td>
<td></td>
<td>Environment Protection</td>
</tr>
<tr>
<td></td>
<td>· Requirements and methods to consult and inform the local community of impacts on the local road network</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>· Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>· A response plan for any traffic incidents within the construction zone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>· Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>· Monitoring, review and amendment mechanisms.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property access - pre-construction</td>
<td>Requirements for any changes to local access arrangements will be confirmed during detailed design in consultation with the local road authority and any affected landowners.</td>
<td>Roads and Maritime</td>
<td>Pre-construction / detailed design</td>
<td>Additional standard safeguard TT3</td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
<td>Standard / additional safeguard</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Notifications to landowners</td>
<td>Disruptions to property access and traffic will be notified to landowners at least five in accordance with the relevant community consultation processes outlined in the TMP.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Construction</td>
<td>Additional standard safeguard TT4</td>
</tr>
<tr>
<td>Property access - during construction</td>
<td>Access to properties will be maintained during construction. Where that is not feasible or necessary, temporary alternative access arrangements will be provided following consultation with affected landowners and the relevant local road authority.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Construction</td>
<td>Additional standard safeguard TT5</td>
</tr>
<tr>
<td>Reduce speeds, traffic delays and disruptions during construction</td>
<td>Road users and local communities and freight industry will be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays owing to construction activities.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Construction</td>
<td>Additional standard safeguard TT5</td>
</tr>
<tr>
<td>Impacts of the regional road network</td>
<td>Where possible, the most disruption work (such as work that requires lane closures) will be carried out at night to minimise potential impacts on the regional road network.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Construction</td>
<td>Additional safeguard</td>
</tr>
</tbody>
</table>
| Impact to oversize loads                   | - The ability to provide passage for oversize loads must be maintained during construction  
- The TMP will provide details on the strategy for informing oversized vehicles of the construction work and any temporary reduction in lane and/or shoulder widths or lane closures. | Construction contractor | Pre-construction | Additional safeguard            |
6.2 Aboriginal heritage

The potential impacts on Aboriginal heritage during construction and operation of the proposal have been assessed as part of the Archaeological Survey Report – Ogilvies Hill (Stage 2 PACHCI) (Jacobs, 2018), Cultural Heritage Values Assessment (CVA) (Jacobs, 2018a) and Aboriginal Cultural Heritage Assessment Report (Stage 3 PACHCI) (CHAR) (Jacobs, 2018b). The CVA and CHAR are provided in Appendix D. The potential impacts, and safeguards to mitigate them, are summarised in this section.

6.2.1 Methodology

The Archaeological Survey Report and CVA were prepared in accordance with the:

- Stage 2 requirements of the Roads and Maritime PACHCI
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (OEH, 2010)

The study area for the Stage 2 PACHCI is defined as the existing Golden Highway within the proposal area with within a 250 metre buffer either side of highway, as Figure 6-3. The assessment comprised of:

- An overview of the Aboriginal history of the study area
- A search of the AHIMS Register maintained by the OEH
- Identification of Aboriginal sites and areas of archaeological potential within the study area
- A site survey with local LALCs
- Assessment of the significance of identified Aboriginal sites
- Assessment of the potential for unidentified Aboriginal sites
- Recommendations and mitigation measures.

The CVA was prepared for a 45 kilometre section of the Golden Highway between Whitingham and Willy Wally Road (about 20 kilometres west of Merriwa) in the Singleton, Muswellbrook and Upper Hunter LGAs’ as part of the Golden Highway Corridor Strategy.

6.2.2 Existing environment

Aboriginal background

Difficulties exist in determining tribal boundaries within the study area, largely due to 200 years of dislocation caused by European settlement. The study area is thought to be within the boundary of the Wonnarua Nation. Commentators describe the fluidity of social organisation amongst the local tribal groups and commonalities in belief systems, language and modes of subsistence. Kinship relationships were likewise an integral and shared component of traditional Aboriginal society and governed the individuals and groups interaction with the environment. Trade was another social phenomena that bound local groups together and involved access routes throughout the landscape traversed by many and varied groups. Similarly, common behaviour was observable in the choices of campsite location, requiring common access to water and seasonal resources.

Aboriginal people of the Upper Hunter region traditionally used a wide variety of natural resources present within this fertile landscape. Ethno-historical accounts list some of the methods through which Aboriginal people harvested these resources. While there are gaps in the ethno-historical account, such as the lack of descriptions regarding stone artefact manufacture and use, it does provide a basis that can be used to understand how Aboriginal people used the landscape prior to non-Aboriginal colonisation.
Modification of the landscape by Aboriginal people took place through the use of fire farming and reed planting/weir development, however little evidence of such activities is likely to have been preserved in the archaeological record due to the perishable nature of the materials used and the historical alteration of the landscape. Evidence of campsites, with deposits of stone artefacts, hearths or middens are, in contrast, likely to be found where the landscape has not suffered severe ground disturbance. Ethno-historical accounts aid in developing a predictive model for the location of Aboriginal sites.

Similarities existed amongst regional tribal groups in their use of traditional material culture. Wood, stone, shell and bone comprised the raw materials of this world, most of which have little chance of being preserved in the archaeological record. Scarred trees, which were used in the production of items such as canoes, containers, shelters and bowls have the potential to be present within the region as do carved trees associated with ceremonial sites. However, the prevalence of logging in the Hunter region has severely reduced remaining scarred and carved tree numbers. Other sites, such as grinding grooves, stone quarries, burials and ceremonial grounds (bora rings, stone arrangements), while rarer, are discussed in the ethno-historical records and have potential to be present within the study area.

The spiritual world of the Wonnarua was, and is, rich and diverse. Many important cultural sites are the central components of their traditions, and a number exist as focal points in the landscape. For example, Roads and Maritime have been informed by Aboriginal knowledge holders that the Golden Highway follows the path of a songline. Songlines trace the stories of the landscape, connecting the past, people and culture to the pathways taken to travel across country. Many pathways that Aboriginal people used to walk are now integrated with modern roads and highways.

**Database searches**

A search of the OEH’s AHIMS was carried out on 5 September 2017. Fourteen records were identified within 250 metres of the proposal. The AHIMS sites consisted of:

- Eleven artefacts scatters
- Three isolated artefacts.

The location of previously registered Aboriginal sites with 250 metres of the proposal are listed in Table 6-3 and shown on Figure 6-3.

**Table 6-3: AHIMS sites within 250 metres of the proposal**

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Site name</th>
<th>Site type</th>
<th>Site Status</th>
<th>Distance from the existing highway (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>37-2-4688</td>
<td>Spur Hill 101</td>
<td>Artefact Scatter</td>
<td>Valid</td>
<td>200</td>
</tr>
<tr>
<td>37-2-4684</td>
<td>Spur Hill 96</td>
<td>Artefact Scatter</td>
<td>Valid</td>
<td>170</td>
</tr>
<tr>
<td>37-2-4685</td>
<td>Spur Hill 98</td>
<td>Artefact Scatter</td>
<td>Valid</td>
<td>130</td>
</tr>
<tr>
<td>37-2-4689</td>
<td>Spur Hill 102</td>
<td>Artefact Scatter</td>
<td>Valid</td>
<td>80</td>
</tr>
<tr>
<td>37-2-4686</td>
<td>Spur Hill 99</td>
<td>Isolated Artefact</td>
<td>Valid</td>
<td>180</td>
</tr>
<tr>
<td>37-2-4690</td>
<td>Spur Hill 103</td>
<td>Artefact Scatter</td>
<td>Valid</td>
<td>130</td>
</tr>
<tr>
<td>37-2-4720</td>
<td>Spur Hill 133</td>
<td>Artefact Scatter</td>
<td>Valid</td>
<td>160</td>
</tr>
<tr>
<td>37-2-4718</td>
<td>Spur Hill 131</td>
<td>Isolated Artefact</td>
<td>Valid</td>
<td>150</td>
</tr>
<tr>
<td>37-2-4719</td>
<td>Spur Hill 132</td>
<td>Isolated Artefact</td>
<td>Valid</td>
<td>190</td>
</tr>
<tr>
<td>37-2-4729</td>
<td>Spur Hill 142</td>
<td>Artefact Scatter</td>
<td>Valid</td>
<td>100</td>
</tr>
<tr>
<td>37-2-4730</td>
<td>Spur Hill 143</td>
<td>Artefact Scatter</td>
<td>Valid</td>
<td>160</td>
</tr>
</tbody>
</table>
### Site survey

As a result of the desktop assessment, predictive modelling was used to determine the archaeological sensitivity of particular landforms within the study area. The predictive model used to identify areas of potential archaeological sensitivity is based on known patterns of site distribution in similar landscape regions or archaeological landscapes. For example, a high sensitivity rating indicates that these areas have specific landscape characteristics are predicted to have a high potential for the discovery of archaeological sites and these sites are more likely to be of higher significance. Landforms with high sensitivity were identified for further investigation as part of the site survey. For the site survey the study area was divided up into four survey areas (SA1, SA2, SA3 and S4 a&b). The survey area locations and features are summarised in Table 6-4 and are shown in Figure 6-1.

#### Table 6-4: Survey areas and description

<table>
<thead>
<tr>
<th>Survey area</th>
<th>Landscape / Section</th>
<th>Summary of assessment</th>
</tr>
</thead>
</table>
| SA1 - Ogilvies Hill/Waning lower-slope | The lower slopes of Ogilvies Hill near the Hunter River floodplain to the east of Denman. SA1 is gently inclined. | • No known Aboriginal heritage sites identified within the study area. The closest known site is located 410 metres to north east  
• Western portion of the survey area slopes toward Hunter River  
• Based on the predictive model, the remaining, undisturbed portions of the survey area are likely to be of low potential archaeological sensitivity  
• Site has been previously disturbed and contains up to two metres of fill  
• No Aboriginal cultural heritage identified. |
| SA2 - Ogilvies Hill/Denman’s Gap/Crest | SA2 is located on the south western slopes of Ogilvies Hill. The survey area varies from steep to moderately inclined. | • Four AHIMS records identified with the survey area (Spur Hill 88 (37-2-4677), Spur Hill 101 (37-2-4688), Spur Hill 102 (37-2-4689), Spur Hill 105 (37-2-4692))  
• Ogilvies Hill survey area is heavily disturbed by erosion from cattle, property access tracks and the Golden Highway construction through Denman Gap  
• Undisturbed portions of the survey area are likely to be of low potential archaeological sensitivity  
• Steeply sloped areas are of low potential archaeological sensitivity confirmed by desktop results:  
  - Lower slopes have low to moderate potential archaeological sensitivity. |
| SA3 - Waning Lower slope (east) | SA3 is the site of an existing stockpile area 7.5 kilometres south east of Denman to the north of the Golden | • No known Aboriginal heritage sites identified within the survey area  
• Large portions of the area (90 per cent) heavily disturbed by previous stockpiling for the Golden Highway and vehicular movement |
Survey area | Landscape / Section | Summary of assessment
---|---|---
SA4 - Ogilvies Hill Lower slope (east) | Highway. SA3 is very gently inclined to level. | - Based on the predictive model, the remaining, undisturbed portions of the survey area are likely to be of low-moderate potential archaeological sensitivity
- No Aboriginal cultural heritage identified.

Survey areas SA4a &b are on the eastern slopes of Ogilvies Hill. SA4a is located on the northern side of the Golden Highway and is moderately to steeply inclined. SA4b on the southern side of the Golden Highway is very gently inclined. | - Ten previously recorded Aboriginal heritage sites (Spur Hill 155 (37-2-4741), Spur Hill 148 (37-2-4735), Spur Hill 147 (37-2-4734), Spur Hill 143 (37-2-4730), Spur Hill 142 (37-2-4729), Spur Hill 126 (37-2-4713), Spur Hill 131 (37-2-4718), Spur Hill 132 (37-2-4719), Spur Hill 135 (37-2-4722) and Spur Hill 113 (37-2-4700) have been identified within or adjacent to the survey area
- Based on the predictive model, the remaining, undisturbed portions of the survey area are likely to be of high potential archaeological sensitivity
- Gully erosion has exposed archaeological deposits with stratigraphic integrity containing numerous stone tools, a variety of raw material types and hearths
- Elevated landforms adjacent to ephemeral waterways possess high archaeological potential
- As shown on Figure 6-2, the site survey identified:
  - Five isolated artefacts (Ogilvies Hill 1, 3, 6, 7 & 9)
  - Three artefact scatters (Ogilvies Hill 2, 4 & 8)
  - Two PADs (Ogilvies Hill 5 and 10).

The surveys identified 10 previously unrecorded Aboriginal archaeological sites consisting of five isolated finds (Ogilvies Hill 1, 3, 6, 7 & 9), three low density artefact scatters (Ogilvies Hill 2, 4 & 8) and two PADs (Ogilvies Hill 5 and 10).

Ogilvies Hill 5 is a PAD identified in an area where a number of previously identified artefact scatters and isolated finds are known (AHIMS 37-2-4746, 37-2-44, 37-2-41, 37-2-35, 37-2-34 and 37-2-29). This site comprises a newly identified high density artefact scatter with PAD including hearths and appears to have considerable archaeological potential.

A further PAD was recorded near to the Ogilvies Hill 4 artefact scatter and was recorded as Ogilvies Hill 10 comprising a large area of unconfirmed potential next to an ephemeral creek that flow past Ogilvies Hill 5 further downstream. The site is likely to incorporate previously identified sites (AHIMS 37-2-4728 and 37-2-4727).

All ten of these previously unrecorded Aboriginal archaeological sites have since been registered on the AHIMS. These sites are described in Table 6-5 and shown on Figure 6-2.

Table 6-5: Archaeological sites identified during the survey

<table>
<thead>
<tr>
<th>Site Name (AHIMS ID)</th>
<th>Site Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ogilvies Hill 1 (37-2-5465)</td>
<td>Isolated Find</td>
<td>The isolated artefact which is a broken indurated mudstone proximal flake, located about 45 metres south of the existing highway on private land adjacent to the study area. The isolated artefact is located on an upper slope on an eroding cattle track on private property.</td>
</tr>
<tr>
<td>Ogilvies Hill 2 (37-2-5466)</td>
<td>Artefact scatter and PAD</td>
<td>The low density artefact scatter is located between 40 and 100 metres from existing highway on private land adjacent to the study area. The...</td>
</tr>
<tr>
<td>Site Name (AHIMS ID)</td>
<td>Site Type</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Golden Highway Upgrade at Ogilvies Hill 3 (37-2-5467)</td>
<td>Isolated surface artefact</td>
<td>The isolated artefact is a rotated indurated mudstone core is located at on a lower slope context.</td>
</tr>
<tr>
<td>Golden Highway Upgrade at Ogilvies Hill 4 (37-2-5468)</td>
<td>Artefact scatter</td>
<td>The low density artefact scatter is located on an eroding access track on private property. The artefact scatter comprised of about eleven indurated mudstone and silcrete artefacts. The site is situated outside the proposal area corridor and is have been disturbed by vehicular movement on the existing property access. There are no consolidated soils within the site area particularly due to apparent sheet wash erosion enhanced by vehicles tracking across the site area. The site therefore offers no archaeological potential.</td>
</tr>
<tr>
<td>Golden Highway Upgrade at Ogilvies Hill 5 (37-2-5482)</td>
<td>Artefact scatter and hearths</td>
<td>Located at the junction of Quarry Road and the Golden Highway the site spans the Road on the southern side of the highway between 500 metres and 1200 metres to the south west of Ogilvies Hill 3. The site is in the vicinity of previously recorded sites (AHIMS 37-2-4734, 37-2-4735, 37-2-4729). The site is a high density artefact scatter comprised of numerous chert, jasper, quartz, milky quartz, mudstone and silcrete artefacts. Tool types include scrapers, notched flakes, blades, micro-blade cores, flake cores in association with hearths and soils with archaeological potential.</td>
</tr>
<tr>
<td>Golden Highway Upgrade at Ogilvies Hill 6 (37-2-5484)</td>
<td>Isolated surface artefact</td>
<td>The artefact is a rotated indurated mudstone flake.</td>
</tr>
<tr>
<td>Golden Highway Upgrade at Ogilvies Hill 7 (37-2-5485)</td>
<td>Isolated surface artefact</td>
<td>The artefact is a silcrete ‘Muller’ stone that has been utilised as a core. The artefact exhibits five flake scars.</td>
</tr>
<tr>
<td>Golden Highway Upgrade at Ogilvies Hill 8 (37-2-5486)</td>
<td>Artefact scatter</td>
<td>The low density artefact scatter contains Four artefacts were located comprising a core tool and three flakes of indurated mudstone.</td>
</tr>
<tr>
<td>Golden Highway Upgrade at Ogilvies Hill 9 (37-2-5487)</td>
<td>Isolated surface artefact</td>
<td>The artefact is an indurated mudstone flake.</td>
</tr>
<tr>
<td>Golden Highway Upgrade at Ogilvies Hill 10 (37-2-5524)</td>
<td>PAD</td>
<td>Located near the junction of Quarry Road and the Golden Highway. The site incorporates previously recorded sites (AHIMS 37-2-4700, 37-2-4728 and 37-2-4727). AHIMS sites 37-2-4713 is located 80 metres to the north and AHIMS 37-2-4704 and 37-2-4699 are further 300 metres north again on the same stream.</td>
</tr>
</tbody>
</table>
Summary of Significance Assessment

A significance assessment is made up of several significance criteria that attempt to define why a site is important. The assessment of Aboriginal cultural heritage was based upon the four criteria of the Australia ICOMOS Burra Charter (Australia ICOMOS 2013) which include:

- Social values
- Historical values
- Scientific values
- Aesthetic values.

Each of the newly identified Aboriginal cultural heritage sites was assessed against the above criteria and an overall significance is assigned based on an average across the values. The summary of the significance assessment of Aboriginal cultural heritage sites located within 20 metres of the existing highway is presented below in Table 6-6.

Table 6-6: Summary of the significance assessment for known sites within 20 metres of the existing highway

<table>
<thead>
<tr>
<th>Name (AHIMS ID)</th>
<th>Social</th>
<th>Historical</th>
<th>Scientific</th>
<th>Aesthetic</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ogilvies Hill 1 (37-2-5465)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Ogilvies Hill 2 (37-2-5466)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>low</td>
<td>Low</td>
</tr>
<tr>
<td>Ogilvies Hill 3 (37-2-5467)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Ogilvies Hill 4 (37-2-5468)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Ogilvies Hill 5 (37-2-5482)</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Ogilvies Hill 6 (37-2-5484)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Ogilvies Hill 7 (37-2-5485)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Ogilvies Hill 8 (37-2-5486)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Ogilvies Hill 9 (37-2-5487)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Ogilvies Hill 10 (37-2-5524)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Spur Hill 142 (37-2-4729)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Spur Hill 147 (37-2-4734)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Spur Hill 148 (37-2-4735)</td>
<td>High</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

Cultural assessment

A CVA was prepared by Jacobs (2018) and included consultation with Aboriginal knowledge holders (refer to Appendix D). The CVA investigated cultural values along the Golden Highway between Willy Wally Road (about 20 kilometres west of Merriwa) and Whittingham (including the proposal area).
Consultation with stakeholders and on-site discussions with Aboriginal knowledge holders have however identified the following cultural heritage values within the landscape which are applicable to the Golden Highway:

- Resource gathering locations and techniques
- Campsites
- Scarred trees
- Transit routes/pathways through the landscape
- Water courses, water holes or springs
- Plants and animals
- Burial sites
- Songlines
- Post-contact sites
- Massacre sites
- Cultural knowledge.

Within the range of the cultural heritage values above, three Aboriginal cultural places along the Golden Highway which are not gazetted Aboriginal Places under S86(4) of the *National Parks and Wildlife Act*, but rather are places of local significance identified during this CVA. These cultural places include:

- Ogilvies Hill
- Saddlers Creek (in which the proposal is located)
- Loders Creek.

Two of the three cultural places within the CVA study area are associated with known Aboriginal site locations registered on the AHIMS. Ogilvies Hill which includes the proposal area was identified as an Aboriginal cultural place due to the following:

- The proposal area at Ogilvies Hill is known to contain a large number of archaeological sites that have been recorded on the AHIMS site register that are associated with waterways flowing from Denman Gap
- Reported by knowledge holders to have been a significant campground
- Recent surveys have confirmed the cultural significance of this area. Stratified archaeological deposits along Quarry Road near its junction with the Golden Highway have been identified that support the view of this area having been an important place.

It is a significant part of a wider cultural landscape. The cultural values of Ogilvies Hill Aboriginal place is summarised in **Table 6-7**.

**Table 6-7 Cultural values identified by knowledge holders for Ogilvies Hill Aboriginal cultural site**

<table>
<thead>
<tr>
<th>Cultural values identified by knowledge holders</th>
<th>Scientific Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ogilvies Hill is considered to have significance to the local Aboriginal community in terms of its:</td>
<td><strong>High Significant</strong></td>
</tr>
<tr>
<td><strong>Historic value:</strong></td>
<td>Ogilvies Hill has demonstrable potential to yield information that will contribute to an understanding of the natural or cultural history of the region. The large amount of archaeological sites, their stratigraphic integrity, diversity of stone tools types and raw</td>
</tr>
<tr>
<td>- Significant in the evolution or pattern of the history of a locality, region, state, nation or people</td>
<td></td>
</tr>
<tr>
<td>- Importance for the density or diversity of cultural features illustrating the human occupation and evolution of the locality, region, state or nation</td>
<td></td>
</tr>
</tbody>
</table>
Cultural values identified by knowledge holders

- Recognised as a significant camp site for Aboriginal people prior to European contact.

Social Value:
- Importance as a concept, place or object highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, aesthetic or educational associations
- Importance in contributing to a community’s sense of place and/or identity
- “Everything is important because it’s all got lore! It all got lore, the whole lot of it” (Jacobs, 2018b).

Ogilvies Hill is considered to be representative in these contexts.

Scientific Significance

materials demonstrate its archaeological potential and high scientific significance.

It is noted that some of the comments from the Aboriginal knowledge holders, regarding cultural values expressed above relate to the wider Hunter Valley region and less specifically to the proposal area. It was also noted that the cultural values expressed by the participants in the CVA and previous assessments have been consistent in voicing an over-arching concern for the wider cultural landscape and criticism of the negative cumulative impacts of mining and development on that landscape.

The cultural values expressed by the participants within the context of the CVA indicate there are strong ongoing connections to the Golden Highway as well as strong interests in the manner in which cultural places are managed. Knowledge holders expressed a strong on-going cultural knowledge of customary lore specific to cultural sites within or near to the proposal area.

The proposal area was identified as having significant cultural values to the local Aboriginal community. This area has both tangible and intangible cultural values.

Cultural places contain cultural values. Aboriginal cultural heritage (places, sites and objects) in NSW are protected by the NPW Act.

### 6.2.3 Potential impacts

**Construction**

The ten Aboriginal archaeological sites (Ogilvies Hill Site 1-10) identified as part of the site survey and the fourteen existing AHIMS sites near the proposal were considered during the concept design development. The concept design was modified to avoid impacts to these sites. As a result, six of the ten newly recorded sites and all of the previously recorded AHIMS sites are located outside the proposal area and would not be impacted by the proposal provided the mitigation measures in **Section 6.2.4** are implemented.

However, the proposal would have the potential to impact on three Aboriginal heritage sites, which are located within the construction footprint (Ogilvies Hill 7, 8 and 9) and one site which is located near the proposal area (Ogilvies Hill 6), refer to **Figure 6-2**. These sites and potential mitigation measures are summarised in **Table 6-8**.
Table 6-8 Potential impacts to Aboriginal cultural heritage and possible mitigation measures

<table>
<thead>
<tr>
<th>Site/PAD name (AHIMS ID)</th>
<th>Site type</th>
<th>Overall significance</th>
<th>Type of Impact</th>
<th>Degree of impact</th>
<th>Description of proposed mitigation measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ogilvies Hill 6 (37-2-5484)</td>
<td>Isolated artefact</td>
<td>Low</td>
<td>Indirect</td>
<td>Whole</td>
<td>Fence site prior to construction.</td>
</tr>
<tr>
<td>Ogilvies Hill 7 (37-2-5485)</td>
<td>Isolated artefact</td>
<td>Low</td>
<td>Direct</td>
<td>Whole</td>
<td>Surface collection of Aboriginal Objects and Care and Control Agreement after consultation and with an AHIP.</td>
</tr>
<tr>
<td>Ogilvies Hill 8 (37-2-5486)</td>
<td>Artefact scatter</td>
<td>Low</td>
<td>Direct</td>
<td>Whole</td>
<td></td>
</tr>
<tr>
<td>Ogilvies Hill 9 (37-2-5487)</td>
<td>Isolated artefact</td>
<td>Low</td>
<td>Direct</td>
<td>Whole</td>
<td></td>
</tr>
</tbody>
</table>

**Operation**

The operation of the proposal would not adversely impact Aboriginal heritage significance or archaeological potential along the Golden Highway.

### 6.2.4 Safeguards and management measures

Safeguards and management measures for Aboriginal heritage are presented in Table 6-9. No specific cultural value mitigation measures were suggested or recommended by Aboriginal knowledge holders.

**Table 6-9 Safeguards and management measures – Aboriginal heritage**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aboriginal heritage</td>
<td>An Aboriginal Heritage Management Plan (AHMP) will be prepared in accordance with the G36 Environment Protection. It will provide specific safeguards and mitigation measures including the installation of limits to construction fencing and sensitive area exclusion zones prior to start of construction.</td>
<td>Contractor</td>
<td>Detailed design / pre-construction</td>
<td>Core standard safeguard AH1 Section 4.9 of QA G36 Environment Protection</td>
</tr>
<tr>
<td>Aboriginal heritage — unexpected finds</td>
<td>The Standard Management Procedure - Unexpected Heritage Items (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. Work will only re-start once the requirements of that Procedure have been satisfied.</td>
<td>Contractor</td>
<td>Detailed design / pre-construction</td>
<td>Core standard safeguard AH2 Section 4.9 of QA G36 Environment Protection</td>
</tr>
<tr>
<td>Minimise risks to Aboriginal cultural heritage</td>
<td>All personnel working on site will receive training to ensure awareness of requirements of the Aboriginal Heritage Management Plan and relevant</td>
<td>Contractor</td>
<td>Detailed design / pre-construction</td>
<td>Additional standard safeguard AH3</td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
<td>Standard / additional safeguard</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------</td>
<td>---------------</td>
<td>--------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>during construction</td>
<td>statutory responsibilities. Site-specific training will be given to personnel when working in the vicinity of identified Aboriginal heritage items.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional Aboriginal heritage impacts</td>
<td>Any further impacts proposed beyond those assessed in this REF or beyond the proposal area must be subject to further assessment and consultation with Aboriginal stakeholders, consistent with the process in this report.</td>
<td>Roads and Maritime</td>
<td>Construction</td>
<td>Additional safeguard</td>
</tr>
</tbody>
</table>
| Impact to Ogilvies Hill 7, 8 and 9 | • A Stage 3 assessment in accordance with Roads and Maritime (2011) PACHCI will be carried, including formal consultation with the Aboriginal community, the preparation of an ACHAR and AHIP based upon a surface collection of Aboriginal Objects  
• A surface collection of Aboriginal Objects will be carried out at Ogilvies Hill 7, 8 and 9 with a view to developing a Care and Control Agreement under the Code of Practice for archaeological Investigation of Aboriginal Objects in New South Wales (2010) in consultation with registered stakeholders  
• The surface collection of Aboriginal Objects will be carried out as per the methodology that was developed in consultation with RAP and outlined in the ACHAR, which is provided in Appendix D). | Roads and Maritime | Pre-construction | Additional safeguard |
| Impacts to Ogilvies Hill 6 | Ogilvies Hill 6 in the vicinity of proposal will be flagged or fenced prior to construction so as to provide an exclusion zone for the duration of the proposal. | Roads and Maritime | Detailed design / pre-construction | Additional safeguard |
6.3 Biodiversity

The potential impacts of the proposal on biodiversity are assessed in the *Golden Highway – Ogilvies Hill Biodiversity Assessment Report* (BAR) (Jacobs, 2018c), provided in Appendix E. The potential impacts, and safeguards to mitigate them, are summarised in this section.

6.3.1 Methodology

A detailed methodology for the biodiversity assessment is provided in the Biodiversity Assessment in Appendix E. The following provides a summary of the methodology used.

The assessment areas referenced throughout this section are defined as:

- **Proposal area**: This area comprises the limits of the proposal as outlined in Figure 1-2
- **Study area**: This includes the proposal area with a surrounding 20 metre buffer. Boundaries of the study area are displayed in Figure 6-2
- **Construction footprint**: As per the definition provided in Section 1.1. The potential loss of vegetation associated with the proposal has been quantified by overlaying the 100 per cent concept design onto the vegetation community map, with a 10 metre buffer to allow for a for construction activities.

The methodology for the biodiversity assessment involved:

- A desktop review of relevant database records and previous studies within the locality to identify Commonwealth and State listed threatened species, populations and ecological communities
- The mapping of vegetation communities and flora through aerial photograph interpretation, broad-scale vegetation mapping, and elevation data to stratify vegetation and habitats in the investigation area
- Targeted terrestrial flora and fauna surveys carried out on 5 August 2016, 9 August 2016 and 10 August 2016. Species targeted during surveys included *Weeping Myall* (*Acacia pendula*), *Tiger Orchid* (*Cymbidium canaliculatum*), *River Red Gum* (*Eucalyptus camaldulensis*), *Slaty Red Gum* (*Eucalyptus glaucina*), and *Wollemi Mint-bush* (*Prostanthera cryptandroides* subsp. *cryptandroides*)
- Vegetation and habitat condition assessment consistent with *Framework for Biodiversity Assessment* (OEH 2014) and *Biobanking Assessment Methodology* (BBAM 2014). The flora survey aimed to provide baseline data for the presence of threatened plant species, populations and ecological communities to provide a basis for the prediction of impacts
- Field surveys were carried out on the 26 July 2016 and 10 August 2016 by ecologists from Jacobs. The field survey included flora and fauna field surveys. The fauna survey method included rapid habitat assessment at multiple sites, searches for evidence of threatened fauna, and opportunistically recording fauna species active at the time of the survey. No targeted fauna survey techniques such as mammal trapping, spotlighting, frog surveys or call playback, were carried out
- An assessment of threatened species to identify the likely occurrence of State and nationally listed threatened species; these were identified from background reviews based on their habitat requirements
- An assessment of significance for threatened species and ecological communities positively identified during surveys and inspections or that are considered to have a moderate or high likelihood of occurring in the investigation area
- Identification of impacts and associated mitigation measures to reduce and manage impacts.

**Database review**

Database searches were carried out of in August 2016 updated in February 2018. The databases searched included the following:

- OEH vegetation information system (VIS) database (Office of Environment and Heritage 2015)
Field survey

Field surveys were carried out on 9 August 2016 and 10 August 2016 with rapid surveys on 5 August 2016 by ecologists from Jacobs. The field survey included vegetation and fauna field surveys:

The fauna survey method included rapid habitat assessment at multiple sites, searches for evidence of threatened fauna, and opportunistically recording fauna species active at the time of the survey. No targeted fauna survey techniques such as mammal trapping, spotlighting, frog surveys or call playback, were carried out. Due to the disturbed nature of the roadside vegetation, the narrow width of road reserve being assessed and the relatively narrow scope of the proposal, these specific and targeted fauna survey techniques were not feasible. To address this limitation, the potential for threatened fauna species to occur was determined through habitat assessment. The exception to this and due to the detection of microbats within a culvert during the survey, was the addition of a bat call device (Anabat call detector) which was specifically deployed in attempt to identify the bat species using the culvert. The bat call detector was placed outside the northern side of the culvert, about five metres away so that bats could be recorded leaving or entering the culvert.

6.3.2 Existing environment

The locality is located within the Hunter sub-region of the Sydney Basin Bioregion as defined by Thackway and Cresswell (1995) and within the Hunter-central Rivers Catchment Management Area (CMA) in the Hunter sub-region.

Vegetation in the upper hunter is characterised by forest and open woodland of White Box, Forest Red Gum, Narrow-leaved Ironbark, Grey Box, Grey Gum, Spotted Gum, Rough-barked Apple and extensive of stands of Swamp Oak in upper reaches and foothills. River Oak and River Red Gum are characteristic of vegetation along streams.

A list of plants and animals recorded during the field surveys is provided in the Biodiversity Assessment in Appendix E. The surveys recorded 86 plant species (of which 23 species were exotic), 40 vertebrate fauna species (including 33 bird species, two mammal species, two frog species and three reptile species) and two weeds priority weeds for the Hunter Region. These weeds include:

- African boxthorn (*Lycium ferocissimum*)
- Prickly pear (*Opuntia stricta*).
Plant community types

The vegetation in and surrounding the study area is mapped by Peake (2006) as Central Hunter Box – Ironbark Woodland (Map Unit 10). Peake (2006) identifies that Denman Gap (which is the area of Ogilvies Hill where the Golden Highway crosses) contains a variant of Central Hunter Box – Ironbark Woodland identified as the ‘Denman Gap slaty box variant’ which is dominated by *Eucalyptus dawsonii* (Slaty Gum).

The detailed floristic plots carried out in the study area during the field survey allowed for quantitative analysis of the vegetation within the study area at Ogilvies Hill against published descriptions of Plant Community Types (PCTs) in the NSW Vegetation Information System (VIS) database and final determinations of threatened ecological communities published by the NSW Scientific Committee and the Commonwealth Threatened Species Scientific Committee. The results of the data analysis suggest there is one PCT within the study area: Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin (PCT 1655). This PCT is eucalypt woodland to forest with a shrubby understorey. It is characterised by a canopy of *Eucalyptus moluccana* (Grey Box) and *Eucalyptus dawsonii* (Slaty gum) with a sparse to moderately dense tree layer with *Acacia salicina* common in the lower small tree layer. Only occasional *Allocasuarina luehmannii* and *Brachychiton populneus* subsp. *populneus* trees were present and these species are not a dominant component of the vegetation. A moderately dense to dense shrub layer dominated by *Olearia elliptica* subsp. *elliptica*, *Acacia cultriformis*, *Psydrax odorata* (Shiny-leaved Canthium), *Notelaea microcarpa* var. *macrocarpa* (Velvet Mock Olive) *Dodonaea viscosa* subsp. *cuneata* (Acacia decora), *Myoporum montanum* and *Solanum brownii* is present. The groundcover is composed of *Dichondra repens*, *Lomandra multiflora* subsp. *Multiflora* (*Many-flowered Mat-rush*), *Aristida spp.*, *Brunoniella australis* (Blue Trumpet), *Cymbopogon refractus* (Barbed Wire Grass), *Desmodium brachypodum* (Large Tick-trefoil), and the sub-shrub *Sida corrugata*.

The dominant species within the native vegetation in the study area closely matches the description of the Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin (PCT 1655). This PCT occurs in varying levels of condition within the study area from moderate/good quality to highly disturbed roadside remnants dominated by weeds in the understorey and areas of regrowth shrubs. The PCT also include regrow *Acacia salicina* shrubland and Derived native grassland. Refer to Photo 6-1 to Photo 6-4.

The absence of any ironbark trees (i.e. *Eucalyptus crebra*) and only occasional occurrence of *Allocasuarina luehmannii* and *Brachychiton populneus* subsp. *populneus* trees indicates that the vegetation within the study area does not closely match the descriptions for other PCTs known from the area including:

- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter
- Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter
- Bull Oak grassy woodland of the central Hunter Valley.
Photo 6-1 Grey Box- Slaty Box shrub – grass woodland on sandstone slopes of the upper Hunter and Sydney Basin near the crest of Ogilvies Hill on the southern side of the Golden highway

Photo 6-2 Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the upper Hunter and Sydney Basin on the western slope of Ogilvies Hill on the northern side of the Golden Highway showing ground layer dominated by exotic grass

Photo 6-3 Regrowth Acacia salicina shrubland along the Golden Highway which is regrowth of the Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the upper Hunter and Sydney Basin PCT

Photo 6-4 Derived native grassland with PCT 1655 in the background along the southern side of the Golden Highway on the eastern slope of Ogilvies Hill

**Threatened Ecological Communities**

Vegetation within the study area belonging to Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin (PCT 1655) and areas of Regrowth Acacia salicina shrubland meet the requirements of the TSC Act listed EEC referred to as *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* (refer to Photo 6-5). While areas of PCT 1655, derived native grassland and some areas of shrubland (within 100 metres of woodland) also come under the EPBC Act listed EEC *Central Hunter Valley eucalypt forest and woodland* (refer to Photo 6-6 and Photo 6-7). The distribution of these EECs are shown on this TEC is Figure 6-3.

The *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* occurs in varying levels of condition within the study area from high quality examples to highly disturbed roadside remnants dominated by weeds in the understorey and areas of regrowth shrubs.
Threatened flora

Twenty-three threatened flora species and three endangered populations have been previously recorded or modelled as having potential to occur in the locality. Many of these species favour habitats that are not represented in the study area or are only known to exist in populations restricted to specific geologies, vegetation types and localities.

No threatened flora species were identified within the study area during field surveys. However, the field study was carried out in late winter (August 2016) when many of the target species (such as ground orchids) are not above ground. As such, the survey would not have recorded these species even if they were present underground. A precautionary approach to the assessment of threatened plants and their likelihood of occurrence in the study area has been taken for this assessment and the presence of suitable habitat was the primary driver of predicting species occurrence.

Within the Hunter-Central Rivers region, the threatened orchid species Diuris tricolor (Pine Donkey Orchid) is known to be associated with the PCT 1655. Diuris tricolor (Pine Donkey Orchid), and the associated Diuris tricolor (Pine Donkey Orchid) population in the Muswellbrook LGA, is considered moderately likely to occur in the study area in the higher quality patches of vegetation and derived native grasslands. However,
the species is considered to have a lower potential to occur in the road reserve. Other threatened flora species known from the locality including Cynanchum elegans (White-flowered Wax Plant), Eucalyptus glaucina (Slaty Red Gum), Eucalyptus nicholii (Narrow-leaved Black Peppermint) (planted trees only), Pomaderris bodalla (Bodalla Pomaderris), Pomaderris queenslandica (Scant Pomaderris), Pomaderris reperta and Prostanthera cryptandroides subsp. cryptandroides (Wollemi Mint-bush) are considered unlikely to occur in the study area due to the absence of suitable habitat.

The study area is at the western edge of the known distribution of *Eucalyptus glaucina* (Slaty Red Gum). A record of this species exists about 1.2 kilometres to the south of the study area on the eastern slope of Spur Hill which is part of the same ridgeline occupied by the study area. The smooth barked trees identified in the study area were *Eucalyptus dawsonii* (Slaty gum). However, it is likely that *Eucalyptus glaucina* (Slaty Red Gum), trees are present scattered along the eastern slope of Ogilvies Hill amongst the *Eucalyptus dawsonii* (Slaty gum) and *Eucalyptus moluccana* (Grey box) trees outside the proposal area.

The endangered *Acacia pendula* population in the Hunter catchment is known to occur in PCT 1655. *Acacia pendula* was not recorded during the field surveys and as this species is relatively large and conspicuous it is considered to have a low likelihood of occurrence.

The *Cymbidium canaliculatum* population in the Hunter Catchment was surveyed for during the field survey but it was not located. Suitable host trees for *Cymbidium canaliculatum* are present in the study area (such as *Eucalyptus moluccana*) so suitable habitat is present. Due to the relatively low number of suitable host trees in the study area, each tree was able to be inspected and it is likely that this species would have been identified if present, regardless of flowering time. This endangered population was therefore considered moderately likely to occur in the study area based on the presence of suitable habitat and nearby records in the locality. An assessment of significance has been prepared for this species.

Refer to the Biodiversity Assessment in Appendix E, in for the full list of threatened flora and their likelihood of occurrence.

**Threatened fauna**

Based on regional records and the presence of suitable habitat, 38 threatened fauna species have been identified in the locality. This includes 15 mammal species, 19 bird species, two reptile species and two frog species. However, the study area is unlikely to provide suitable habitat for a number of these species as there are no sandstone ridge tops or gullies, no wet or rainforest habitat. However, habitats within the study area are of suitable quality for a number of threatened birds and microbats. In addition, there is no suitable habitat for threatened fish present in the study area.

One threatened species, the speckled Warbler (*Chthonicola sagittata*), listed as vulnerable under the TSC Act, was identified in woodland on the western side of the ridge. Multiple individuals of this species were observed foraging within the study area and even flying across the road into adjoining vegetation, demonstrating that vegetation within the study area likely forms parts of their home range.

Woodland vegetation in the study area provides suitable habitat for a number of woodland bird species including:

- Regent Honeyeater (*Anthochaera Phrygia*)
- Painted Honeyeater (*Graitiella picta*)
- Brown Treecreeper (*Climacteris picumnus victoriae*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Hooded Robin (*Melanodryas cucullata cucullata*)
- Scarlet Robin (*Petroica boodang*)
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*)
- Diamond Firetail (*Stagonopleura guttata*).
In addition, the Swift Parrot (*Lathamus discolor*) is also considered to be a potential visitor to the study area in the winter as it has been identified close to the study area in previous assessments (Cumberland Ecology, 2015).

There are seven culverts located within the study area, many of these would be suitable as roosting habitats for threatened microbats, such as the Southern Myotis (*Myotis macropus*) and or the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*).

Microbats were observed in box culverts on the western side of the hill, about 30 metres outside the proposal area. This culvert is outside of the proposal area and would not be impacted by the proposal. The bats were roosting about 2.5 metres in where culvert extensions had been added, creating a recess in the concrete (see Photo 6-6). This, in combination with many scats on the ground below the recess, demonstrates that this culvert is used often by individuals of this species. The species observed were not able to be confidently identified without removing the bats, which would have placed unnecessary stress on them. However, based on their head shape and forearm length they were likely to be the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) and/or Southern Myotis (*Myotis macropus*). An Anabat detector was placed in front of the culvert on the night of 9 August 2016 to attempt to identify what species was using the culvert. **Table 6-10** displays the results of the analysis of the recorded calls.

![Photo 6-8 One of the microbats observed in the culvert and the box culvert entrances](image)

**Table 6-10 Microbat call analysis results**

<table>
<thead>
<tr>
<th>Species recorded</th>
<th>Legal status</th>
<th>Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>White-striped Freetail Bat (<em>Tadarida australis</em>)</td>
<td>-</td>
<td>Probable</td>
</tr>
<tr>
<td>Yellow-bellied Sheath-tailed Bat (<em>Saccolaimus flaviventris</em>)</td>
<td>V V</td>
<td>Possible</td>
</tr>
<tr>
<td>Large-eared Pied Bats (<em>Chalinolobus dwyeri</em>)</td>
<td>V V</td>
<td>Possible</td>
</tr>
</tbody>
</table>

An additional cave-roosting species (Large-eared Pied Bats (*Chalinolobus dwyeri*)) was identified using the riparian vegetation adjoining the study area. The two other species (White-striped Freetail Bat (*Tadarida australis*) and Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*)) identified from the call analysis were likely foraging in the area of the bat detector.

Eight culverts are present under the Golden Highway through the study area. These culverts may be suitable as roosting habitat for bats such as the Southern Myotis and/or the Eastern Bentwing-bat. However, no roosting bats were found inside the proposal area during the surveys. Most of the culverts in the proposal area were not large enough to inspect, however mud nests of swallows could be seen in many of them. As the culverts are not sealed the temperature inside is likely to fluctuate with outside
temperatures. Optimal dark conditions are generally not present within the culverts with bright daylight entering from both sides. For these reasons most culverts are not optimal as roosting habitat for cave-dwelling bat species but may be used as a roost site on occasion. As a precautionary approach, all culverts would be inspected for roosting microbats prior to any culvert work.

Hollow-bearing *Eucalyptus moluccana* (Grey Box) in the study area and broader locality would likely provide roosting habitat for hollow roosting microbats including the Eastern Freetail-bat (*Mormopterus norfolkensis*), Corben’s Long-eared Bat (*Nyctophilus corbeni*) and Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*).

The sandstone escarpments several kilometres to the west would also likely provide roosting habitat for cave-roosting microbats including the Eastern Cave Bat (*Vespaderus troughtoni*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Large-eared Pied Bat (*Chalinolobus dwyeri*) and Southern Myotis (*Myotis macropus*) (all listed as vulnerable under the TSC Act) and the study area is within the foraging range of bats roosting on the escarpment.

Based on nearby records and the presence of suitable habitat, a total of 18 threatened fauna species including eight microbats and 10 birds are considered moderately likely to occur. These include:

- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)
- Eastern Cave Bat (*Vespaderus tروعtōnī*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Southern Myotis (*Myotis macropus*)
- Eastern Freetail-bat (*Mormopterus norfolkensis*)
- Corben’s Long-eared Bat (*Nyctophilus corbeni*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)
- Speckled Warbler (*Chθthonicola sagittata*)
- Regent Honeyeater (*Antoθchaera Phrygia*)
- Painted Honeyeater (*Grantiella picta*)
- Brown Treecreeper (*Climacteris picumnus victoriae*)
- Varied Sittella (*Daphoθenositta chrysopθera*)
- Hooded Robin (*Melanodryas cucullata cucullata*)
- Scarlet Robin (*Petroca boodang*)
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*)
- Diamond Firetail (*Stagonopleura guttata*)
- The Swift Parrot (*Lathamus discolor*).

Refer to the Biodiversity Assessment provided in Appendix E, in for the full list of threatened fauna and their likelihood of occurrence.

**Habitat connectivity**

Habitat connectivity along the Golden Highway around the study area is currently intact for flying animals, however ground dwelling animals are somewhat restricted by the barrier effect of the road. Connectivity is not entirely obstructed by the current road, though ground dwelling fauna are likely to be deterred from crossing by traffic and potentially killed by vehicle collision. Where woody vegetation is growing in the study area, there is a gap varying from about five to 20 metres between vegetation and the traffic lanes. The ridgetop vegetation in the study area is part of a large north-south corridor between National Parks to the south (Putty State Forest, Wollemi National Park, Yengo National Park) with Barrington Tops and Chichester north east of Muswellbrook.
Fauna habitat and condition

No aquatic habitat in the study area was identified during the site surveys and no critical habitat as listed in the Register of Critical Habitat kept by the OEH is present within the study area.

Natural fauna habitats in the locality have been largely removed and/or modified for agricultural activities and industry development. Although somewhat isolated and fragmented, habitat in the study includes:

- Remnant or regrowth grassy and shrubby woodland
- High quality remnant woodland
- Regrowth shrubland
- Cleared and modified agricultural and residential landscapes.

The best quality habitat is on the south side of the highway, on the western side of the hill. Vegetation is dominated by remnant *E. moluccana* (Grey Box), many of which exhibit small-medium sized hollows. Stags are also common, as are fallen trees, both often providing hollow habitats. Fallen logs, thick leaf litter and small sandstone rocks littered across the ground provide good quality habitat for reptiles and invertebrates. No Hollow bearing trees were identified within the proposal footprint.

All flower and nectar producing trees and shrubs provide a foraging resource for many nectarivorous birds and small mammals. Twenty seven bird species were identified in the study area during the site visits. Many of these species likely utilise a large area of the ridge top vegetation and are able to move across the landscape despite the level of fragmentation from clearing. Evidence of Eastern Grey Kangaroos (*Macropus giganteus*) (ie. footprints and scats) were abundant and a wombat burrow with fresh scats was identified on the eastern side of the hill. Numerous skins were observed running around leaf litter and rocks including the Eastern Striped Skink (*Ctenotus robustus*) and the Fence Skink (*Cryptoblepharus virgatus*).

Large remnant *E. moluccana* (Grey Box) in the locality exhibit many hollows, many at the end of branches, refer to Photo 6-7. Most of these hollows are outside the proposal area within private property. The hollows are likely to provide nesting and roosting habitat for hollow-dependant birds and microbats. It would be unlikely that the hollows provide and habitat for large mammals. The hollows observed were not big enough for an owl.

![Photo 6-9 Grey Box with hollows within the study area](image-url)
Legend
- Proposal area
- Construction footprint
- Culvert
- Basin
- Biodiversity study area
- Watercourse
- Cadastre
- Bat detector
- Hollow-bearing tree
- Threatened species
- Eastern Bentwing-bat
- Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (BC Act)
- Central Hunter Valley eucalypt forest and woodland (EPBC Act)
- Acacia salicina regrowth
- Derived Native Grassland
- Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin - Moderate / Good
- Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin - Poor

Figure 6-3 | Biodiversity values
6.3.3 Potential impacts

**Construction**

Removal of native vegetation

The potential loss of vegetation associated with the proposal has been quantified by overlaying the proposal footprint onto the vegetation community map, with a 10 metre buffer to allow for a small contingency surrounding the proposal for construction activities. The results are summarised in Table 6-11. Currently there is around 5.67 hectares of fragmented vegetation within the construction footprint, which would potentially be removed as part of the proposal. Outside of the construction footprint and within the proposal area, the plant and machinery would manoeuvre around native vegetation within the construction footprint.

Table 6-11: Condition of native vegetation in the study area and predicted loss from the proposal

<table>
<thead>
<tr>
<th>Plant Community Type</th>
<th>Condition</th>
<th>Potential impact (ha)*</th>
<th>Impact in the context of the locality (within 10 km) – Peak (2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin (PCT 1655)</td>
<td>Moderate / Good</td>
<td>2.41</td>
<td>&lt;0.01% (3,167 ha of MU 10 mapped in the locality)</td>
</tr>
<tr>
<td>Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin (PCT 1655)</td>
<td>Poor</td>
<td>1.32</td>
<td></td>
</tr>
<tr>
<td>Derived Native Grassland</td>
<td>Derived Native Grassland</td>
<td>1.59</td>
<td>&lt;0.01% (3,167 ha mapped in the locality)</td>
</tr>
<tr>
<td>Acacia salicina regrowth</td>
<td>Acacia salicina regrowth</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>5.67 ha</strong></td>
<td><strong>&lt;0.1%</strong></td>
</tr>
</tbody>
</table>

As can be seen from Table 6-11, the proposal would remove about 5.67 hectares of this vegetation.

The process of clearing vegetation would also result in additional impacts including:

- Loss of hollow-bearing trees
- Removal of dead-wood and dead trees
- Bushrock removal.

Although the proposal would not result in large amounts of any of these additional impacts, they must be considered in the clearing process. Numerous hollow-bearing trees were identified within the study area. Grey Box appears to readily form hollows in this area and some trees were observed to contain up to five hollows each. These would be suitable for many hollow-roosting bat species. However, these hollow-bearing trees are on the outskirts of the construction footprint and are likely able to be avoided. The removal of dead wood/trees and bushrock may reduce habitat availability for some fauna species. However, as the areas to be impacted are in the disturbed road corridor, there are few occurrences of these habitat features and the impact would be minimal.

Safeguards and mitigation measures designed to reduce the impact of vegetation removal are provided in Section 6.3.4.
Threatened biodiversity

The proposal's predicted impacts on the EEC's are outlined in Table 6-12. All areas of regrowth *Acacia salicina* shrubland is also considered to be a regenerating form of Hunter Valley Footslopes Slaty Gum Woodland (BC Act). Derived Native Grasslands and areas of regrowth *Acacia salicina* shrubland that are within 100 metres of woodland are counted under the EPBC Act listed TEC.

**Table 6-12 Impacts on threatened ecological communities**

<table>
<thead>
<tr>
<th>Threatened ecological community</th>
<th>Formation</th>
<th>Potential impact (ha)</th>
<th>Impact in the context of the locality (within 10 km)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BC Act</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (vulnerable)</td>
<td>Woodland (PCT 1655)</td>
<td>3.72</td>
<td>&gt;0.1%</td>
</tr>
<tr>
<td></td>
<td>Regrowth <em>Acacia salicina</em> shrubland</td>
<td>0.35</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>4.08</td>
<td>0.01%</td>
</tr>
<tr>
<td><strong>EPBC Act</strong></td>
<td></td>
<td>5.53</td>
<td>&gt;0.01%</td>
</tr>
<tr>
<td>Central Hunter Valley eucalypt forest and woodland (endangered)</td>
<td>Woodland (PCT 1655)</td>
<td>2.41</td>
<td>&lt;0.01% (3,167 ha of MU 10 mapped in the locality)</td>
</tr>
<tr>
<td></td>
<td>Regrowth <em>Acacia salicina</em> shrubland</td>
<td>1.32</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Derived native grassland</td>
<td>1.59</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Regrowth <em>Acacia salicina</em> shrubland (within 100 metres of woodland)</td>
<td>0.21</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>5.53</td>
<td>&gt;0.01%</td>
</tr>
</tbody>
</table>

As shown in Table 6-12, the proposal would remove 4.08 hectares of *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* (vulnerable –TSC Act) and about 5.53 hectares of the *Central Hunter Valley eucalypt forest and woodland* (endangered EPBC Act).

When considered in the context of the locality the proportional impact is low at less than 0.01 per cent. This impact has been quantified based on construction footprint (ie 10 metre buffer on the concept design).

The proposal would result in the reduction of potential habitat for one threatened flora species, however this species was not confirmed as present during field surveys and was assessed using a precautionary approach, as potentially present (refer to Table 6-13). This species is considered moderately likely to occur in or next to, the study area based on the presence of suitable habitat.

**Table 6-13 Impacts on threatened flora**

<table>
<thead>
<tr>
<th>Threatened species</th>
<th>Ecosystem or species credit species</th>
<th>Status</th>
<th>Potential impact to habitat (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cymbidium canaliculatum population in the Hunter Catchment</td>
<td>Species</td>
<td>EP</td>
<td>3.72 hectares</td>
</tr>
</tbody>
</table>
The proposal would require the removal of vegetation which provides habitat for a range of threatened flora and fauna species as outlined in Table 6-14. All vegetation the would be impacted (except for derived native grasslands) is considered potential foraging habitat for the threatened species listed in Table 6-14. The overall impact to foraging habitat is predicted at about 4.08 hectares, which represents about 0.17 per cent of the local occurrence of habitat for these species.

Table 6-14 Predicted loss of threatened species habitat from the proposal

<table>
<thead>
<tr>
<th>Threatened species</th>
<th>BC Act</th>
<th>EPBC Act</th>
<th>Potential occurrence</th>
<th>Potential impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Bentwing-bat (<em>Miniopterus schreibersii oceanensis</em>)</td>
<td>V</td>
<td>–</td>
<td>Potentially recorded</td>
<td>4.08 ha (Foraging habitat. Culverts where bats were identified would not be impacted)</td>
</tr>
<tr>
<td>Eastern Cave Bat (<em>Vespadelus troughtoni</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Large-eared Pied Bat (<em>Chalinolobus dwyeri</em>)</td>
<td>V</td>
<td>V</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Southern Myotis (<em>Myotis macropus</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Eastern Freetail-bat (<em>Mormopterus norfolkensis</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Corben’s Long-eared Bat (<em>Nyctophilus corbeni</em>)</td>
<td>V</td>
<td>V</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Greater Broad-nosed Bat (<em>Scoteanax rueppellii</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Yellow-bellied Sheathtail-bat (<em>Saccolaimus flaviventris</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Swift Parrot (<em>Lathamus discolor</em>)</td>
<td>E</td>
<td>E</td>
<td>Moderate</td>
<td>4.08 ha (Foraging habitat)</td>
</tr>
<tr>
<td>Painted Honeyeater (<em>Grantiella picta</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td>4.08 ha (Foraging habitat)</td>
</tr>
<tr>
<td>Regent Honeyeater (<em>Anthochaera Phrygia</em>)</td>
<td>CE</td>
<td>CE</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Brown Treecreeper (<em>Climacteris picumnus victoriae</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td>4.08 ha (Foraging habitat)</td>
</tr>
<tr>
<td>Diamond Firetail (<em>Stagonopleura guttata</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Grey-crowned Babbler (<em>Pomatostomus temporalis temporalis</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Hooded Robin (<em>Melanodryas cucullata cucullata</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Scarlet Robin (<em>Petroica boodang</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>Speckled Warbler (<em>Chthonicola sagittata</em>)</td>
<td>V</td>
<td>–</td>
<td>Recorded</td>
<td></td>
</tr>
<tr>
<td>Varied Sittella (<em>Daphoenositta chrysoptera</em>)</td>
<td>V</td>
<td>–</td>
<td>Moderate</td>
<td></td>
</tr>
</tbody>
</table>

Fauna Habitat

Habitat that would be impacted by the proposal is generally limited to foraging habitat, however numerous small hollows were observed within the study area, which may be used by hollow-roosting microbat species such as the Eastern Freetail-bat, Corben’s Long-eared Bat, Greater Broad-nosed Bat and Yellow-bellied Sheathtail-bat. However, surveys did not identify any hollow-bearing trees within the proposal proposed footprint that would be impacted.
There are no expected direct impacts to the box culvert located to the west of the proposal, however construction works may result in potential roost disturbance through noise and vibration. Many of the culverts within the proposal area have overgrown vegetation at the entrance and did not appear to provide much roosting opportunities during the field surveys. Considering this, the potential for bats in all other culverts is low.

Numerous hollow-bearing trees were identified within the study area. However, no hollow bearing trees were identified within the proposal area and there is not expected to be any impact to habitat trees.

**Injury and mortality**

Fauna injury or death has the greatest potential to occur during vegetation clearing and the extent of this impact would be proportionate to the extent of vegetation that is cleared. Some mobile species, such as birds, may be able to move away from the path of clearing and may not be greatly affected unless they are nesting. However, other species that are less mobile (e.g. ground dwelling reptiles), or those that are nocturnal and nest or roost in trees during the day (e.g. arboreal mammals and microchiropteran bat species), may find it difficult to move rapidly when disturbed. Common fauna species such as possums, reptiles and frogs are the most likely to be affected.

Entrapment of wildlife in any trenches that are dug is a possibility if the trenches are deep and steep sided. Wildlife may also become trapped in machinery that is stored in the proposal area overnight that may result in injury or death.

**Wildlife connectivity and habitat fragmentation**

While the proposal would not divide any new areas of continuous habitat, the vegetation clearing required would result in some habitat loss which would result in small increases to isolation of vegetation fragments in the landscape as some vegetation fragments would be reduced in size from the proposal.

**Impacts to hydrology and aquatic habitat**

The construction phase of the proposal presents a low risk to degradation of downstream aquatic habitat. However, no aquatic habitat was identified within the study area at the time of the field surveys. Although several drainage lines pass underneath the Golden Highway, they would only drain water away during rain events (refer to Section 6.5). The absence of macrophyte vegetation around these drainage lines suggests that they do not often contain water. Overall, potential impacts on surface water quality were considered minor and manageable with the application of standard mitigation measures.

**Proliferation of weeds**

During the construction of the proposal there would be the potential to disperse weed seeds and plant material into adjoining areas of high quality native vegetation where weed species do not currently occur in high density. The most likely causes of weed dispersal would be associated with clearing of vegetation and stockpile of contaminated mulch and topsoil during earthworks, and movement of soil and attachment of seed (and other propagules) to construction vehicles and machinery.

**Pathogens**

While pathogens were not observed or tested for in the study area the potential for pathogens to occur would be treated as a risk during construction. Safeguards and mitigation measures for the potential introduction and spread of pathogens are provided in Section 6.3.4.

**Operation**

The operational impact of the proposal would relate to the cumulative impacts associated with clearing native vegetation and the loss of habitat for flora and fauna species.

The potential biodiversity impacts of the project must be considered as a consequence of the construction and operation of the proposal within the existing environment. The proposal would not act alone in causing impacts to biodiversity, as large areas of vegetation within the locality have already been removed,
predominately for mining. The incremental effects of multiple sources of impact (past, present and future) are referred to as cumulative impacts and provide an opportunity to consider the proposal within a strategic context.

The accumulating impacts of historic vegetation clearing for agriculture, mining, rural urban development and maintenance of infrastructure would likely include continued loss of biodiversity in the Hunter Catchment. While data from all recent projects in the locality is not freely available, some information on the likely biodiversity impacts from recent projects was available as presented in Table 6-15. The total cumulative impact of the two projects listed in Table 6-15 and the proposal would result in about a 1.3 per cent reduction in the mapped area of the Central Hunter Grey Box – Ironbark Woodland EEC (TSC Act).

Table 6-15 Cumulative impacts within Central Hunter Valley

<table>
<thead>
<tr>
<th>Project</th>
<th>Total impact</th>
<th>TEC</th>
<th>This project</th>
<th>Cumulative impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drayton South Coal Project</td>
<td>A loss of 1,439 ha of native vegetation, including five threatened ecological</td>
<td>151 hectares of Central Hunter Grey Box –</td>
<td>4.08 ha of Central Hunter Grey Box – Ironbark</td>
<td>1.3% (14,818 ha total area mapped in Central Hunter Valley)</td>
</tr>
<tr>
<td>(about 10 km north-east of the proposal)</td>
<td>communities (269.5 ha) and habitat for four threatened flora species and 21</td>
<td>Ironbark Woodland (TSC Act)</td>
<td>Ironbark Woodland (TSC Act)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>threatened and/or migratory fauna species.</td>
<td></td>
<td>&lt;0.001% (14,818 ha total area mapped in Central Hunter Valley)</td>
<td></td>
</tr>
<tr>
<td>Mt Arthur open cut coal mine (about 10 km</td>
<td>Loss of 235 hectares of native vegetation</td>
<td>41 hectares of Central Hunter Grey Box –</td>
<td></td>
<td></td>
</tr>
<tr>
<td>north of the proposal)</td>
<td></td>
<td>Ironbark Woodland (TSC Act)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The proposal is one of 10 proposed upgrades along the Golden Highway. The total length of all 10 projects is about 32.5 kilometres).

The proposed works in these sections includes the widening of the entire length by four metres and addition of 3.5 metre wide climbing lanes in some areas. Although all these sites would not contain vegetation, the cumulative impact of the whole project needs to be considered as each site would be assessed individually.

**Conclusion on significance of impacts**

An assessment of significance has been carried out for threatened species and ecological communities that have been positively identified or that were considered to have a moderate or high likelihood of occurring in the investigation area (refer to Appendix E).

The follow threatened species and EECs species were assessed for significance under the TSC Act:

- Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion
- *Cymbidium canaliculatum* population in the Hunter Catchment
- Cave-roosting microbats:
  - Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)
  - Eastern Cave Bat (*Vespadelus troughtoni*)
  - Large-eared Pied Bat (*Chalinolobus dwyeri*)
  - Southern Myotis (*Myotis macropus*)
- Hollow-roosting microbats
- Eastern Freetail-bat (Mormopterus norfolkensis)
- Corben’s Long-eared Bat (Nyctophilus corbeni)
- Greater Broad-nosed Bat (Scoteanax rueppellii)
- Yellow-bellied Sheathtail-bat (Saccolaimus flaviventris).

- Woodland birds
  - Brown Treecreeper (Climacteris picumnus victoriae)
  - Diamond Firetail (Stagonopleura guttata)
  - Grey-crowned Babbler (Pomatostomus temporalis subsp. temporalis),
  - Hooded Robin (Melanodryas cucullata cucullata),
  - Scarlet Robin (Petroica boodang)
  - Speckled Warbler (Chthonicola sagittata)
  - Varied Sittella (Daphoenositta chrysoptera).

- Nectarivores birds
  - Painted Honeyeater (Grantiella picta)
  - Swift Parrot (Lathamus discolor)
  - Regent Honeyeater (Anthochaera Phrygia).

The assessments of significance found that the proposal would not likely to significantly impact threatened species, populations or ecological communities or their habitats, as defined by the TSC Act or FM Act meaning a Species Impact Statement is not required.

The follow threatened species and EEC were assessed for significance under the EPBC Act:

- Central Hunter Valley eucalypt forest and woodland
- Regent Honeyeater (Anthochaera Phrygia)
- Swift Parrot (Lathamus discolor)
- Painted Honeyeater (Grantiella picta)
- Corben’s Long-eared Bat (Nyctophilus corbeni)
- Large-eared Pied Bat (Chalinolobus dwyeri).

The assessments of significance found that the proposal would not likely to significantly impact threatened species, populations, ecological communities or migratory species, as defined by the EPBC Act.

### 6.3.4 Safeguards and management measures

Safeguards and management measures for biodiversity are presented in **Table 6-16**.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiversity</td>
<td>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime’s Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</td>
<td>Contractor</td>
<td>Detailed design / pre-construction</td>
<td>Core standard safeguard B1</td>
</tr>
</tbody>
</table>

**Golden Highway Upgrade at Ogilvie’s Hill**

*Review of Environmental Factors*
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
</table>
| Minimise risks to native flora and fauna during construction | - Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features (eg hollow bearing trees) and revegetation areas  
- Requirements set out in the *Landscape Guideline* (RTA, 2008)  
- Pre-clearing survey requirements  
- Procedures for unexpected threatened species finds and fauna handling  
- Protocols to manage weeds and pathogens. | Contract | Pre-construction and construction | Core standard safeguard B2 |
<p>| Biodiversity                               | A pre-construction check of native flora and fauna species and habitat will be conducted in accordance with the <em>Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects</em>. Biodiversity management measures identified during the pre-construction check will be incorporated into the CEMP Flora and Fauna Management Plan. | Contractor | Detailed design / pre-construction | Core standard safeguard B3 |
| Protect native flora and fauna, minimise edge effects and avoid inadvertent impacts | Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible. | Contractor | Construction                 | Core standard safeguard B4 |
| Unexpected threatened species             | Consistent with the <em>Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects</em>, and any specific requirements of the approved Flora and Fauna Management Plan, an unexpected finds procedure will be implemented in the event that a threatened species or ecological community that had not been identified and assessed by the REF is | Contractor | Construction                 | Core standard safeguard B5 |</p>
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protect native flora and fauna, minimise edge effects and avoid inadvertent impacts</td>
<td>unexpectedly encountered during the construction process.</td>
<td>Contractor</td>
<td>Construction</td>
<td></td>
</tr>
</tbody>
</table>
| Stockpiles, plant and ancillary sites | Consistent with the approved Flora and Fauna Management Plan:  
- The limits of clearing within the construction site will be delineated using appropriate signage and barriers, identified on site construction drawings and during construction staff induction  
- Vegetation and habitat features to be retained, such as hollow-bearing trees, will be clearly identified and protected by suitable fencing, signage or markings. | Contractor | Construction | Additional standard safeguard B9 |
| Fauna handling | Vehicle parking, machinery, construction compounds, material stockpiles and the like, will be located in cleared or disturbed areas, not within the drip-zone of vegetation to be retained or within other protected or exclusion zones identified in the Flora and Fauna Management Plan. | Contractor | Construction | Additional standard safeguard B10 |
| Habitat management - minimising impacts | Consistent with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, and any specific requirements of the approved Flora and Fauna Management Plan, management arrangements will be implemented to ensure safe fauna handling. As a minimum that will include:  
- Fauna handling being carried out by appropriately licenced ecologists or wildlife carers  
- Liaison with local animal rescue agency, wildlife carer group or vet to establish agreed arrangements for fauna rescue or injured animal assistance  
- Induction information for construction staff. | Contractor | Construction | Additional standard safeguard B11 |
| | Consistent with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects. As a minimum that will include:  
- No vegetation clearing or bushrock removal beyond limits identified in this REF | Contractor | Construction | Additional standard safeguard B12 |
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
</table>
| Weed, Pest Species and Pathogen Management | Avoiding identified exclusion zones and protected habitat features  
Avoiding mixing of topsoil with woody debris materials  
Separation of woody vegetation suitable for re-use during construction and rehabilitation or revegetation works  
Implementation of staged clearing  
Trimming and pruning to be carried out in accordance with relevant Australian Standards  
In riparian zones: avoiding clearing during likely flood periods; ensuring cleared vegetation does not enter the waterway; retaining roots and stumps to maintain bank stability; applying the hierarchy for snag management set out in the Guidelines. | Contractor | Construction | Additional standard safeguard B13 |
| Removal of threatened species habitat and habitat features | Habitat removal will be carried out in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority 2011)  
Habitat that is found to be impacted by the proposed clearing works will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock and Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority 2011). | Contractor | Construction | Additional safeguard |
6.3.5 Biodiversity offsets

This biodiversity assessment (Appendix E) identifies that the proposal would not be likely to have a significant impact on any threatened biodiversity listed under the TSC Act or EPBC Act. In this instance, the EPBC Act environmental offsets policy does not apply.

It is Roads and Maritime policy that biodiversity offsets are to be provided where more than one hectare of high conservation value vegetation is cleared and/or more than five hectares of habitat for threatened species is cleared (Roads and Maritime Services 2011).

About 4.08 hectares of remnant vegetation meeting the description of the vulnerable Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion would be removed by the proposal. This does not trigger the need for offsets as the impacts for the NSW listed community are not greater than five hectares. However, this woodland vegetation also meets the description of the EPBC Act listed critically endangered Central Hunter Valley eucalypt forest and woodland ecological community. A total of 2.41 hectares of this CEEC in ‘Moderate / Good’ condition would be impacted by the proposal. As such, offsets are required to compensate for this loss.
6.4 Noise and vibration

The potential noise and vibration impacts on sensitive receivers during construction and operation of the proposal have been assessed as part of the Golden Highway – Ogilvies Hill Noise and Vibration Assessment (Jacobs, 2018d) and HW27 - Golden Highway Upgrades Diversion Construction noise review (Jacobs, 2018e) provided in Appendix F. The main findings of the report are summarised below.

6.4.1 Methodology

The Noise and Vibration Assessment provided in Appendix F has been prepared in accordance with the following:

- *Road Noise Policy*, NSW EPA, 2011 (RNP)
- *Noise Criteria Guideline*, Roads and Maritime Services, April 2015 (NCG)
- *Noise Policy for Industry*, NSW Environment Protection Authority, 2017 (NPI)
- *Calculation of Road Traffic Noise*, UK Department of Transport, 1988 (CoRTN)
- *Construction Noise and Vibration Guideline*, Transport (Roads and Maritime), April 2016 (CNVG)
- *Interim Construction Noise Guideline*, Department of Environment and Climate Change NSW, July 2009 (ICNG)

In summary, the methodology for the noise and vibration assessment included the following:

- Identifying noise and vibration sensitive receivers and defining the study area
- Undertaking noise monitoring to determine the existing noise environment
- Establishing noise and vibration assessment criteria
- Prediction of construction and operational noise levels
- Assessing predicted noise and vibration levels against the relevant criteria to identify potential impacts
- Identify safeguards and management measures to be implemented to minimise impacts.

**Study area**

The study area noise and vibration assessment has been defined as sensitive receivers located within 1,500 metres of the proposal. Receivers were identified using aerial photography, GIS databases and information gathered from site visits.

**Noise monitoring**

Unattended noise monitoring to identify background noise levels for the proposal was carried out from 24 to 30 November 2016 at representative locations (refer to Section 6.4.2 and Figure 6-4) using automatic unattended noise monitoring equipment (Type 1 Ngara noise loggers). The loggers continuously measured the level of ambient noise over 15-minute periods for the duration of the monitoring period at each location.

Short-term attended noise monitoring was carried out to identify ambient noise sources (such as traffic) at the same monitoring locations using a SVAN Type 1 sound level meter.
6.4.2 Existing environment

**Sensitive receivers**

There is one rural residential property located within the study area, located 780 metres from the proposal. The receiver around the proposal is shown in Figure 6-4 and presented in Table 6-17.

The existing noise environment around the proposal is primarily influenced by road traffic noise. No vibration-sensitive commercial or other land uses (such as medical imaging or electronics facilities) have been identified within the study area.

### Table 6-17 Summary of nearby residential receivers

<table>
<thead>
<tr>
<th>Receiver ID</th>
<th>Receiver type</th>
<th>Distance from proposal (metres)</th>
<th>Distance nearest ancillary site (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R01</td>
<td>Residential</td>
<td>3,600</td>
<td>1,600</td>
</tr>
<tr>
<td>R01</td>
<td>Residential</td>
<td>3,300</td>
<td>1,300</td>
</tr>
<tr>
<td>R02</td>
<td>Residential</td>
<td>2,600</td>
<td>1,050</td>
</tr>
<tr>
<td>R03</td>
<td>Residential</td>
<td>2,500</td>
<td>1,100</td>
</tr>
<tr>
<td>R04</td>
<td>Residential</td>
<td>2,500</td>
<td>1,700</td>
</tr>
<tr>
<td>R05</td>
<td>Residential</td>
<td>780</td>
<td>1,050</td>
</tr>
<tr>
<td>R06</td>
<td>Residential</td>
<td>2,500</td>
<td>1,000</td>
</tr>
<tr>
<td>R07</td>
<td>Residential</td>
<td>2,500</td>
<td>950</td>
</tr>
<tr>
<td>R08</td>
<td>Residential</td>
<td>2,600</td>
<td>1,200</td>
</tr>
<tr>
<td>R09</td>
<td>Residential</td>
<td>2,800</td>
<td>1,500</td>
</tr>
<tr>
<td>R10</td>
<td>Residential</td>
<td>3,050</td>
<td>1,800</td>
</tr>
<tr>
<td>R11</td>
<td>Residential</td>
<td>3,000</td>
<td>1,700</td>
</tr>
<tr>
<td>R12</td>
<td>Residential</td>
<td>3,000</td>
<td>1,700</td>
</tr>
</tbody>
</table>

**Existing noise environment**

The existing noise environment has been identified based on the results of attended and unattended noise monitoring carried out at a representative location within the study area. Unattended and attended noise monitoring was carried out at R02 and R06 as shown in Figure 6-4. 15-minute attended quality assurance measurements were also completed at these locations.

Noise results were post-processed to eliminate inconsistent features (including wind speed greater than five metres per second, rain and seasonal insect noise) and develop the data into the relevant metrics for assessment.

Low pass filtered noise monitoring metrics applicable for the assessment for road and construction noise assessment are presented in Table 6-18 respectively. The rating background level (RBL) refers to the median value of monitored background noise levels measured over each period ‘L\(\text{Aeq}\)’ is the equivalent continuous sound level or energy-time average for the relevant period of monitoring.
Table 6-18 Long-term noise monitoring results (low pass filtering applied)

<table>
<thead>
<tr>
<th>Location</th>
<th>Road noise results LAeq dB(A)</th>
<th>Construction noise measured RBLs dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day (15 hour), 7 am to 10 pm</td>
<td>Night (9 hour), 10 pm to 7 am</td>
</tr>
<tr>
<td>N01 (R02)</td>
<td>48.3</td>
<td>44.1</td>
</tr>
<tr>
<td>N02 (R06)</td>
<td>48.0</td>
<td>41.3</td>
</tr>
<tr>
<td></td>
<td>Day (11 hour), 7 am to 6 pm</td>
<td>Evening (4 hour), 6 pm to 10 pm</td>
</tr>
<tr>
<td>N01 (R02)</td>
<td>25.5</td>
<td>34.0</td>
</tr>
<tr>
<td>N02 (R06)</td>
<td>33.9</td>
<td>23.6</td>
</tr>
<tr>
<td></td>
<td>Night (9 hour), 10 pm to 7 am</td>
<td></td>
</tr>
<tr>
<td>N01 (R02)</td>
<td>25.5</td>
<td></td>
</tr>
<tr>
<td>N02 (R06)</td>
<td>29.6</td>
<td></td>
</tr>
</tbody>
</table>

Where evening and night time RBLs were measured as being less than 30 dB(A), they have been adjusted to 30 dB(A) for the purpose of setting noise management levels. Similarly, for day time RBLs recorded to be less than 35 dB(A) these were also adjusted to 35 dB(A), consistent with guidance presented in the NPI. (refer to Section 6.4.3).
Figure 6-4 | Noise monitoring locations and noise sensitive receivers
Existing traffic noise along the proposed traffic diversion routes

Roads and Maritime’ Construction Noise Estimator (CNE) was used to predict the noise levels of existing traffic flows along the affected bypass routes at nearby residential receivers. The traffic volumes and composition data that was used in the CNE are detailed in *HW27 - Golden Highway Upgrades Diversion Construction noise review* (Jacobs, 2018e) (Appendix E) and summarised in Table 6-19. The locations of where traffic data was collected along the temporary bypass routes is shown in Figure 6-5.

Table 6-19 Estimated existing traffic flows

<table>
<thead>
<tr>
<th>Road segment</th>
<th>Year</th>
<th>Direction 1 (Northbound / Westbound)</th>
<th>Direction 2 (Southbound/Eastbound)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Day (7am to 10pm)</td>
<td>Night (10pm to 7am)</td>
<td>Day (7am to 10pm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LV</td>
<td>HV</td>
<td>LV</td>
</tr>
<tr>
<td>01</td>
<td>2019</td>
<td>7105</td>
<td>488</td>
<td>2542</td>
</tr>
<tr>
<td>02</td>
<td>2019</td>
<td>3488</td>
<td>1280</td>
<td>1601</td>
</tr>
<tr>
<td>03</td>
<td>2019</td>
<td>1486</td>
<td>314</td>
<td>372</td>
</tr>
<tr>
<td>04</td>
<td>2019</td>
<td>2525</td>
<td>348</td>
<td>631</td>
</tr>
<tr>
<td>05</td>
<td>2019</td>
<td>1925</td>
<td>358</td>
<td>481</td>
</tr>
</tbody>
</table>

Day (LA\textsubscript{15 hour}) and night (LA\textsubscript{9 hour}) noise levels predictions using the CNE at the nearest sensitive receiver location along each segment are summarised in Table 6-20. The high levels predicted for segments 01 and 02 along the New England Highway, and 05 and 06 along Denman Road are a result of residential receivers being located in close proximity to the road at these locations.

Table 6-20 Predicted existing traffic noise levels

<table>
<thead>
<tr>
<th>Bypass road segment</th>
<th>L\textsubscript{AEq 15 hour} (Day)</th>
<th>L\textsubscript{AEq 9 hour} (Night)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>79.2</td>
<td>74.6</td>
</tr>
<tr>
<td>02</td>
<td>69.7</td>
<td>66.2</td>
</tr>
<tr>
<td>03</td>
<td>57.2</td>
<td>53.5</td>
</tr>
<tr>
<td>04</td>
<td>58.5</td>
<td>54.7</td>
</tr>
<tr>
<td>05</td>
<td>65.9</td>
<td>62.1</td>
</tr>
<tr>
<td>06</td>
<td>65.8</td>
<td>62.0</td>
</tr>
<tr>
<td>07</td>
<td>45.3</td>
<td>41.7</td>
</tr>
</tbody>
</table>
6.4.3 Criteria

Construction noise criteria

Construction noise criteria have been established for the proposal in accordance with the ICNG in the form of construction Noise Management Levels (NMLs).

The NMLs for residential receivers were derived from the existing background noise levels, or rating background levels (RBL), with the relevant criteria applied in accordance with the ICNG for works during recommended standard hours and works outside these hours. Table 6-21 identifies the methodology applied in the development of NMLs for residential receivers.
Table 6-21 Development of construction noise management levels (NML)

<table>
<thead>
<tr>
<th>Time of day</th>
<th>NML LAeq (15 min)</th>
<th>How to apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended standard hours</td>
<td>Noise affected (RBL + 10 dB)</td>
<td>The noise affected level represents the point above which there may be some community reaction to noise. 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. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and the duration, as well as contact details.</td>
</tr>
<tr>
<td>Monday to Friday 7.00am to 6.00pm</td>
<td>Noise affected (RBL + 10 dB)</td>
<td>Highly noise affected (75 dB(A))</td>
</tr>
<tr>
<td>Saturday 8.00am to 1.00pm</td>
<td>Noise affected (RBL + 5 dB)</td>
<td>A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see Section 7.2.2 of the ICNG (DECC, 2009).</td>
</tr>
<tr>
<td>No work on Sundays or public holidays</td>
<td>Noise affected (RBL + 5 dB)</td>
<td></td>
</tr>
</tbody>
</table>

Source: *Interim Construction Noise Guideline (DECC, 2009)*

Based on the results of background noise statistics (low pass filtered) presented in Table 6-18 and the application of the criteria presented in Table 6-21, the following construction NMLs have been established as outlined in Table 6-22. Where RBLs measured are less than 30 dB(A), they have been set to 30 dB(A) for the purpose of developing NMLs.

Table 6-22 Construction noise management levels

<table>
<thead>
<tr>
<th>Noise monitoring location</th>
<th>Noise management level (NML) Laeq 15 minute dB(A)</th>
<th>Outside recommended standard hours of construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard hours of construction</td>
<td>Day (1 pm to 6 pm Saturday and 8 am to 6 pm Sunday)</td>
</tr>
<tr>
<td>N01 (R02)</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>N02 (R06)</td>
<td>45</td>
<td>40</td>
</tr>
</tbody>
</table>
Levels measured at N01 are considered to be applicable to residential receivers R01 to R05, with levels measured at N02 applicable at residential receivers R06 to R12.

**Sleep disturbance criteria**

The sleep disturbance awakening guidance value is the threshold at which an awakening reaction is likely to occur. Research discussed in the RNP identified this threshold to be an internal bedroom noise level of around 50 to 55 dB(A). A value of 55 dB(A) internally translates to an external level of 65 dB(A) when conservatively allowing 10 dB(A) noise based guidance presented for an ‘open window’ in AS2436-2010. Conservatively applying a -10 dB(A) correction to convert between the $L_{A1\text{ minute}}$ to $L_{A\text{Eq 15 minute}}$ metric realises a value of 55 dB(A) which was applied in this assessment.

**Construction vibration criteria**

Construction vibration criteria are separated into two categories being vibration effects on humans, and vibration impacts on building structures.

**Human comfort criteria**

The NSW EPA classifies vibration as one of three types:

- Continuous – where vibration occurs uninterrupted and can include sources such as machinery and constant road traffic
- Impulsive – where vibration occurs over a short duration (i.e. less than 2 seconds) and occurs less than three times during the assessment period, which is not defined. This may include activities such as occasional dropping of heavy equipment or loading / unloading activities
- Intermittent – occurs where continuous vibration activities are regularly interrupted, or where impulsive activities recur. This may include activities such as rock hammering, drilling, pile driving and heavy vehicle or train pass-bys.

Construction vibration is typically classed as intermittent and is assessed using the vibration dose value (VDVs). Relevant assessment criteria expressed as preferred and maximum VDVs are provided in Table 6-17.

**Table 6-17: Preferred and maximum values for continuous and impulsive vibration acceleration (m/s²) 1-80 Hz (DECC, 2006)**

<table>
<thead>
<tr>
<th>Location</th>
<th>Assessment period</th>
<th>Preferred values</th>
<th>Maximum values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>z-axis</td>
<td>X and y axis</td>
</tr>
<tr>
<td>Continuous vibration</td>
<td>Day or night</td>
<td>0.0050</td>
<td>0.0036</td>
</tr>
<tr>
<td>Critical areas*</td>
<td>Day</td>
<td>0.010</td>
<td>0.0071</td>
</tr>
<tr>
<td>Residences</td>
<td>Night</td>
<td>0.007</td>
<td>0.005</td>
</tr>
<tr>
<td>Offices, schools, educational institutions and places of worship</td>
<td>Day or night</td>
<td>0.020</td>
<td>0.014</td>
</tr>
<tr>
<td>Workshops</td>
<td>Day or night</td>
<td>0.04</td>
<td>0.029</td>
</tr>
</tbody>
</table>

**Impulsive vibration**

<table>
<thead>
<tr>
<th>Location</th>
<th>Assessment period</th>
<th>Preferred values</th>
<th>Maximum values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>z-axis</td>
<td>X and y axis</td>
</tr>
<tr>
<td>Critical areas²</td>
<td>Day or night</td>
<td>0.0050</td>
<td>0.0036</td>
</tr>
<tr>
<td>Residences</td>
<td>Day</td>
<td>0.30</td>
<td>0.21</td>
</tr>
<tr>
<td>Night</td>
<td>0.10</td>
<td>0.071</td>
<td>0.20</td>
</tr>
</tbody>
</table>
**Location** | **Assessment period** | **Preferred values** | **Maximum values**
--- | --- | --- | ---
|  |  | **z-axis** | **X and y axis** | **z-axis** | **X and y axis**
Offices, schools, educational institutions and places of worship | Day or night | 0.64 | 0.46 | 1.28 | 0.92
Workshops | Day or night | 0.64 | 0.46 | 1.28 | 0.92

1 Daytime is 7am to 10pm. Night-time is 10pm to 7am
2 Includes hospital operating theatres or precision laboratories.

Intermittent vibration is assessed differently; using vibration dose values (VDV). Preferred and maximum VDVs are also provided in *Assessing Vibration: a technical guideline*, (DECC, February 2006) and have been reproduced in Table 6-23.

**Table 6-23 Preferred and maximum VDVs for intermittent vibration (ms$^{-1.75}$), (DECC, 2006)**

<table>
<thead>
<tr>
<th>Location</th>
<th>Day time (7 am to 10 pm)</th>
<th>Night time (10 pm to 7 am)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preferred VDV</td>
<td>Maximum VDV</td>
</tr>
<tr>
<td>Critical areas1</td>
<td>0.10</td>
<td>0.20</td>
</tr>
<tr>
<td>Residences</td>
<td>0.20</td>
<td>0.40</td>
</tr>
<tr>
<td>Offices, schools, educational institutions and places of worship</td>
<td>0.40</td>
<td>0.80</td>
</tr>
<tr>
<td>Workshops</td>
<td>0.80</td>
<td>1.60</td>
</tr>
</tbody>
</table>

1 Includes operating theatres, precision laboratories and other areas where vibration-sensitive activities may occur.

**Buildings and structures**

The British Standard 7385 is used as a guide to assess the likelihood of building damage from ground vibration such as that caused by piling, compaction, construction equipment and road and rail traffic. The standard recommends levels at which ‘cosmetic’, ‘minor’ and ‘major’ categories of damage might occur based on the type of structure affected, using the peak particle velocity (PPV) parameter. The criteria are presented in Table 6-24.

**Table 6-24 Structural damage criteria for cosmetic building damage, (BS7385-2: 1993)**

<table>
<thead>
<tr>
<th>Group</th>
<th>Type of structure</th>
<th>Peak particle velocity (PPV) - mm/s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4Hz to 15Hz</td>
</tr>
<tr>
<td>1</td>
<td>Reinforced or framed structures Industrial and heavy commercial buildings</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Un-reinforced or light framed structures Residential or light commercial type buildings</td>
<td>15 to 20</td>
</tr>
</tbody>
</table>

Section 7 of the CNVG (Roads and Maritime, 2016) recommends safe working distances for achieving human comfort (*Assessing Vibration: a technical guideline*, (DECC, February 2006)) and cosmetic building damage (BS7385-2:1993) criteria for a range of different plant and equipment. Although it is noted that these distances are indicative and vary depending on local geotechnical conditions; these offsets have been considered for the initial assessment of potential vibration impacts during the construction of the proposal. These have been reproduced in Table 6-25.
Table 6-25 Recommended safe working distances for vibration-intensive plant and equipment, (CNVG, Roads and Maritime 2016)

<table>
<thead>
<tr>
<th>Plant</th>
<th>Rating / description</th>
<th>Safe working distance (meters)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cosmetic damage</td>
<td>Human response</td>
</tr>
<tr>
<td>Vibratory Roller</td>
<td>&lt;50 kN (typically 1-2 tonne)</td>
<td>5</td>
<td>15 to 20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;100 kN (typically 2-4 tonne)</td>
<td>6</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;200 kN (typically 4-6 tonne)</td>
<td>12</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;300 kN (typically 7-13 tonne)</td>
<td>15</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;300 kN (typically 13-18 tonne)</td>
<td>20</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;300 kN (&gt; 18 tonne)</td>
<td>25</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Small hydraulic hammer</td>
<td>300 kg – 5 to 12 tonne excavator</td>
<td>2</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Medium hydraulic hammer</td>
<td>900 kg – 12 to 18 tonne excavator</td>
<td>7</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Large hydraulic hammer</td>
<td>1600 kg – 18 to 34 tonne excavator</td>
<td>22</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>Vibratory pile driver</td>
<td>Sheet piles</td>
<td>2 to 20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Pile boring</td>
<td>≤800 mm</td>
<td>2 (nominal)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Jackhammer</td>
<td>Hand held</td>
<td>1 (nominal)</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

* Includes operating theatres, precision laboratories and other areas where vibration sensitive activities may occur

Buried services

DIN 4150-3:1999-02 provides guidance for evaluating the effects of short-term vibration on buried services. This guidance has been reproduced in Table 6-26.

Table 6-26 DIN 4150-3: 1999-02 guidance for evaluating effects of short-term vibration on buried services

<table>
<thead>
<tr>
<th>Pipe material</th>
<th>Guideline value for velocity measured on the pipe (mm/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel (including welded pipes)</td>
<td>100</td>
</tr>
<tr>
<td>Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)</td>
<td>80</td>
</tr>
<tr>
<td>Masonry, plastic</td>
<td>50</td>
</tr>
</tbody>
</table>

Construction traffic

Operational road traffic criteria adopted from the RNP is also considered to be applicable to construction traffic noise, therefore a relative increase criteria of 2 dB(A) has been adopted for the assessment of construction traffic impacts associated with the proposal.

Temporary traffic diversions during construction works.

Section 9 of the CNVG outlines the method of assessment required for temporary traffic re-routing during construction works. This first involves evaluating whether traffic noise along the re-routed roads would
increase noise levels at the nearest residential receivers by more than 2 dB(A) (i.e. 2.1 dB(A)) relative to existing conditions. Where this is the case, day and night time equivalent noise levels are to be compared against the fixed road category-based criteria in the NSW Road Noise Policy (RNP), (DECC, 2011), with adjustments made where the re-routing results in a temporary change in road category.

If both criteria are found to be triggered, compliance is to be reviewed at all nearby residential receivers and mitigation measures in the Noise Mitigation Guideline (NMG), (Roads and Maritime, 2014) are to be considered in consultation with Roads and Maritime as to the extent that the measures would be both reasonable and feasible given the temporal nature of impacts.

Operational traffic noise

Where a proposal has the potential to generate a new source of noise for residential receivers due to changes in road alignment or where a proposal would result in a change to the volume or mix of vehicles, an operational traffic noise assessment is carried out in accordance with the RNP, (DECC, 2011). Where the changes of an existing road alignment are only minor, such as relating to safety projects, where the project is not intended to increase traffic carrying capacity or traffic mix, activities are classified as ‘minor works’ and a less intensive assessment of traffic noise impacts is required.

In accordance with the NCG the minor works requirement for noise levels not to result in an increase of more than 2 dB(A) (ie 2.1 dB(A) or more) relative to existing noise levels at the worst affected receiver apply. As such, the primary operational noise requirement considered for this assessment is whether the proposal would result in a traffic noise increase of more than 2.1 dB(A) or more at any nearby receiver.

Although not considered applicable to a proposal of this nature, it is nevertheless noted that the measured day and night time equivalent noise levels at N01 and N02 are were below applicable criteria for the redevelopment of the relevant road type (‘existing freeway/arterial/sub-arterial roads’) when corrected to account for façade reflections.

6.4.4 Potential impacts

Construction

It is expected that the proposal would be constructed over a 12 month starting late 2018. The Roads and Maritime’s Construction Noise Estimator (2016) (CNE) was used to estimate whether the proposal has the potential to affect ‘many receivers, few receivers or no receivers’. The criteria established in Section 6.4.3 was applied, with the following default construction scenarios considered from the CNE:

- 01 – Site establishment
- 02 – Utility adjustments
- 03 – Corridor clearing
- 04 – Bulk earthworks
- 05 – Drainage infrastructure
- 06 – Paving / asphalting
- 07 – Re-surfacing works
- 08 – Road furniture installation
- 09 – Compound site establishment
- 10 – Compound site operations.

Noise from an additional construction scenario, 11 – mobile asphalt plant, which would be positioned at temporary ancillary facility site OH1 was also considered. An overall sound power level (SWL) of 114 dB(A) was applied for this activity.
The final construction methodology and staging would be refined during the detailed design phase of the proposal, and associated noise and vibration impacts and mitigation measures re-assessed as required.

Proposed plant and equipment to be used during each stage of construction are provided in Section 3.3.4 and have been factored into the assessment of construction noise and vibration impacts during each stage of construction.

Predicted construction noise impacts

Predicted $L_{Aeq 15 \text{ minute}}$ dB(A) sound pressure levels (SPLs) at each receiver for each scenario listed above are listed below in Table 6-27. The results presented are considered to be conservative noting that they consider the worst-case separation distance, whereas in reality noise sources would move owing to the linear nature of the proposal.
### Table 6-27 Predicted noise levels using CNE

<table>
<thead>
<tr>
<th>Rec.</th>
<th>NML LAeq 15 minute dB(A)</th>
<th>Sleep disturbance guidance level</th>
<th>Predicted SPL LAeq 15 minute dB(A) for each construction scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
<td>Eve.</td>
<td>Night</td>
</tr>
<tr>
<td>R01</td>
<td>45</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td>R02</td>
<td>45</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td>R03</td>
<td>45</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td>R04</td>
<td>45</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td>R05</td>
<td>45</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td>R06</td>
<td>45</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>R07</td>
<td>45</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>R08</td>
<td>45</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>R09</td>
<td>45</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>R10</td>
<td>45</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>R11</td>
<td>45</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>R12</td>
<td>45</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

*Guidance value*
As shown in Table 6-27, the predictions using the CNE indicate that noise levels at surrounding receivers would be unlikely to exceed day, evening or night time NMLs during all phases of construction assessed, or sleep disturbance guidance values.

Sleep disturbance impacts
Considering guidance presented in Appendix E of the CNVG, it is unlikely that sleep disturbance criteria would be encroached at any of the surrounding receivers considered in this assessment during any stage of the proposal.

Mitigation and management measures
Beyond the standard mitigation measures outlined in Appendix B of the CNVG, no additional measures were assessed to be required except prior notification at receiver R01 of construction details and also that activities may occasionally be audible at the premises during construction.

Construction vibration impacts
Some vibration-intensive equipment may be used during the construction of the proposal including compaction equipment. Relevant recommended safe setback distances to maintain building cosmetic and human comfort criteria for these types of plant are reproduced below in Table 6-28.

### Table 6-28 Recommended safe setback distances for relevant vibration-generating plant

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibratory Roller</td>
<td>&lt;50 kN (typically 1-2 tonne)</td>
<td>5 metres</td>
<td>15 m to 20 metres</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;100 kN (typically 2-4 tonne)</td>
<td>6 metres</td>
<td>20 metres</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;200 kN (typically 4-6 tonne)</td>
<td>12 metres</td>
<td>40 metres</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;300 kN (typically 7-13 tonne)</td>
<td>15 metres</td>
<td>100 metres</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;300 kN (typically 13-18 tonne)</td>
<td>20 metres</td>
<td>100 metres</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;300 kN (&gt; 18 tonne)</td>
<td>25 metres</td>
<td>100 metres</td>
<td></td>
</tr>
</tbody>
</table>

Considering these safe working setback distances (Table 6-28) and the distance to nearby structures and receivers (refer to Table 6-17), vibration levels would not be expected to exceed relevant criteria as described in Section 6.4.3, as such, vibration impacts would not be expected to arise from the proposal.

To provide guidance for avoiding vibration-related impacts at nearby utilities, peak particle velocities at different setback distances from different sizes of vibratory rollers and operating settings (low and high amplitude) were predicted using the methods detailed in the British Standard (BS 5228-2:2014 as present in Table 6-29. The lower value related to relating to operations in ‘low amplitude mode’ (i.e. lower vibratory setting for the drum) and the higher value relevant to operations completed in ‘high amplitude mode’.

### Table 6-29 Guidance for avoiding vibration-related damage to surrounding utilities

<table>
<thead>
<tr>
<th>Vibratory roller details</th>
<th>DIN 4150-3:1999-02 criteria</th>
<th>Peak particle velocity (ppv) mm/s at specified distance (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Specifics</td>
<td>1</td>
</tr>
<tr>
<td>Small</td>
<td>4 tonne, 0.8 metre drum width</td>
<td>50 mm/s (Masonry, plastic)</td>
</tr>
<tr>
<td>Medium</td>
<td>11 tonne, 2.1 metre drum width</td>
<td>80 mm/s (Clay, concrete, reinforced)</td>
</tr>
</tbody>
</table>
As shown in Table 6-29, the smallest practicable plant resulting in vibration levels well within the criteria should preferably be selected where feasible, to minimize any risk of damage. Where vibration levels for the selected plant are close to or above the criteria, then a review and assessment should be undertaken and alternative plant or construction techniques considered. This review and assessment should also consider concurrent vibration monitoring and inspection of the utility to ensure that no damage takes place where vibration levels are close to the criteria.

**Construction traffic**

The CNE was utilised to assess potential impacts arising from construction traffic. Existing traffic inputs were added as below with volumes extrapolated from observations made during attended monitoring about eight kilometres to the east of the proposal, and additional traffic generated during construction was conservatively estimated based on the anticipated workforce. Based on these inputs in was found that additional noise arising from construction traffic would not result in changes of more than 2 dB(A) above day and night time traffic noise levels at the nearest receiver (R06); existing noise levels.

**Temporary traffic diversion routes**

As described in Section 3.3.7 and Section 6.1.2, some construction activities associated with the proposal would require that traffic is temporarily redirected onto other nearby roads. It is expected that this would increase the volume of traffic along these redirected roads which would temporarily increase road traffic-related noise levels at surrounding sensitive receivers.

Temporary bypass 01 would reduce traffic along the Golden Highway between the New England Highway and Denman Road, such that it is expected that a smaller volume mainly comprising of local traffic would utilise the Edderton Road section of temporary bypass 02. To estimate the residual traffic utilising the Edderton Road bypass route (segment 07), it was assumed that 20 per cent of the 2019 AADT volumes at Location C would be added. The incremental bypass volumes applied are summarised below in Table 6-30, with cumulative (i.e. existing and incremental bypass flows) values listed in Table 6-31. Results from the assessment are presented in Table 6-32.

### Table 6-30 Redirected incremental traffic volumes

<table>
<thead>
<tr>
<th>Temporary bypass number</th>
<th>Year</th>
<th>Direction 1 (Northbound / Westbound) Day (7am to 10pm)</th>
<th>Direction 1 (Northbound / Westbound) Night (10pm to 7am)</th>
<th>Direction 2 (Southbound/Eastbound) Day (7am to 10pm)</th>
<th>Direction 2 (Southbound/Eastbound) Night (10pm to 7am)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LV HV</td>
<td>LV HV</td>
<td>LV HV</td>
<td>LV HV</td>
<td>RMS, 2011</td>
</tr>
<tr>
<td>01</td>
<td>2019</td>
<td>1030 114</td>
<td>140 16</td>
<td>1076 120</td>
<td>137 15</td>
<td></td>
</tr>
<tr>
<td>02 (Edderton Road)</td>
<td>2019</td>
<td>257 29</td>
<td>35 4</td>
<td>269 30</td>
<td>34 4</td>
<td></td>
</tr>
</tbody>
</table>
**Table 6-31 Cumulative traffic along bypassed road segments**

<table>
<thead>
<tr>
<th>Road segment</th>
<th>Year</th>
<th>Direction 1 (Northbound / Westbound)</th>
<th>Direction 2 (Southbound/Eastbound)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Day (7am to 10pm)</td>
<td>Night (10pm to 7am)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LV</td>
<td>HV</td>
</tr>
<tr>
<td>01</td>
<td>2019</td>
<td>8135</td>
<td>602</td>
</tr>
<tr>
<td>02</td>
<td>2019</td>
<td>4518</td>
<td>1394</td>
</tr>
<tr>
<td>03</td>
<td>2019</td>
<td>2516</td>
<td>428</td>
</tr>
<tr>
<td>04</td>
<td>2019</td>
<td>3555</td>
<td>462</td>
</tr>
<tr>
<td>05</td>
<td>2019</td>
<td>2955</td>
<td>472</td>
</tr>
<tr>
<td>06</td>
<td>2019</td>
<td>2890</td>
<td>461</td>
</tr>
<tr>
<td>07</td>
<td>2019</td>
<td>684</td>
<td>87</td>
</tr>
</tbody>
</table>

**Table 6-32 Predicted changes in noise levels resulting from the temporarily bypassed traffic**

<table>
<thead>
<tr>
<th>Bypass segment</th>
<th>LAEq 15 hr (Day)</th>
<th>LAEq 9 hr (Night)</th>
<th>Change</th>
<th>RNP criteria</th>
<th>Existing</th>
<th>During bypass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
<td>During bypass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>79.2</td>
<td>79.9</td>
<td>+0.7</td>
<td>74.6</td>
<td>75.0</td>
<td>+0.4</td>
</tr>
<tr>
<td>02</td>
<td>69.7</td>
<td>70.3</td>
<td>+0.6</td>
<td>66.2</td>
<td>66.5</td>
<td>+0.3</td>
</tr>
<tr>
<td>03</td>
<td>57.2</td>
<td>59.0</td>
<td>+1.8</td>
<td>53.5</td>
<td>54.5</td>
<td>+1.0</td>
</tr>
<tr>
<td>04</td>
<td>58.5</td>
<td>59.9</td>
<td>+1.4</td>
<td>54.7</td>
<td>55.4</td>
<td>+0.8</td>
</tr>
<tr>
<td>05</td>
<td>65.9</td>
<td>67.5</td>
<td>+1.6</td>
<td>62.1</td>
<td>63.0</td>
<td>+0.9</td>
</tr>
<tr>
<td>06</td>
<td>65.8</td>
<td>67.4</td>
<td>+1.6</td>
<td>62.0</td>
<td>62.9</td>
<td>+0.9</td>
</tr>
<tr>
<td>07</td>
<td>45.3</td>
<td>47.2</td>
<td>+1.9</td>
<td>41.7</td>
<td>42.6</td>
<td>+1.1</td>
</tr>
</tbody>
</table>

Given that increases of 2.1 dB(A) or more were not predicted at the nearest receivers along any of the temporary bypass road segments, no noise mitigation measures were determined to be necessary during both temporary bypasses.

**Operation**

There would be no increase in the volume of traffic, mix of traffic, or posted speed as a result of the proposal. At the nearest location where the proposal would result in the flow of traffic becoming closer to R01, the separation distance is about 1200 metres. At this location the flow of traffic would be move around 11 metres closer to R01.
An assessment was completed using the calculation method for road traffic noise presented in CoRTN, to determine whether noise levels would be likely to increase at nearby receivers by 2 dB(A) or more as a result of the proposal. The CoRTN assessment method considers several input variables including traffic flow, percentage heavy vehicles, traffic speed, road gradient, propagation pathway from road source to receiver including, terrain barrier and shielding effects to determine noise levels arising from road traffic at receivers.

Considering traffic realignments, the resulting increase in traffic noise at the nearest receiver was identified to be the order of well under one dB(A) at the receiver. This is mitigated further by the fact that the Golden Highway is within a cutting relative to R01 at this location and is also screened by intervening terrain.

Given these findings it was concluded that the proposal was unlikely to result in road noise levels increasing 2.1 dB(A) or more relative to existing road operations at surrounding receivers and that no specific operational mitigation measures would be necessary.

In general, it is expected that the new road pavement would reduce noise levels associated with tyre and road interactions for light vehicles. Further, the proposal is intended to improve the flow of traffic over Winery Hill such that the frequency of some maximum noise events (ie deceleration and braking) from light vehicles vehicle would be reduced, though the frequency of maximum noise events from heavy vehicles is expected to remain largely the same.

### 6.4.5 Safeguards and management measures

Safeguards and management measures to be implemented to mitigate and manage noise and vibration impacts are provided in Table 6-33.

Table 6-33 Safeguards and management measures – Noise and vibration

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise and vibration</td>
<td>A Noise and Vibration Management sub-plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will identify:</td>
<td>Contractor</td>
<td>Detailed design / pre-construction</td>
<td>Core standard safeguard NV1</td>
</tr>
<tr>
<td></td>
<td>• All potential significant noise and vibration generating activities associated with the activity</td>
<td></td>
<td></td>
<td>Section 4.6 of QA G36 Environment Protection</td>
</tr>
<tr>
<td></td>
<td>• Feasible and reasonable mitigation measures to be implemented, taking into account Beyond the Pavement: urban design policy, process and principles (Roads and Maritime, 2014)</td>
<td></td>
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<tr>
<td></td>
<td>• A monitoring program to assess performance against relevant noise and vibration criteria</td>
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<tr>
<td></td>
<td>• Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures</td>
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<tr>
<td></td>
<td>• Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
<td>Standard / additional safeguard</td>
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</tbody>
</table>
| Noise and vibration           | All sensitive receivers (eg local residents) likely to be affected will be notified at least five business days prior to starting any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of:  
  - The proposal  
  - The construction period and construction hours  
  - Contact information for project management staff  
  - Complaint and incident reporting  
  - How to obtain further information.                                                                                                                                                                                                                                                                                                                                                                      | Contractor     | Detailed design / pre-construction | Core standard safeguard NV2             |
| Site induction                 | All personnel working on site will receive training to ensure awareness of requirements of the NVMP. Site-specific training will be given to personnel when working in the vicinity of sensitive receivers.                                                                                                                                                                                                                                                                                               | Contractor     | Pre-construction / construction | Additional standard safeguard                 |
| Noise and vibration           | Where possible, works outside of standard construction hours will be planned so that noisier works are carried out in the earlier part of the evening or night time.                                                                                                                                                                                                                                                                                                         | Contractor     | Pre-construction / construction | Additional safeguard                 |
| Vibration impacts to underground utilities | The use of high intensity vibratory compaction equipment near underground services will be limited. If vibration-intensive plant and equipment change from that which has been in the *Noise and Vibration Assessment* (Jacobs, 2018d), a review will be carried out prior to commencing work.                                                                                                                                                                                                 | Construction contractor | Construction | Additional safeguard                 |
6.5 Hydrology and flooding

The potential impacts of the proposal on water quality and hydrology are presented in this section, together with safeguards and management measures to mitigate any negative impacts.

6.5.1 Existing environment

The proposal is located within the Hunter River Catchment about 100 kilometres north of Sydney. It is bound by the Great Dividing Range in the west, Manning and Karuah catchments in the north, and by the Lake Macquarie and Hawksbury-Nepean catchments in the south. The Hunter Catchment is the largest coastal catchment in NSW, with an area of about 21,500 square kilometres. Elevations across the catchment vary from over 1,500 metres in the high mountain ranges north of the catchment, to less than 50 metres on the floodplains of the lower valley. The Hunter River which supports a large population and a diverse range of important water users is located around 5.5 kilometres to south east. The largest tributary of the Hunter is the Goulburn River which joins the Hunter River about 10 kilometres to the west of the proposal. The unnamed water ways around the proposal are shown on Figure 1-2.

Surface water

The majority of watercourses and drainage lines around the proposal area are ephemeral and most flow events occur in direct response to major rainfall, with flow frequently of short duration. The absence of macrophyte vegetation around them suggests they do not often contain water (Jacobs, 206).

Flooding

The proposal area is not located within a flood prone location.

Water quality monitoring data

The Hunter region, and particularly the lower Hunter catchment, supports a high level of urban and industrial development which has affected water quality. In the upper catchment significant land clearing has resulted in erosion and salinity problems (Muswellbrook Council, 2016).

There is currently no publically available water quality data for any of the waterways near the proposal. However, these waterways within the proposal area drain into the Hunter River for which there is some water quality data. The water quality of the Hunter River near Denman in April 2015 was found to be suitable for recreation, stock drinking but not for human drinking (Muswellbrook Council, 2016).

Drainage and water quality elements

Existing pavement drainage in the proposal area consists of swales and open channels and six culverts. There is no formal treatment of stormwater runoff from the existing Golden Highway and no containment infrastructure within the proposal area.

6.5.2 Potential impacts

Construction

Construction of the proposal would involve earthworks to widen the Golden Highway. The removal of vegetation and earthworks would disturb soils with the potential to transport sediment offsite into unnamed drainage lines within and near the proposal. Construction activities with the potential to impact on local water quality from sedimentation and contamination from the following activities include:
- Construction near waterways including the unnamed drainage lines within and near the proposal located
- Removal of vegetation
- General earthworks, including stripping of topsoil and excavation or filling of cuts and fills
- Stockpiling of topsoil and vegetation
- Transportation of cut and/or fill materials
- Movement of heavy vehicles across exposed earth
- Accidental spills of fuels, oils or other chemicals from construction vehicles or equipment (including the asphalt batch plant)
- Blocking or diverting local drainage lines may result in localised areas of flooding and scour during rainfall events
- Operation of the asphalt batch plan.

The batching facility would expose the natural ground surface through the clearing of pastoral grass land and vegetation, stripping of top soil and grading/levelling of the ancillary site (OH1) as required. The batching facility would also slightly alter the topography and increase the impermeable surface area of the ancillary site (OH1), which would likely to result in increased runoff to water capture basins. Runoff from material stockpiles and fluids from the first flush containment system are expected to contain hydrocarbons. Therefore, they would be captured and disposed of offsite at a licences facility.

Water captured within the ancillary sites and sediment basins would be reused wherever possible (for dust suppression purposes and/or truck cleaning) and may be discharged in accordance with EPL requirements.

As there are unnamed and named drainage lines traversing the proposal area coupled with the undulating and hilly nature of the topography, the risks to water quality from sediment runoff during construction would be moderate. An assessment using the Road and Maritime’s Practice Note (PN143) based on the information available at the 80 per cent concept design stage to assess the need for water quality basins. The assessment recommended the installation of up to five temporary sediment basins to manage water quality during construction. The locations of the temporary sediment basins are shown in Figure 1-2 and Section 3.4.2 provides a description of the size and location.

The use of the sediment basins, standard construction site management measures and with the implementation of the proposed safeguards and management measures, the risks to water quality would be minimal.

Construction does not involve deep excavation or drilling and would therefore be unlikely to impact groundwater.

The ancillary sites are not located in flood prone areas or near drainage line or waterway. Provided the safeguards and management measures are implemented for ancillary sites no major impacts would be expected to water.

Non potable water sources (including the potential for water extraction from the Hunter River) would be investigated during detailed design to minimise reliance on potable water where feasible. Any water extraction would occur only after consultation with the NSW Office of Water, and acquisition of associated permits and approvals.

**Operation**

The proposal has been designed to accommodate stormwater volumes during a 100 year storm event, and includes measures to protect in-stream water quality and prevent scour and erosion to protect aquatic ecosystems.

The risk of accidental spills of hazardous materials would always be present from accidents and incidents involving vehicles. Contaminants could flow into the highway drainage system and impact downstream
ecosystems and waterways. The improved horizontal and vertical geometry and improved layout of the road would improve safety and therefore reduce the risk of accidental spills during operation.

Mitigation measures to reduce any additional impact to water quality as a result of the proposal have been provided in Table 6-34.

### 6.5.3 Safeguards and management measures

Safeguards and management measures for water quality and hydrology are presented in Table 6-34

### Table 6-34 Summary of mitigation measures - Water quality and hydrology

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil and water</td>
<td>A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.</td>
<td>Contractor</td>
<td>Detailed design / pre-construction</td>
<td>Core standard safeguard SW1</td>
</tr>
</tbody>
</table>
|                                             | • A site specific Erosion and Sediment Control Plan/s (ESCP) will be prepared and implemented as part of the Soil and Water Management Plan  
• The plan will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather. | Contractor     | Detailed design / Pre-construction | Core standard safeguard SW2                      |
| Contaminants entering receiving environments during construction | Control measures to minimise the risk of water pollution will be implemented including:  
• All fuels, chemicals, and liquids will be stored at least 50 metres away from the existing stormwater drainage system and stored in an impervious bunded area within the compound site  
• Plant and maintenance machinery will be refuelled in impervious bunded areas in the designated compound area  
• Vehicle wash downs and/or concrete truck washouts would be carried out within a designated bunded area of an impervious surface or carried out off-site. | Construction contractor | Construction | Additional safeguard |
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
</table>
| Pollution as a result of sediment entering waterways during construction | • Water management controls and an associated maintenance and inspection program will be developed during detailed design  
• Controls to improve the water quality from construction sites will include sediment basins as described in Section 3.4.2. During detailed design, the following will be confirmed:  
  - Location and size of sedimentation basins  
  - Installation of other water quality measures where required.  
• The sediment basin design, construction and management would be in general accordance with the:  
• Roads and Maritimes General Specifications G36 and G38. | Design contractor and Roads and Maritime | Detailed design |                             |
| Extraction of water                                                   | Non potable water sources (including the potential for water extraction from the Hunter River) would be investigated during detailed design to minimise reliance on potable water where feasible. Any water extraction would occur only after consultation with the NSW Office of Water, and acquisition of associated permits and approvals. | Roads and Maritime / Construction contractor | Construction | Additional safeguard |

Other safeguards and management measures that would address hydrology and water quality are impacts are identified in Section 6.6.3.
6.6 Topography, geology, soils and contamination

This section outlines the local topography, drainage, geology and soils, the potential impacts of the proposal, and safeguards to mitigate them.

6.6.1 Existing environment

**Topography and drainage**

The topography of the proposal area is dictated by a prominent north south trending ridgeline running from Ogilvies Hill in the north to Spur Hill in the south.

The elevation of the proposal area ranges from about 250 metres Australian Height Datum (AHD)) at the top of the ridgeline, to 160 metres AHD away from the ridgeline at the eastern end of proposal. Moderate to steep slopes exist at the flanks of the ridgeline, with steeper grades and existing rock cuttings on the Golden Highway as the alignment traverses the ridgeline. Drainage is to the east and west away from the Denman Gap ridgeline within a series of minor gullies and depressions.

**Geology and soils**

Geology is dominated by permian sedimentary rocks, which include the Singleton Coal measures (divided into the Whittingham Coal Measures and Wollombi Coal Measures), shale, tuffs, sandstone and conglomerate, with some lava beds in the oldest portion of the sequence (1:100,000 Scale Geological Series Sheet 9033, Hunter Coalfield Regional Geology). Quaternary sediments are located along the channels and in the immediate surrounds of the Hunter and Goulburn rivers; and many other streams and rivers (Peake 2006).

Soil landscape mapping suggests that shallow soils comprising residual and colluvial shallow loams and sands would be anticipated at the upper ridgeline within the proposal, with brown solodic soils on the lower slopes. Sandy earths and possible siliceous sands may be observed within drainage lines on the lower slopes (Singleton Soil Landscape Map1:250,000). The soil in the proposal are expected to be highly erodible and highly dispersible, and there is evidence of gully and sheet erosion around the proposal.

**Acid sulfate soils**

A review of the CSIRO Australian Soil Resource Information System (ASRIS) was carried on 24 October 2016. The search indicated that there is a low to extremely low probability of encountering any acid sulphate soils within the proposal area.

**Contamination**

A search of official databases searches did not reveal any known contaminated sites within the proposal area. The following databases were searched on the 11 October 2016:

- OEH contaminated land records for Singleton Council and Muswellbrook Shire Council: These records showed there were no contaminated site records within 500 metres of the proposal area
- The POEO Act public register: This showed that there were no licences on record for near the proposal area. No other licences or notices are for properties or operations within and/or immediately next to the proposal area
- The review of contamination databases indicates low potential for contamination within the proposal area. However, agricultural practices around the proposal area may have used pesticides and herbicides, and there would also be potential for the proposed ancillary sites to have had illegal dumping of waste products
Contamination is considered a low risk to the proposal due to the low intensity of development surrounding the proposal area. There may be contamination surrounding the proposal area associated with agricultural practices.

### 6.6.2 Potential impacts

**Construction**

Construction activities would have the following potential impacts on soils and contamination:

- **Topography:** The earthworks would result in a minor change to the topography of the proposal area. However, this change is consistent with the existing topography and would not be expected to be significant.

- **Soil erosion and loss of topsoil:** This could result from the removal of vegetation (clearing and grubbing) along both sides of the proposal area, and disturbance of the ground surface during site preparation, earthworks, excavation and other construction activities. Earth moving activities have the potential to expose loose soils and mobilise these materials. Soil erosion and loss of top soil would be most likely to occur in areas of larger excavation such as where the batters would be trimmed and excavated. Due to the undulating and hilly terrain through this section of the Golden Highway, the maximum cutting size is about eight metres high. For this reason, the risk of erosion and sedimentation would be moderate.

- **Disturbance of contaminated soil:** Contamination is considered a low risk due to the low intensity of development surrounding the proposal area, however there may be contamination surrounding the proposed associated with agricultural practices and illegal dumping. If contamination is present in these areas, the proposal would have the potential to disperse contaminated materials. (refer to Section 6.4.1)

- **Spills of contaminating materials:** There would be potential for construction activities to result in contamination of soil and/or water due to leaks and spills of potentially contaminating materials. Spill containment would be used at ancillary site to contain spills and spill response procedures would be followed. These impacts would generally be temporary, and mitigation measures to reduce the impacts are summarised in Table 6-35.

**Operation**

Once the proposal is operational, the surfaces disturbed during construction would have been re-surfaced or revegetated and, therefore, erosion would be minimal.

### 6.6.3 Safeguards and management measures

The proposed safeguards and management measures for soils are presented in Table 6-35.

**Table 6-35 Summary of mitigation measures –Soils and contamination**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contaminated land</td>
<td>If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent</td>
<td>Contractor</td>
<td>Detailed design / Pre-construction</td>
<td>Core standard safeguard C2</td>
</tr>
</tbody>
</table>
<pre><code>                                                             |                |                             | Section 4.2 of QA G36 Environment Protection             |
</code></pre>
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accidental spill</td>
<td>A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime <em>Code of Practice for Water Management</em> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).</td>
<td>Contractor</td>
<td>Detailed design / Pre-construction</td>
<td>Core standard safeguard C3 Section 4.3 of QA G36 Environment Protection</td>
</tr>
<tr>
<td>Stockpile management</td>
<td>Stockpiles will be designed, established, operated and decommissioned in accordance with the Roads and Maritime <em>Stockpile Site Management Guideline 2015</em>.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td>Additional standard safeguard SW9</td>
</tr>
</tbody>
</table>
| Soil stabilisation and restoration | The rehabilitation of disturbed areas will be carried out progressively as construction stages are completed, and in accordance with:  
  • Landcom’s Managing Urban Stormwater: Soils and Construction series  
  • Roads and Maritimes’ *Landscape Guideline*  
| Erosion and sedimentation    | The SWMP will be implemented throughout the construction period. It will include the following safeguards:  
  • Designated exclusion zones will be identified for the storage and use of construction plant and equipment. These zones will delineate traffic areas and restrict entry and exit points to construction sites  
  • Areas of risk near the proposal, such as steep areas or highly erodible soils, will be identified and evaluated.                                                                                                               | Construction contractor | Construction                  | Additional safeguard              |
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact</td>
<td>appropriate management controls implemented</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Temporary or permanent diversion drains will be used to divert off-site run-off around or through the construction site to minimise the volume of flow that mixes with on-site run-off</td>
<td></td>
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<tr>
<td></td>
<td>• Physical controls will be developed in line with the ESCP, including sediment basins, sediment fences, sediment filters, rock check dams, level spreaders, and onsite diversion drains installed before construction and maintained during construction</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Exposed batters will be lined, if required</td>
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<tr>
<td></td>
<td>• A schedule for the ongoing maintenance and inspection of temporary erosion and sediment controls will be developed.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Pollution from run-off</td>
<td>Ancillary facilities will be managed within the ESCP. The following measures will be included to limit sediment and other contaminations entering receiving waterways:</td>
<td>Construction contractor</td>
<td>Construction</td>
<td>Additional safeguard</td>
</tr>
<tr>
<td></td>
<td>• Chemicals will be stored within a sealed or bunded area</td>
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<tr>
<td></td>
<td>• Appropriate controls will be in place where plant is stored</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• Run-off from ancillary sites will be controlled and treated before discharging into downstream waterways</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Vehicle movements will be restricted to designated pathways where feasible</td>
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<tr>
<td></td>
<td>• Areas that will be exposed for extended periods, such as car parks and main access roads, will be stabilised where feasible.</td>
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</tr>
</tbody>
</table>
6.7 Landscape character and visual impacts

An assessment was carried out to identify the extent and magnitude of potential visual impacts of the proposal. The assessment is documented in the Golden Highway, Ogilvies Hill Upgrade, - Visual Assessment Report (Envisage, 2017), which is provided in Appendix G and summarised below.

6.7.1 Methodology

For the assessment of landscape character and visual impact, the study area includes the area covered by the proposal area, and distance views from northbound and southbound lanes as shown in Figure 6-6. The visual impact assessment was carried out in accordance with Roads and Maritime’s Guidelines for Landscape Character and Visual Impact Assessment (2013).

The study area for the landscape and visual impact assessment is the area from where the proposal would be potentially seen.

**Landscape character**

For the purpose of the landscape character assessment, the proposal area is considered to be one landscape character unit (LCU).

The assessment of impact on landscape character is based on a combination of the sensitivity of the identified landscape character zones and the magnitude (physical size and scale) of the proposal in that zone. This is used to derive an impact assessment rating for the proposal within each landscape character zones (refer to Table 6-36).

**Table 6-36 Landscape character and visual impact matrix (source: Roads and Maritime 2013)**

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Moderate</td>
<td>High to Moderate</td>
</tr>
<tr>
<td>Low</td>
<td>Negligible</td>
</tr>
<tr>
<td>Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

**Visual impact assessment**

Visual impact assessment is carried out to understand the day-to-day visual effects of a proposal on people’s views. It is based on the assessment of a number of selected viewpoints that are rated according to the sensitivity of the view and the magnitude of the proposal within that view. The locations and directions of the chosen viewpoints are representative of the range of viewpoints both within and beyond the road corridor.

Three key viewpoints (KV) were identified within the proposal visual envelope, as shown on Figure 6-6. The KV are representative of the road users travelling in either direction. There are no nearby houses with views over the proposal. The closest residence has views of the highway blocked by existing vegetation which would not be removed as part of the proposal.

The assessment of the visual impact on these viewpoints has considered the sensitivity of the view (that is, the quality of the view and how it would be affected by the proposal) and the magnitude of the proposal within that view (that is, the physical size and scale of the change and its proximity to the viewer). The combination of sensitivity and magnitude was then used to derive the visual impact rating (refer to Table 6-36).
Figure 6-6 Viewpoints within the proposal visual envelope - east section (Envisage, 2017)
6.7.2 Existing environment

**Landscape character**

The existing landscape character of the proposal area reflects its mostly rural nature, mostly undeveloped nature, with it comprising a local range that is well-vegetated with native trees and has steep sides. The range sits within and above a wider, flat rural landscape that has been extensively cleared of trees, and supports mostly cattle grazing and some crops. The main vegetation in this rural landscape is confined to watercourses. The landholdings are large with houses usually set well back from the Golden Highway and being few.

The surrounding range and area known locally as Denman Gap acts as a local landscape landmark that rises above the nearest plain and one that can be seen by motorists for some distance when approaching from both sides. When descending on either side its elevated landform provides opportunities for wide views over the surrounding rural landscape and towards other vegetated covered ranges to the south (Martindale Range and Doyles Range) and north (Mount Dangar).

**General visibility**

The closed residential property is located about 800 metres north of the proposal. This property does not have direct view of the Golden Highway. The visibility of this section of the proposal would be limited due primarily to the combination of landform and vegetation which largely serve to screen views of it from a wider area. Although the low range on which the proposal is located is elevated above the surrounding rural plain, when approaching from either side of the hill there are limited opportunities for views of the road. Refer to Photo 6-10 and Photo 6-11.

When travelling from the east towards Denman Gap, short sections of the lighter colour of the road can be seen between gaps in the vegetation, yet the cutting at the top is not noticeably evident. When travelling from the west there are no distance views of the existing highway until quite close, as the winding road and taller vegetation block views.

![Photo 6-10 View to toward the range and Denman Gap from eastern side. The Golden Highway is quite concealed up the hill.](image-url)
6.7.3 Potential impacts

Construction
There would be minor long term impacts on visual amenity from the clearing of vegetation and the additional climbing lanes. Short term visual impacts include earthworks, generation of waste, traffic barriers and temporary signage would result in a more cluttered streetscape.

Construction worksites would be restored following the completion of construction. Measures to ameliorate the impacts are summarised in Section 6.7.4.

Operation
Landscape character
Due to the combination of the steep, mostly vegetated landform of the range, as well as its contrast to the surrounding flat rural plain, the landscape character has led to the landscape character being assessed as having a Moderate sensitivity to change. The magnitude of change to this LCU is considered Moderate immediately following the tree removal, with a negligible magnitude of change in the longer term once proposed landscape rehabilitation occurs. The main change to the landscape character in this section would be:

- The widening of the existing road to provide the new climbing lanes would mostly occur along the northern side, with the extent of disturbance up to a maximum width of about 50 metres near Denman Gap.
- On the eastern side of Denman Gap the most widespread landform change would be due to fill embankments, with the largest of about 340 metres long, up to about 25 metres wide and two metres deep (between chainage 70790 and chainage 71130), constructed on the lower northern side leading up to Denman Gap.
- Widening and extension of the existing large cutting to about 10 metres high near the top of Denman Gap (between chainage 71130 and chainage 71320).
• On the western side of Denman Gap there would be less landscape change, with it mostly restricted to a long fill embankment a maximum of about 15 metres wide along the northern side of the highway (between chainages 71350 and chainages 71930)

• Removal of trees in areas affected by the road widening, although such areas have been relatively limited due to the location of the works.

The overall impact would be moderate in the short term and low in the long term.

**Visual impacts**

The only KV that would be affected by the proposal would be those available from the Golden highway when travelling in either direction. There are no nearby houses from where there would be any change to existing views once the proposal is constructed.

The potential visual impacts of the proposal were assessed for three KV in terms of the viewpoint’s sensitivity to change and the magnitude of the proposed changes that would be seen from the viewpoint. As outlined in Section 6.7.2, the KV represents the road users within the proposal area. The visual impact on the KV are summarised in Table 6-37.
Table 6-37 Visual impact assessment

<table>
<thead>
<tr>
<th>Impact</th>
<th>Comment</th>
<th>Photo of KV (Envisage, 2017)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KV -1: Road users on the eastern side of Denman Gap travelling west</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Moderate</td>
<td>The existing views when travelling west are quite close and enclosed, with the highway curving up and around the hill and the nearby vegetation and landform preventing views over the ridge and of the existing cutting until almost reaching that highpoint. The existing roadway is visually quite steep and narrow, with low vegetation and some groups of trees along both sides. The main change would be the widening of the road, vegetation removal and the cutting near the top of the ridge. The fill embankments would be partially hidden due to the higher level of the road. The changes would mean that when travelling west the existing enclosed views would become more open due to the road widening and tree removal. The removal of existing trees on the northern side of the first large bend would mean that longer views would become possible up the hill. The sensitivity of the KV has been assessed as moderate. While the magnitude has been assessed as Moderate in the short term and Low in the long term as the replanted vegetation becomes established. The overall impact level was assessed as being Moderate in the short term and moderate to low in the longer term.</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Low to moderate</td>
<td></td>
</tr>
<tr>
<td>Overall impact</td>
<td>Moderate short term and moderate to low in the long term</td>
<td></td>
</tr>
</tbody>
</table>

| **KV -2: Road users on the eastern side of Denman Gap travelling east** | | |
| Sensitivity | Moderate | Currently when travelling east there are attractive, panoramic views over the rural plain, yet these views are not possible until on the lower part of the ridge as other potential viewpoints higher up are blocked by trees. Therefore, the most noticeable change would be seen by motorists as they descend down the hill due to previously unavailable regional views becoming available, with this outcome seen as a positive one in terms of driver experience, and one that has been recommended to be retained. The sensitivity of the KV has been assessed as Moderate. While the magnitude has been assessed as Moderate in the short term and Moderate to Low in the long term as the replanted vegetation becomes established. The overall impact level was assessed as being moderate in the short term and low in the longer term. |
| Magnitude | Low to moderate | |
| Overall impact | Moderate short term and moderate to low in the long term | |
Sensitivity  
Magnitude

<table>
<thead>
<tr>
<th>Impact</th>
<th>Comment</th>
<th>Photo of KV (Envisage, 2017)</th>
</tr>
</thead>
</table>
| KV -3: Road users on the western side of Denman Gap travelling in either direction | Currently there are regional views possible towards the town of Denman when just on the western side of Denman Gap as motorists are descending down the hill, with the town lights seen in the distance at night. The proposal required removal of trees along the northern side during construction would not further open up these views. The Golden Highway would be widened with a low fill embankment up to 15 metres wide constructed along the majority of the northern side of the highway, western side of Denman Gap. This would incorporate an area that already has a low embankment which is mostly covered with low native vegetation with few large trees.

The change to views seen by road users travelling along the highway on the western side of the Denman Gap would be similar in each direction. Initially the construction of the fill embankment and wider road, and the associated vegetation clearing on the northern side would be noticed, however, this change would be relatively minor as most of the vegetation is low with limited large trees impacted. The sensitivity of the KV has been assessed as moderate. While the magnitude has been assessed as moderate in the short term and low in the long term as the replanted vegetation becomes established. The overall impact level was assessed as being moderate in the short term and moderate to low in the longer term.

| Overall impact | Moderate short term and moderate low in the long term |

The landscape character and visual impact of the proposal would be Moderate to Moderate to Low. The main impact would be due to the removal of native vegetation, the widening of the existing highway, the construction of large fill embankments (the largest been about 340 metres long and about two in height), and the expansion of the large cutting at Denman Gap. Overall, the proposal is considered to be in keeping with the scale and bulk of existing road infrastructure in the locality.

Overall there would be a relatively low magnitude of change to views seen from the Golden Highway due to the proposal, with maximum cuttings of eight metres high and a slight increase to fill embankments in places. The highway would be slightly wider with wider road shoulders throughout and some turning lanes in certain locations such as property access points. Road users would not be expected to notice a substation visual change.
### 6.7.4 Safeguards and management measures

Safeguards and management measures for Landscape character and visual impacts are presented in Table 6-38.

#### Table 6-38 Safeguards and management measures – Landscape character and visual impacts

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
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</thead>
</table>
| Landscape character and visual impact | A Landscape plan and specification will be prepared as part of the detailed design stage and implemented as part of the CEMP. The plan and specification will include design treatments for:  
  - Location and identification of existing vegetation and proposed landscaped areas, including species to be used  
  - Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage  
  - Procedures for monitoring and maintaining landscaped or rehabilitated areas.  
  
  The Landscape Plan and specification will be prepared in accordance with relevant guidelines, including:  
  - *Landscape Guideline* (RTA, 2008)  
  - *Shotcrete Design Guideline* (RTA, 2005). | Roads and Maritime and Contractor | Detailed design / pre-construction | Additional standard |
<p>| Visual impact of work sites | Project work sites, including construction areas and supporting facilities (such as storage compounds and offices) will be managed to minimise visual impacts, including avoiding temporary light spill if required, rehabilitation of disturbed areas, appropriate storage of equipment, parking, stockpile screening and arrangements for the storage and removal of rubbish and waste materials. | Contractor | Construction | Core standard safeguard UD2 |
| Visual impact of work sites | Compound and ancillary facilities will be decommissioned and the sites rehabilitated to their existing condition or as otherwise agreed with the landowner on completion of works. | Contractor | Construction | Additional safeguard |</p>
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment of cuttings and embankments</td>
<td>• Roadside cuttings will retain the natural rock surface where feasible</td>
<td>Roads and Maritime and Contractor</td>
<td>Detailed design / -construction</td>
<td>Additional safeguard</td>
</tr>
<tr>
<td></td>
<td>• Where the cutting is dominated by earth, the cutting will be stabilised with low native vegetation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Shotcrete will be avoided.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retaining opportunities for clear views</td>
<td>The removal of vegetation on the eastern downhill section, on the northern side of the highway will be an opportunity to open-up existing regional views to a far wider panoramic area and as such this area will be kept clear of large trees and be stabilised with low vegetation.</td>
<td>Roads and Maritime and Contractor</td>
<td>Detailed design / construction</td>
<td>Additional safeguard</td>
</tr>
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<td></td>
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</tbody>
</table>
6.8 Socio-economic

The potential impacts of the proposal on the socio-economic environment, property and land use are assessed in this section, together with identification of measures to avoid, manage or mitigate potential impacts. The cumulative socio-economic impacts for the wider program of work to upgrade the Golden Highway as part of the Golden Highway Corridor Strategy have been assessed as part of the *Golden Highway Upgrade Cumulative Socio-economic Assessment* (Jacobs, 2018f), which is provided in Appendix H.

6.8.1 Methodology

The socio-economic assessment was prepared in accordance with Roads and Maritime’s *Environmental Impact Assessment Practice Note N05 – Socio-economic assessment* (Roads and Maritime, July 2013).

The methodology for the preparation of the socio-economic and land use assessment involved a four stage process, as follows:

- Identifying the scope of assessment and defining the study area based on the likely range of potential socio-economic and land use impacts and the communities most likely to be affected by the proposal
- Assessing the existing socio-economic and land use characteristics, values and conditions in the study area, to provide a baseline from which potential benefits and impacts of the proposal can be assessed
- Identifying and evaluating the proposal’s potential impacts on the socio-economic and land use conditions and values of the study area as a result of construction and operation of the proposal
- Identifying safeguards and management measures to avoid, minimise or mitigate potential socio-economic and land use impacts identified in the assessment.

The assessment of existing socio-economic conditions and land uses of the proposal area principally draws on information from the Australian Bureau of Statistics (ABS) *Census of Population and Housing 2011*, supplemented with information and data from:

- Government agencies such as the NSW Department of Planning and Environment
- State Government and Muswellbrook Shire Council publications, including the Muswellbrook Shire Community Strategic Plan 2013-2023
- Muswellbrook Local Environment Plan 2009
- A desktop survey of businesses and properties located near the proposal
- Community and stakeholder consultation carried out for the proposal.

Community and stakeholder consultation is documented in Section 5, the outcome of which has informed this assessment.

The study area for the assessment includes those communities that are likely to be affected by the proposal’s construction and operation. The study area has been identified as including the ABS Statistical Area Level (SA1) 112701 which includes the proposal area.

6.8.2 Existing environment

The proposal is located within the Muswellbrook LGA of the Upper Hunter Valley region about 130 kilometres northwest of Newcastle. The LGA covers over 3,400 square kilometres, of which 40 per cent is national parks (Muswellbrook Shire Council, 2016).

The LGA consists of two larger towns, Muswellbrook and Denman, as well as a number of outlining rural communities. The Golden Highway traverses the study area and provides for regional freight distribution...
servicing the surrounding agricultural and mining industries, as well as providing a link between the Hunter and the central west.

There is one residential property within one kilometre of the proposal. There are two property accesses with gates within the proposal area that provide access to the Golden Highway.

**Population and demographics**

Data is primarily sourced from the 2011 ABS Census, supplemented from other sources including NSW government agencies and Muswellbrook Shire Council.

Key findings of the demographics of the community within the study area can be summarised as follows:

- The study area (ie communities located within the ABS SA1 112701) comprised a population of 320 people in 2011
- In the 10 years from 2005 to 2015, the population of the LGA grew by about 1.1 per cent per annum to 17,201 as of 2015, which was slightly lower than the overall rate of population growth for NSW
- The study area has a younger population compared with the LGA and NSW, with the median age being 31 years compared with the median ages of 34 and 38 for the LGA and NSW respectively
- Communities in the study area generally display lower levels of cultural diversity compared with the LGA and NSW
- There are lower levels of vulnerability in the study area, with lower levels of people requiring assistance compared with the LGA and NSW, which is reflective of the younger population
- The study area and LGA have slightly higher median household incomes compared with NSW, with the median household income of the study area standing at $1,375 per week compared with $1,237 per week for NSW as a whole
- The dominant industry of employment for residents in the study area is categorised as agriculture, forestry and fishing (49 per cent), reflecting the importance of the agricultural industry in the area (LGA 7.1 and 2.2 for NSW)
- More people participate in the labour force in the study area (82.4 per cent) compared with NSW (59.7 per cent), which is reflective of the younger population
- A high proportion of workers in the study area (14.5 per cent) walk to work compared with workers of the LGA (4.2 per cent) and NSW (4.1 per cent), suggesting many residents reside at their place of employment.

**Social infrastructure**

There are no community facilities or social infrastructure located in the proposal area. Residents of the study area would be required to travel to nearby towns of Denman or Muswellbrook for community facilities, social infrastructure, retail, and commercial services.

**Business and industry**

There are no businesses located in the proposal area.

**Community values**

The study area’s rural uses and landscapes are important to the character and identity of the area, while the rural amenity and lifestyles are valued by the local communities. Residents of the LGA value the community in which they live and its rural atmosphere. According to the Muswellbrook Shire Community Strategic Plan 2013-2023, residents generally feel the LGA is a safe and friendly place (Muswellbrook Council, 2013).
During consultation for this plan, many residents identified improvements to the roads as being a key issue they would like to see addressed over the next 10 to 15 years.

**Property and land use**

The proposal area is surrounded by agricultural land which is predominately grazing land and cleared of native vegetation. Land uses next to the proposal area are primary production (Local Environment Plan 2009). The land zoning is discussed in Section 4.1.2.

**The Golden Highway regional context**

The Golden Highway connects the Hunter region to the east with the Central West and Orana region to the west. The Hunter and Central West and Orana regions are characterised by wineries, coal mining, agricultural production and regional and rural communities. Reflecting this, the Golden Highway serves as an important transport network for rural and regional communities, business and industry, and tourism.

**The Hunter Region Profile**

The Hunter region has traditionally been known for coal mining and horse breeding, although in recent times, the region has developed a reputation for food and wine production. Key regional towns near to the study corridor include Singleton and Muswellbrook. These are identified in the Hunter Regional Plan 2036 as important strategic centres in the region and as the focus for population and/or economic growth over the next 20 years.

Singleton and Muswellbrook have traditionally been centres of primary production, with beef cattle properties, dairy farms and vineyards, coal mining and related industries. The Singleton LGA is the largest producer of coal in NSW with approximately 20 coal mining operations (Singleton Council, 2017). Muswellbrook LGA accommodates a range of coal mining activities and important agricultural areas including 26 stud farms and five open cut mine operations.

The Hunter region has the largest economy in regional NSW. In 2013, it contributed $38.5 billion to Gross Regional Product (GRP), representing 28 per cent of regional NSW’s total GRP (Hunter Economic Profile, 2013). The top three industries by contribution to GRP in 2013 included: mining (14.7 per cent); manufacturing (9.5 per cent); and health care and social assistance (6.7 per cent) (Hunter Economic Profile, 2013). The Port of Newcastle is a vital hub for exporting agricultural produce and coal to new markets throughout Asia.

The Hunter region also has a significant tourism industry, receiving nearly 3.4 million domestic and international overnight visitors, and 6.6 million domestic daytrip visitors in the year to December 2016 (Destination NSW, 2016). Major tourist attractions include wineries, the Werakata and Wollemi National Parks and Lake Macquarie.

### 6.8.3 Potential impacts

The Golden Highway Upgrade would have beneficial impacts for regional and local communities through reduced traffic congestion, improved access and connectivity, and improved road safety. However, during construction there would be both temporary localised and regional cumulative impacts on the community, businesses and industry, due to construction of the project, and concurrent construction works associated with the Golden Highway Upgrade. These are discussed in further detail below.

**Property**

**Property acquisition and landuse**

As discussed in Section 3.6 and outlined in Table 3-6, the proposal would require the partial acquisition or adjustment of four properties. The extent of partial property acquisition is about 29,653 square metres.
Property adjustment impacts include relocating property boundary fencing, driveway adjustments and loss of roadside vegetation.

Some temporary leases of land would be required during construction to accommodate the ancillary sites.

**Construction**

**Local impacts**

**Access and connectivity**

During construction, potential impacts on access and connectivity in the study area would generally relate to:

- Traffic delays and disruptions for motorists and other road users along the Golden Highway due to the implementation of traffic management measures, such as temporary lane closures or stoppages and reductions in speed limits. These impacts would be temporary.
- Increased construction traffic on Golden Highway, including light and heavy vehicles used to deliver equipment, materials and spoil, and construction workers accessing the work site. These impacts would be temporary.
- Changes to access arrangements for private property access for residents. Access to private properties would be maintained during construction. Where temporary changes are required, suitable access arrangements would be implemented in consultation with affected property owners.

**Local business and industry**

During construction, potential impacts on local business and industry would arise from:

- Temporary impacts to freight efficiency and oversizing freight scheduling.
- Temporary traffic disruptions and construction activities reducing connectivity along the Golden Highway.

An analysis of the monetary impact caused by delays to both heavy vehicle drivers and freight within the proposal area, indicates that construction would have an estimated delay cost of $44,119.

**Amenity**

Construction of the proposal may affect the local amenity for nearby sensitive receivers, such as residential dwellings. Minor temporary amenity impacts may be experienced by residents and other nearby sensitive receivers located close to construction work and ancillary sites due to increased noise and dust from construction activities and increased traffic, including heavy vehicles. Mitigation measures to minimise noise and dust impacts are provided in Sections 6.4.5 and Section 6.10 respectively.

**Regional impacts**

**Access and connectivity**

As described in Section 6.1.2, the construction of the proposal would affect access and connectivity in the region for motorists, business owners, bus services to Denman and surrounding areas including school bus services, regional freight and commercial traffic.

The potential cumulative delay along the Golden Highway due to multiple project construction concurrently would be in the order of up to 31 minutes between the New England Highway and Dubbo. Traffic impacts and mitigation measures to minimise traffic impacts are discussed in Section 6.1.2 and Section 6.1.3 respectively.
Business and industry

During construction, potential impacts on business and industry in the region would arise from:

- Increased travel times to employment (i.e. to coal mines, farms, wineries) due to some residents choosing to use alternative, and potentially longer routes, to avoid using the Golden Highway
- Increased travel to tourist destinations and small businesses in the region, including wineries, cafes, and retail in townships which may discourage some road users from making the journey
- Incur greater costs to business and industry in the region due to increase in travel times for freight and commercial traffic.

An analysis of the potential monetary impacts caused by cumulative delays to both heavy vehicle drivers and freight was carried out. Overall it was calculated that the costs of delays along the Golden Highway would be up to $353,693 (based on increased travel times) due to multiple projects being constructed concurrently.

As outlined above, potential cumulative delays to road users would be up to 31 minutes along the length of the Golden Highway. Notification of communities and road users about potential delays and disruptions would assist in helping people plan their journeys and minimise potential impacts on travel times, as discussed in Section 6.1.3.

Amenity

During construction, potential cumulative impacts on community values and safety in the region would generally relate to:

- ‘Construction fatigue’ for local residents and road users due to multiple construction activities being carried out over an extended period
- Disruptions and travel delays for motorists and freight due to changed traffic conditions
- Reduced perceptions of safety along the road corridor, with some road users choosing to use alternative routes along local, lower order roads which may be perceived to be more dangerous
- Increased costs to business and industry due to delays and disruptions to freight movements
- Reduced emergency response times for emergency services vehicles, including police, ambulance, and fire and rescue services utilising the Golden Highway.

Potential cumulative impacts on emergency service response times would affect service vehicles along the length of the Golden Highway. This may require changes to some emergency service operations during construction.

Operation

Access and connectivity

As discussed in Section 2.5 the proposal would generally improve access and connectivity to community services and facilities within or near the study area through the introduction of climbing lanes, and overtaking opportunities providing improved travel times, consistent road conditions to improve freight efficiency and improved road safety, with the introduction of an increased median separation and widened paved shoulders. This would have beneficial impacts for local communities and workers as well as communities across the broader Muswellbrook Shire and Upper Hunter.

Business and industry impacts

At a regional level, the proposal would have beneficial impacts on business and industry through improved access and connectivity. In particular, the proposal would improve travel times and reliability for freight and commercial vehicles, reducing transport costs.
Amenity
The operation of the proposal would improve access and connectivity for freight and would improve amenity for local communities by providing safer and more efficient travel to the community, which in turn may encourage the wider use of regional facilities and community networks.

6.8.4 Safeguards and management measures
Safeguards and management measures for landscape character and visual impacts are presented in Table 6-39.

Table 6-39 Safeguards and management measures – Socio-economic and land use

<table>
<thead>
<tr>
<th>Impact</th>
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<th>Standard / additional safeguard</th>
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</table>
| Socio-economic                | A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):  
  - Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions  
  - Contact name and number for complaints  
  - Mechanisms to share issues raised by stakeholders with other Golden Highway Upgrade projects  
  - The CP will be prepared in accordance with the Community Involvement and Communications Resource Manual (RTA, 2008)  
  - Coordination with other Golden Highway Upgrade projects’ CP will be carried out to ensure consistency in the information provided to the community during construction. | Contractor                     | Detailed design / pre-construction | Core standard safeguard SE1   |
<p>| Property acquisition         | All property acquisition will be carried out in accordance with the Land Acquisition Information Guide (Roads and Maritime, 2012) and the Land Acquisition (Just Terms Compensation) Act 1991.                                           | Roads and Maritime project manager | Pre construction / detailed design | Core standard safeguard PL1    |
| Emergency vehicle access      | Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency.                                      | Roads and Maritime and Construction Contractor | Pre construction / detailed design | Additional safeguard SE2       |
| Consultation - property owners| Consultation will be carried out with all affected property owners during detailed design and construction to develop and                                           | Roads and Maritime and          | Pre construction              | Additional safeguard SE5       |</p>
<table>
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<tr>
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<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultation – business and industry</td>
<td>implement measures to mitigate impacts on their property.</td>
<td>Construction Contractor</td>
<td>/ detailed design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consultation will be carried out with business, industry, freight transport providers and managers of tourism related businesses about the timing and duration of construction activities.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Pre construction / detailed design</td>
<td></td>
</tr>
<tr>
<td>Complaints</td>
<td>A complaints handling procedure and register will be included in the CEMP.</td>
<td>Construction Contractor</td>
<td>Construction</td>
<td>Additional safeguard SE8</td>
</tr>
</tbody>
</table>

Other safeguards and management measures that would address socio-economic impacts are identified in Section 6.1 (Traffic and transport), Section 6.4 (Noise and vibration), Section 6.10 (Air quality) and Section 6.17 (Landscape character and visual amenity).
### 6.9 Waste

#### 6.9.1 Policy setting

The WARR Act promotes waste avoidance and resource recovery by developing waste avoidance and resource recovery strategies and programs.

Roads and Maritime endeavours to reduce and manage waste to conserve resources and reduce impacts associated with waste disposal through the implementation of the waste management hierarchy established under the WARR Act as follows:

- **Waste Avoidance** – Take action to avoid the generation of waste and to be more efficient in its use of resources. If unable to avoid generating waste, then reduce the amount of waste generated and reduce the toxicity or potential harm associated with its generation and management
- **Resource Recovery** – Maximise the reuse, reprocessing, recycling and recovery of energy from materials
- **Disposal** – Disposal is the least desirable option and must be carefully handled to minimise negative environmental outcomes.

#### 6.9.2 Potential impacts

**Construction**

Construction would generate waste streams typical of road construction, including:

- Green waste from cleared vegetation
- Road construction materials from construction of the widened road
- Bitumen, concrete and asphalt from removal of any existing road surfaces
- Roadside materials (ie. guide posts, guard rails, traffic signage)
- Excess fill material from any excavation of soils and fill embankments during construction
- Construction wastes created from the demolition of old road pavement from the Golden Highway
- Oil, grease and other liquid wastes from the maintenance of construction plant and equipment
- General wastes and sewage from site compounds and offices
- Plant and equipment maintenance waste including liquid wastes from cleaning, repairing and maintenance
- Packaging materials from items delivered to site, such as pallets, crates, cartons, plastics and wrapping materials.

Any remaining surplus material would be stockpiled in a suitable location for use by Roads and Maritime on future projects, or disposed of to a licenced facility following validation assessment of the type of spoil waste classification. Allowance would be made at the proposed ancillary sites for initial stockpiling of surplus material, either for re-use elsewhere on the site, or prior to its disposal. Sufficient space exists across the proposed ancillary sites to accommodate material stockpiles, and these would be managed in accordance with the contractor’s construction management plan and environmental management plan. Surplus material that cannot be used within the proposal area would be reused on other projects along the Golden Highway or disposed of in the following order of priority:

- Transferred to other Roads and Maritime projects for reuse in accordance with the NSW Environmental Protection Authority (EPA) Excavated Public Road Material resource recovery exemption
• Transferred to an approved Roads and Maritime stockpile site for future re-use, only if a specific project has been identified before stockpiling and Protection of the Environment Operations Act 1997 (POEO Act) waste regulatory requirements have been met. If a project cannot be identified the material would not be stockpiled within the proposal.

• Transported off site for reuse by a third party in accordance with a relevant EPA resource recovery exemption or planning approval.

• Disposed of at an approved materials recycling or waste disposal facility.

• As otherwise provided for by the relevant waste legislation.

The quantities of each type of waste would be defined during detailed design. In addition, as detailed in Section 4.2.1, an EPL may be required for the proposal.

6.9.3 Safeguards and management measures

Measures to manage the potential waste from the proposal are summarised in Table 6-40.

Table 6-40 Summary of mitigation measures -Waste

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
</table>
| Waste  | A Waste Management Plan will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:  
  • Measures to avoid and minimise waste associated with the project  
  • Classification of wastes generated by the project and management options (re-use, recycle, stockpile, disposal)  
  • Classification of wastes received from off-site for use in the project and management options  
  • Identifying any statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions  
  • Procedures for storage, transport and disposal  
  • Monitoring, record keeping and reporting, including any documentation management obligations arising from resource recovery exemptions.  
  The Plan will be prepared taking into account the Roads and Maritime Environmental Procedure - Management of Wastes on Roads and Maritime Services Land and relevant Roads and Maritime Waste Fact | Contractor | Pre construction / detailed design | Core standard safeguard W1  
Section 4.2 of QA G36  
Environment Protection |
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
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<tbody>
<tr>
<td></td>
<td><em>Sheets</em>, as well as the adopting the Resources Management Hierarchy principles of the WARR Act.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Existing condition of ancillary sites</td>
<td>Prior to land being used for ancillary construction purposes (compounds, storage, parking, etc) a pre-construction land assessment will be carried out to identify the presence of any pre-existing wastes. The assessment will be prepared in accordance with the Roads and Maritime <em>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</em>. Where the land is privately owned, a copy of the assessment will be provided to the landowner.</td>
<td>Contractor</td>
<td>Pre construction / detailed design</td>
<td>Core standard safeguard W2</td>
</tr>
<tr>
<td>Excavated material</td>
<td>Opportunity to reuse material between Golden Highway upgrades will be considered to minimise waste to landfill. This is should be viable where the is excessive cut material at Winery Hill and a deficit of cut to fill material for the proposal.</td>
<td>Contractor</td>
<td>Construction</td>
<td>Additional safeguard</td>
</tr>
<tr>
<td>Final condition of ancillary sites</td>
<td>A post-construction land assessment will be carried out of land that was used for ancillary construction purposes (compounds, storage, parking, etc) to determine the suitability for hand-back to the landowner.</td>
<td>Contractor</td>
<td>Post construction / operation</td>
<td>Additional standard safeguard W12</td>
</tr>
</tbody>
</table>
6.10 Other impacts

6.10.1 Existing environment and potential impacts

<table>
<thead>
<tr>
<th>Environmental factor</th>
<th>Existing environment</th>
<th>Potential impacts</th>
</tr>
</thead>
</table>
| Non-Aboriginal Heritage | Searches of the following databases were conducted on 12 July 2016:  
  - RTA section 170 register  
  - NSW Heritage database  
  - Commonwealth EPBC heritage list  
  - Australian Heritage Places Inventory  
  - Singleton Local Environmental Plan (LEP) 2013 and Muswellbrook (LEP) 2009.  
No items were identified with 500 metres of the proposal. | Impacts to non-Aboriginal heritage as a result of construction and operation of the proposal would not be expected as no heritage items were not identified within or near the proposal area. |
| Air quality and greenhouse gas | Ambient air quality at the proposal are influenced by local sources including traffic along the Golden Highway, as well as regional influences arising from mining and extractive activities within the Upper Hunter. The main air pollutants from motor vehicles are carbon monoxide (CO), nitrogen dioxide (NO$_2$) and fine particles (PM$_{10}$, i.e. particulate matter with equivalent aerodynamic diameters of less than 10 microns), whereas deposited dust and particulate matter are the primary pollutants associated with regional influences. During construction air quality impacts would potentially occur in the vicinity of the proposal and would be dependent upon atmospheric conditions. The proposal would have potential to generate dust during earth works, stockpiles and the use of imported fill. Levels of airborne dust would be expected to be low level and unlikely to cause concern to sensitive receivers (the nearest sensitive receive is located 800 metres from the proposal). Construction equipment and plant would emit exhaust fumes and would contribute to local air quality. However, in the context of the existing vehicular movements along the Golden Highway and given the short duration of the construction period, this was considered to be negligible. The operation of the batch plan at ancillary site OH1 would also produce odours. However, as the nearest sensitive receiver (from batch plant) is over one kilometre away the odours would have diffused before reaching the receiver. |
Environmental factor | Existing environment | Potential impacts
--- | --- | ---
Utilities | The utilities within the proposal area are described in Section 3.5. | No major utility relocations would be required as part of this proposal, however utilities would need to be protected during construction.

### 6.10.2 Safeguards and management measures

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
</table>
| Non-Aboriginal Heritage | • The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered  
  • Work will only re-start once the requirements of that Procedure have been satisfied. | Contractor | Detailed design / pre-construction | Core standard safeguard H2  
  Section 4.10 of QA G36 Environment Protection |
| Air quality | An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to:  
  • Potential sources of air pollution  
  • Air quality management objectives consistent with any relevant Published EPA and/or OEH guidelines  
  • Mitigation and suppression measures to be implemented  
  • Methods to manage work during strong winds or other adverse weather conditions  
  • A progressive rehabilitation strategy for disturbed areas. | Contractor | Detailed design / pre-construction | Core standard safeguard AQ1  
  Section 4.4 of QA G36 Environment Protection |
| Utilities | Prior to the start of works:  
  • The location of existing utilities and relocation details will be confirmed following consultation with the affected utility owners | Contractor | Detailed design / pre-construction | Core standard safeguard U1 |
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hazards and risk management</strong></td>
<td>- If the scope or location of proposed utility relocation works falls outside of the assessed proposal scope and footprint, further assessment will be carried out.</td>
<td>Contractor</td>
<td>Detailed design / pre-construction</td>
<td>Core standard safeguard HAZ1</td>
</tr>
<tr>
<td></td>
<td>A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to:</td>
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<tr>
<td></td>
<td>1. Details of hazards and risks associated with the activity</td>
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<tr>
<td></td>
<td>2. Measures to be implemented during construction to minimise these risks</td>
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<tr>
<td></td>
<td>3. Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials</td>
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<td></td>
<td>4. A monitoring program to assess performance in managing the identified risks</td>
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<td></td>
<td>5. Contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations.</td>
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<tr>
<td></td>
<td>The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or OEH publications.</td>
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</tbody>
</table>
6.11 Cumulative impacts

Cumulative impacts have the potential to arise from the interaction of individual elements within the proposal and the additive effects of the proposal with other external projects. Roads and Maritime is required under clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, to take into account potential cumulative impacts as a result of the proposal.

6.11.1 Study area

The study area used for the assessment of cumulative impacts has been defined by identifying other developments or activities that are under way now within 20 kilometres of the proposal, or are likely to start during the proposals scheduled construction timeframe. Construction of the proposal would begin in late 2018.

6.11.2 Broader program of work

As outlined in Section 2.1, the proposal originated as part of a wider program of work to upgrade the Golden as part Golden Highway Corridor Strategy. The closest project as part of this programme of work is Winery Hill upgrade located about five kilometres to the east. The proposal and the Winery Hill upgrade would be constructed concurrently.

Many of these projects would overlap with the construction timeframe of the proposal (refer to Table 6-1). As described in the *Golden Highway Road User Delay Traffic Management Summary Report* (GHD, 2017) the highest average cumulative delay per trip would be about 31 minutes, which would be experienced by eastbound traffic in the afternoon peak hour. The cumulative delay would be the greatest in August 2019 when all the projects would be construction at the same time. The highest worst case cumulative delay per trip would be 42 minutes, which is experienced by eastbound traffic in the PM peak hour. Refer to Section 6.1.2.

6.11.3 Other projects and developments

Other approved developments around the proposal that have the potential to overlap include:

- Dolwendee Quarry Project: located about 15 kilometres west of the proposal
- Drayton South Coal Project: this projects boundary follows the Golden highway road corridor boundary within the study area. The current determination for his project is refused. However, this could change in the near future
- Mount Arthur Coal: located about six kilometres from the proposal. Approval for the extension of this project has been granted with conditions.

6.11.4 Potential impact

On terms of cumulative impact, this proposal would most likely be perceived as part of a larger, staged overall upgrade of the Golden Highway, with the effects from construction being similar for all receivers located near to the proposal. Property owners, residents, businesses local along the Golden Highway and road users would experience extended periods of disruptions related to road construction and likely to experience ‘construction fatigue’ due to extended periods of disruption caused by construction activities, construction traffic, noise and dust, interruptions to access, and occasional night-time construction work.
The likely cumulative impacts of the proposal, other projects and developments during construction and operation are summarised in Table 6-41.

Table 6-41 Potential cumulative impacts

<table>
<thead>
<tr>
<th>Environmental factor</th>
<th>Construction</th>
<th>Operation</th>
</tr>
</thead>
</table>
| Traffic and transport   | As a result of the proposal and other nearby proposals that form part of the Golden Highway Corridor Strategy within a similar time period. There is potential for impacts on traffic and transport to be greater than those that were identified for the proposal in isolation. Impacts would primarily be a result of road and lane closures and an increase in construction-related traffic. Potential cumulative impacts would include:  
  - Increased travelling time on the road network  
  - Reduced traffic speeds on the road network  
  - Increased construction traffic volumes along the highway  
  - Impacts to oversize freight scheduling. | The proposal and other road upgrades along the Golden Highway would have a positive cumulative impact on travel times and road safety resulting in an improved transport corridor. |
| Biodiversity            | Long-term plans for Golden Highway and other individual projects that would contribute to the loss of endangered species and EECs. The proposal would impact on about 5.67 hectares of vegetation of which up to 4.96 hectares is comprised of two overlapping EECs including about:  
  - 4.08 hectares of *Hunter Valley Footslopes Slaty Gum Woodland* listed as endangered under the TSC Act  
  - 5.53 hectares of *Central Hunter Valley eucalypt forest and woodland* listed critically endangered under the EPBC Act (refer to Section 6.3).  

When considered in the context of the locality (the area within 10 kilometres of the proposal) the proportional impact is small. However, when considered in the context of other proposed developments within the study area, the cumulative impacts to endangered species and EECs would be potentially be large in terms of the already cleared nature of the region. The total cumulative impact of the two projects where data was available (Drayton Coal and Mt Arthur) and this current project would result in a 1.3 per cent reduction in the mapped area of the Central Hunter Grey Box – Ironbark Woodland EEC (TSC Act). Refer to Section 6.3.3. | No cumulative impact is anticipated during operation of the proposal. |
| Visual amenity          | Multiple construction activities would have a cumulative impact on the visual amenity of the Golden Highway for the road user as they would pass multiply works sites. Earthworks, construction compounds, stockpile sites, and construction machinery would be highly visible. | Overall, the proposal would be considered to be in keeping with the scale and bulk of existing road infrastructure. |
Cumulative impacts would mainly be associated with changes to road conditions during construction across multiple projects resulting in temporary delays and disruptions, and subsequent impacts on people's access to employment, services and facilities, and movement of freight. Multiple construction activities over an extended period would also likely result in ‘construction fatigue’ for local residents and road users. The proposal and other planned road upgrades as part of the Golden Highway Strategy would have a positive cumulative impact on travel times, freight efficiency and road safety.

The proposal would involve earthworks, with the overall aim of maximising the re-use of material on site or between projects along the Golden Highway. There are opportunities to move material excavated material between projects to another projects for another for fill material. This would help reduce on material going to landfill.

No cumulative impact is anticipated during operation of the proposal.

### 6.11.5 Safeguards and management measures

Measures to manage cumulative impacts are proved in **Table 6-42**.

**Table 6-42 Summary of mitigation measures for cumulative impacts**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative impacts from construction of multiple projects</td>
<td>The CEMP will be updated as required to address cumulative impacts as other projects/activities begin. This will include a process to review and update mitigation measures as new work begins or if complaints are received.</td>
<td>Contractor</td>
<td>Pre-construction</td>
<td>Additional safeguard</td>
</tr>
<tr>
<td>Cumulative traffic and access impacts</td>
<td>The TMP will be prepared in consultation with the Transport Management Centre and Muswellbrook Shire Council.</td>
<td>Contractor</td>
<td>Pre-construction</td>
<td>Additional safeguard</td>
</tr>
<tr>
<td>Cumulative construction impacts</td>
<td>To minimise potential impacts during construction, construction of the proposal would be staged to enable work to be completed safely while maintaining traffic flows at all times. Construction would involve building one lane at a time, and moving traffic between the lanes to keep traffic flows for the duration of work. This approach will ensure that negative cumulative impacts on</td>
<td>Roads and Maritime</td>
<td>Detailed design, pre-construction</td>
<td>Additional safeguard</td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
<td>Standard / additional safeguard</td>
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<td>both the function of the Golden Highway and the surrounding environment will be minimised where possible.</td>
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</table>

Other safeguards and management measures that would address cumulative impacts are identified in Sections 6.1 to 6.10.
7. Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are also listed.

7.1 Environmental management plans (or system)

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

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

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Hunter region, prior to the start of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out:

- QA Specification G36 – Environmental Protection (Management System)
- QA Specification G38 – Soil and Water Management (Soil and Water Plan)
- QA Specification G40 – Clearing and Grubbing
7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposal works on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1: Summary of safeguards and management measures

<table>
<thead>
<tr>
<th>No.</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
</table>
| GEN1 | General - minimise environmental impacts during construction | A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to starting the activity. As a minimum, the CEMP will address the following:  
  - Any requirements associated with statutory approvals  
  - Details of how the project will implement the identified safeguards outlined in the REF  
  - Issue-specific environmental management plans  
  - Roles and responsibilities  
  - Communication requirements  
  - Induction and training requirements  
  - Procedures for monitoring and evaluating environmental performance, and for corrective action  
  - Reporting requirements and record-keeping  
  - Procedures for emergency and incident management  
  - Procedures for audit and review.  

The endorsed CEMP will be implemented during the undertaking of the activity. | Contractor / Roads and Maritime project manager | Pre-construction / detailed design | Core standard safeguard GEN1 |
<table>
<thead>
<tr>
<th>No.</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEN2</td>
<td>General - notification</td>
<td>All businesses, residential properties and other key stakeholders (e.g., schools, local councils) affected by the activity will be notified at least five business days prior to commencement of the activity.</td>
<td>Contractor / Roads and Maritime project manager</td>
<td>Pre-construction</td>
<td>Core standard safeguard GEN2</td>
</tr>
</tbody>
</table>
| GEN3 | General – environmental awareness | All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include:  
- Areas of Aboriginal heritage sensitivity  
- Aboriginal heritage management including unexpected finds procedures  
- Threatened species habitat and EEC  
- Records of training will be maintained by the contractor, including details of staff attending, dates, nature of training provided, and training provider(s) used. | Contractor / Roads and Maritime project manager | Pre-construction / detailed design | Core standard safeguard GEN3 |
| GEN4 | General – environmental awareness | Standard construction hours:  
- Monday to Friday 7.00 am to 6.00 pm  
- Saturdays 8.00 am to 1.00 pm  
- No construction on Sundays or Public Holidays. Works outside standard construction hours (including those detailed within this REF) will be carried out in accordance with the management and mitigation measures detailed within the Noise and Vibration Management Plan. | Contractor | Construction | Core standard safeguard GEN4 |
<p>| GEN5 | General – environmental awareness | The Roads and Maritime Project Manager will notify the Roads and Maritime Environment Manager at least five business days prior to the commencement of the activity. The notification will include a copy of any local community notification carried out (GEN2). | Contractor | Pre-construction / detailed design | Additional safeguard GEN7 |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
</table>
| TT-1 | Traffic and transport          | A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime Traffic Control at Work Sites Manual (RTA, 2010) and QA Specification G10 Control of Traffic (Roads and Maritime, 2008). The TMP will include:  
  - Confirmation of oversize haulage routes and/or detours  
  - Measures to maintain access to local roads and properties  
  - Site specific traffic control measures (including signage) to manage and regulate traffic movement  
  - Requirements and methods to consult and inform the local community of impacts on the local road network  
  - Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads  
  - A response plan for any traffic incidents within the construction zone.  
  - Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic  
  - Monitoring, review and amendment mechanisms. | Contractor                | Detailed design / Pre-construction                                    | Core standard safeguard TT1 |
<p>| TT-2 | Property access - pre-construction | Requirements for any changes to local access arrangements will be confirmed during detailed design in consultation with the local road authority and any affected landowners. | Roads and Maritime         | Pre construction / detailed design | Additional standard safeguard TT3 |
| TT-3 | Notifications to landowners    | Disruptions to property access and traffic will be notified to landowners at least five in accordance with the relevant community consultation processes outlined in the TMP. | Roads and Maritime and Construction Contractor | Construction | Additional standard safeguard TT4 |</p>
<table>
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<tr>
<th>No.</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-4</td>
<td>Property access - during construction</td>
<td>Access to properties will be maintained during construction. Where that is not feasible or necessary, temporary alternative access arrangements will be provided following consultation with affected landowners and the relevant local road authority.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Construction</td>
<td>Additional standard safeguard TT5</td>
</tr>
<tr>
<td>TT-5</td>
<td>Reduce speeds, traffic delays and disruptions during construction</td>
<td>Road users and local communities and freight industry will be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays owing to construction activities.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Construction</td>
<td>Additional standard safeguard TT5</td>
</tr>
<tr>
<td>TT-6</td>
<td>Impacts of the regional road network</td>
<td>Where possible, the most disruption work (such as work that requires lane closures) will be carried out at night to minimise potential impacts on the regional road network.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Construction</td>
<td>Additional safeguard</td>
</tr>
</tbody>
</table>
| TT-7 | Impact to oversize loads | • The ability to provide passage for oversize loads must be maintained during construction  
• The TMP will provide details on the strategy for informing oversized vehicles of the construction work and any temporary reduction in lane and/or shoulder widths or lane closures. | Construction contractor | Pre-construction | Additional safeguard |

### Aboriginal heritage

<p>| AH-1 | Aboriginal heritage | An Aboriginal Heritage Management Plan (AHMP) will be prepared in accordance with the G36 Environment Protection. It will provide specific safeguards and mitigation measures including the installation of limits to construction fencing and sensitive area exclusion zones prior to the start of construction. | Contractor | Detailed design / pre-construction | Core standard safeguard AH1 Section 4.9 of QA G36 Environment Protection |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
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</table>
| AH-2 | Aboriginal heritage – unexpected finds | • The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction  
• Work will only re-start once the requirements of that Procedure have been satisfied. | Contractor | Detailed design / pre-construction | Core standard safeguard AH2  
Section 4.9 of QA G36 Environment Protection |
| AH-3 | Minimise risks to Aboriginal cultural heritage during construction | All personnel working on site will receive training to ensure awareness of requirements of the Aboriginal Heritage Management Plan and relevant statutory responsibilities. Site-specific training will be given to personnel when working in the vicinity of identified Aboriginal heritage items. | Contractor | Detailed design / pre-construction | Additional standard safeguard AH3 |
| AH-4 | Additional Aboriginal heritage impacts | Any further impacts proposed beyond those assessed in this REF or beyond the proposal area must be subject to further assessment and consultation with Aboriginal stakeholders, consistent with the process in this report. | Roads and Maritime | Construction | Additional safeguard |
| A-5 | Impact to Ogilvies Hill 7, 8 and 9 | • A Stage 3 assessment in accordance with Roads and Maritime (2011) PACHCI will carried, including formal consultation with the Aboriginal community, the preparation of an updated ACHAR and AHIP based upon a surface collection of Aboriginal Objects  
• A surface collection of Aboriginal Objects will be carried out at Ogilvies Hill 7, 8 and 9 with a view to developing a Care and Control Agreement under the *Code of Practice for archaeological Investigation of Aboriginal Objects in New South Wales* (2010) in consultation with registered stakeholders  
• The surface collection of Aboriginal Objects will be carried out as per the methodology that was developed in consultation with RAP and outlined in the ACHAR, which is provided in *Appendix D*). | Roads and Maritime | Pre-construction | Additional safeguard |
<table>
<thead>
<tr>
<th>No.</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
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</thead>
<tbody>
<tr>
<td>A-6</td>
<td>Impacts to Ogilvies Hill 6</td>
<td>Ogilvies Hill 6 in the vicinity of proposal will be flagged or fenced prior to construction so as to provide an exclusion zone for the duration of the proposal.</td>
<td>Roads and Maritime</td>
<td>Detailed design / pre-construction</td>
<td>Additional safeguard</td>
</tr>
</tbody>
</table>
| B-1 | Biodiversity                                | A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime’s *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:  
  - Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features (eg hollow bearing trees) and revegetation areas  
  - Requirements set out in the *Landscape Guideline* (RTA, 2008)  
  - Pre-clearing survey requirements  
  - Procedures for unexpected threatened species finds and fauna handling  
  - Protocols to manage weeds and pathogens. | Contractor                      | Detailed design / pre-construction | Contractor standard safeguard B1  |
<p>| B-2 | Minimise risks to native flora and fauna during construction | A pre-construction check of native flora and fauna species and habitat will be conducted in accordance with the <em>Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects</em>. Biodiversity management measures identified during the pre-construction check will be incorporated into the CEMP Flora and Fauna Management Plan. | Contractor                      | Pre-construction and construction | Contractor standard safeguard B2 |
| B-3 | Biodiversity                                | Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.                 | Contractor                      | Detailed design / pre-construction | Contractor standard safeguard B3 |
| B-4 | Protect native flora and fauna, minimise edge effects and | All personnel working on site will receive training to ensure awareness of requirements of the Flora and Fauna Management Plan and relevant statutory responsibilities. Site-specific training will be given to personnel. | Contractor                      | Construction                     | Contractor standard safeguard B4 |</p>
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<th>Responsibility</th>
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<th>Standard / additional safeguard</th>
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<tbody>
<tr>
<td>B-5</td>
<td>avoid inadvertent impacts</td>
<td>when working in the vicinity of areas of identified biodiversity value that are to be protected.</td>
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<td></td>
<td>Unexpected threatened species</td>
<td>Consistent with the Biodiversity Guidelines - <em>Protecting and managing biodiversity on RTA projects</em>, and any specific requirements of the approved Flora and Fauna Management Plan, an unexpected finds procedure will be implemented in the event that a threatened species or ecological community that had not been identified and assessed by the REF is unexpectedly encountered during the construction process.</td>
<td>Contractor</td>
<td>Construction</td>
<td>Core standard safeguard B5</td>
</tr>
</tbody>
</table>
| B-6 | Protect native flora and fauna, minimise edge effects and avoid inadvertent impacts | Consistent with the approved Flora and Fauna Management Plan:  
  - The limits of clearing within the construction site will be delineated using appropriate signage and barriers, identified on site construction drawings and during construction staff induction  
  - Vegetation and habitat features to be retained, such as hollow-bearing trees, will be clearly identified and protected by suitable fencing, signage or markings. |
|     |                                             |                                                                                                                                                                                                                                                                                                                                                      | Contractor     | Construction | Additional standard safeguard B9 |
| B-7 | Stockpiles, plant and ancillary sites      | Vehicle parking, machinery, construction compounds, material stockpiles and the like, will be located in cleared or disturbed areas, not within the drip-zone of vegetation to be retained or within other protected or exclusion zones identified in the Flora and Fauna Management Plan.                                                                                                                   | Contractor     | Construction | Additional standard safeguard B10 |
| B-8 | Fauna handling                              | Consistent with the Biodiversity Guidelines - *Protecting and managing biodiversity on RTA projects*, and any specific requirements of the approved Flora and Fauna Management Plan, management arrangements will be implemented to ensure safe fauna handling. As a minimum that will include:  
  - Fauna handling being carried out by appropriately licenced ecologists or wildlife carers |
<p>|     |                                             |                                                                                                                                                                                                                                                                                                                                                      | Contractor     | Construction | Additional safeguard B11     |</p>
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</table>
| B-9 | Habitat management - minimising impacts | Consistent with the Biodiversity Guidelines - *Protecting and managing biodiversity on RTA projects*. As a minimum that will include:  
- No vegetation clearing or bushrock removal beyond limits identified in this REF  
- Avoiding identified exclusion zones and protected habitat features  
- Avoiding mixing of topsoil with woody debris materials  
- Separation of woody vegetation suitable for re-use during construction and rehabilitation or revegetation works  
- Implementation of staged clearing  
- Trimming and pruning to be carried out in accordance with relevant Australian Standards.  
In riparian zones: avoiding clearing during likely flood periods; ensuring cleared vegetation does not enter the waterway; retaining roots and stumps to maintain bank stability; applying the hierarchy for snag management set out in the Guidelines. | Contractor | Construction | Additional standard B12 |
| B-10 | Weed, Pest Species and Pathogen Management | Consistent with the Biodiversity Guidelines - *Protecting and managing biodiversity on RTA projects*. As a minimum that will include:  
- Implementation of appropriate weed control methods and weed disposal  
- Implementation of appropriate hygiene protocols where there are potential or known pathogen risks. | Contractor | Construction | Additional standard safeguard B13 |
<p>| B-11 | Removal of threatened habitat | Habitat removal will be carried out in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: | Contractor | Construction | Additional safeguard |</p>
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|     | species habitat and habitat features | Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority 2011)  
- Habitat that is found to be impacted by the proposed clearing works will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock and Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority 2011). |                |        |                                 |
|     | Noise and vibration | **NV-1**  
A Noise and Vibration Management sub-plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will identify:  
- All potential significant noise and vibration generating activities associated with the activity  
- Feasible and reasonable mitigation measures to be implemented, taking into account *Beyond the Pavement: urban design policy, process and principles* (Roads and Maritime, 2014).  
- A monitoring program to assess performance against relevant noise and vibration criteria  
- Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures  
- Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. | Contractor | Detailed design / pre-construction | Core standard safeguard NV1 |
|     | Noise and vibration | **NV-2**  
All sensitive receivers (eg local residents) likely to be affected will be notified at least five business days prior to start of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of:  
- The proposal  
- The construction period and construction hours | Contractor | Detailed design / pre-construction | Core standard safeguard NV2 |
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<td></td>
<td></td>
<td>• Contact information for project management staff</td>
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<td>• Complaint and incident reporting</td>
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<td>• How to obtain further information.</td>
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<td>NV-3</td>
<td>Site induction</td>
<td>All personnel working on site will receive training to ensure awareness of requirements of the NVMP. Site-specific training will be given to personnel when working in the vicinity of sensitive receivers.</td>
<td>Contractor</td>
<td>Pre-construction / construction</td>
<td>Additional standard safeguard</td>
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<tr>
<td>NV-4</td>
<td>Noise and vibration</td>
<td>Where possible, works outside of standard construction hours will be planned so that noisier works are carried out in the earlier part of the evening or night time.</td>
<td>Contractor</td>
<td>Pre-construction / construction</td>
<td>Additional safeguard</td>
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</table>
| NV-5| Out of hours works construction | • Where out-of-hours activities are required, high impact noise generating activities will be carried out prior to 11pm where possible  
• Where out-of-hours activities are required, respite periods (Respite Period 1 and Respite Period 2) in accordance with the CNVG would be implemented  
• Duration respite for out-of-hours (increase in number of nights per week but a reduced overall construction period) works will be considered in consultation with the affected sensitive receivers  
• During out of hours works, conduct monitoring to measure construction noise levels against NMLs and sleep disturbance criteria. Were required, implement additional control measures as detailed in the CNVG will be applied if noise levels noise levels require further mitigation. | Construction contractor | Construction | Additional safeguard |
<p>| NV-6| Vibration impacts to underground utilities | The use of high intensity vibratory compaction equipment near underground services will be limited. If vibration-intensive plant and equipment change from that which has been in the Noise and Vibration Assessment (Jacobs, 2018d), a review will be carried out prior to commencing work. | Construction contractor | Construction | Additional safeguard |</p>
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<td></td>
<td><strong>Water quality and hydrology</strong></td>
<td><strong>W-1</strong> Soil and water A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.</td>
<td>Contractor</td>
<td>Detailed design / pre-</td>
<td>Core standard safeguard SW1 Section 2.1 of QA G38 Soil and Water Management</td>
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<td></td>
<td><strong>W-2</strong> Soil and water • A site specific Erosion and Sediment Control Plan/s (ESCP) will be prepared and implemented as part of the Soil and Water Management Plan • The plan will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.</td>
<td>Contractor</td>
<td>Detailed design / Pre-</td>
<td>Core standard safeguard SW2 Section 2.2 of QA G38 Soil and Water Management</td>
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<td><strong>W-3</strong> Contaminants entering receiving environments during construction Control measures to minimise the risk of water pollution will be implemented including: • All fuels, chemicals, and liquids will be stored at least 50 metres away from the existing stormwater drainage system and stored in an impervious bunded area within the compound site • Plant and maintenance machinery will be refuelled in impervious bunded areas in the designated compound area</td>
<td>Construction contractor</td>
<td>Construction</td>
<td>Additional safeguard</td>
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| W-4 | Pollution as a result of sediment entering waterways during construction | * Vehicle washdowns and/or concrete truck washouts would be carried out within a designated bunded area of an impervious surface or carried out off-site.  
* Water management controls and an associated maintenance and inspection program will be developed during detailed design  
* Controls to improve the water quality from construction sites will include sediment basins as described in Section 3.4.2. During detailed design, the following will be confirmed:  
  - Location and size of sedimentation basins  
  - Installation of other water quality measures where required.  
* The sediment basin design, construction and management would be in general accordance with the:  
  - Roads and Maritimes General Specifications G36 and G38. | Design contractor and Roads and Maritime | Detailed design | Additional safeguard |
| WH-5 | Extraction of water                                                   | Non potable water sources (including the potential for water extraction from the Hunter River) would be investigated during detailed design to minimise reliance on potable water where feasible. Any water extraction would occur only after consultation with the NSW Office of Water, and acquisition of associated permits and approvals. | Roads and Maritime / Construction contractor | Construction | Additional safeguard |

**Soils and contamination**

<p>| S-1  | Contaminated land                                                      | If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed | Contractor | Detailed design / Pre-construction | Core standard safeguard C2 Section 4.2 of QA G36 |</p>
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<td></td>
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<td>and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.</td>
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<td>Environment Protection</td>
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<td>S-2</td>
<td>Accidental spill</td>
<td>A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime <em>Code of Practice for Water Management</em> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).</td>
<td>Contractor</td>
<td>Detailed design / Pre-construction</td>
<td>Core standard safeguard C3</td>
</tr>
<tr>
<td>S-3</td>
<td>Stockpile management</td>
<td>Stockpiles will be designed, established, operated and decommissioned in accordance with the Roads and Maritimes’ <em>Stockpile Site Management Guideline 2015</em>.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td>Additional standard safeguard SW9</td>
</tr>
</tbody>
</table>
| S-4 | Soil stabilisation and restoration | The rehabilitation of disturbed areas will be carried out progressively as construction stages are completed, and in accordance with:  
- Landcom’s Managing Urban Stormwater: Soils and Construction series  
- Roads and Maritime *Landscape Guideline* (RTA, 2008)  
| S-5 | Erosion and sedimentation | The SWMP will be implemented throughout the construction period. It will include the following safeguards:  
- Designated exclusion zones will be identified for the storage and use of construction plant and equipment. These zones will delineate traffic areas and restrict entry and exit points to construction sites | Construction contractor | Construction    | Additional safeguard          |
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<td>· Areas of risk near the proposal, such as steep areas or highly erodible soils, will be identified and appropriate management controls implemented</td>
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<td>· Temporary or permanent diversion drains will be used to divert off-site run-off around or through the construction site to minimise the volume of flow that mixes with on-site run-off</td>
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<td>· Physical controls will be developed in line with the ESCP, including sediment basins, sediment fences, sediment filters, rock check dams, level spreaders, and onsite diversion drains installed before construction and maintained during construction</td>
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<td>· Exposed batters will be lined, if required</td>
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<td>· A schedule for the ongoing maintenance and inspection of temporary erosion and sediment controls will be developed.</td>
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<td>S-6</td>
<td>Pollution from run-off</td>
<td>Ancillary facilities will be managed within the ESCP. The following measures will be included to limit sediment and other contaminations entering receiving waterways:</td>
<td>Construction contractor</td>
<td>Construction</td>
<td>Additional safeguard</td>
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<td>· Chemicals will be stored within a sealed or bunded area</td>
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<td>· Appropriate controls will be in place where plant is stored</td>
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<td>· Run-off from ancillary sites will be controlled and treated before discharging into downstream waterways</td>
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<td>· Vehicle movements will be restricted to designated pathways where feasible</td>
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<td>· Areas that will be exposed for extended periods, such as car parks and main access roads, will be stabilised where feasible.</td>
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<tr>
<td>LC-1</td>
<td>Landscape character and visual impact</td>
<td>A Landscape Plan and specification will be prepared as part of the detailed design stage and implemented as part of the CEMP. The plan and specification will include design treatments for:</td>
<td>Roads and Maritime and Contractor</td>
<td>Detailed design / pre-construction</td>
<td>Additional safeguard</td>
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<td>• Location and identification of existing vegetation and proposed landscaped areas, including species to be used</td>
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<td>• Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage</td>
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<td>• Procedures for monitoring and maintaining landscaped or rehabilitated areas.</td>
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<td>The Landscape Plan and specification will be prepared in accordance with relevant guidelines, including:</td>
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<td>• Landscape Guideline (RTA, 2008)</td>
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<td>• Shotcrete Design Guideline (RTA, 2005).</td>
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<td>LC-2</td>
<td>Visual impact of work sites</td>
<td>Project work sites, including construction areas and supporting facilities (such as storage compounds and offices) will be managed to minimise visual impacts, including avoiding temporary light spill if required, rehabilitation of disturbed areas, appropriate storage of equipment, parking, stockpile screening and arrangements for the storage and removal of rubbish and waste materials.</td>
<td>Contractor</td>
<td>Construction</td>
<td>Core standard safeguard UD2</td>
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<tr>
<td>LC-3</td>
<td>Visual impact of work sites</td>
<td>Compound and ancillary facilities will be decommissioned and the sites rehabilitated to their existing condition or as otherwise agreed with the landowner on completion of works.</td>
<td>Contractor</td>
<td>Construction</td>
<td>Additional safeguard</td>
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<tr>
<td>LC-4</td>
<td>Treatment of cuttings and embankments</td>
<td>• Roadside cuttings will retain the natural rock surface where feasible</td>
<td>Roads and Maritime and Contractor</td>
<td>Detailed design / pre-construction</td>
<td>Additional safeguard</td>
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|     |                                            | • Where the cutting is dominated by earth, the cutting will be stabilised with low native vegetation  
     |                                            | • Shotcrete will be avoided.                                                              |                               |                                  |
|     |                                            |                                                                                         |                               |                                       |                                 |
| LC-5| Retaining opportunities for clear views    | The removal of vegetation on the eastern downhill section, on the northern side of the highway will be an opportunity to open-up existing regional views to a far wider panoramic area and as such this area will be kept clear of large trees and be stabilised with low vegetation. | Roads and Maritime and Contractor | Detailed design / construction | Additional safeguard |
|     |                                            |                                                                                         |                               |                                       |                                 |
| SE-1| Socio-economic                             | A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):  
     |                                            | • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions  
     |                                            | • Contact name and number for complaints  
     |                                            | • Mechanisms to share issues raised by stakeholders with other Golden Highway Upgrade projects  
     |                                            | • The CP will be prepared in accordance with the *Community Involvement and Communications Resource Manual* (RTA, 2008)  
<pre><code> |                                            | • Coordination with other Golden Highway Upgrade projects’ CP will be carried out to ensure consistency in the information provided to the community during construction. | Contractor | Detailed design / pre-construction | Core standard safeguard SE1 |
</code></pre>
<p>| SE-2| Property acquisition                       | All property acquisition will be carried out in accordance with the <em>Land Acquisition Information Guide</em> (Roads and Maritime, 2012) and the <em>Land Acquisition (Just Terms Compensation) Act 1991</em>. | Roads and Maritime project manager | Pre construction / detailed design   | Core standard safeguard PL1  |</p>
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<tr>
<td>SE-3</td>
<td>Emergency vehicle access</td>
<td>Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Pre construction / detailed design</td>
<td>Additional safeguard SE2</td>
</tr>
<tr>
<td>SE-4</td>
<td>Consultation - property owners</td>
<td>Consultation will be carried out with all affected property owners during detailed design and construction to develop and implement measures to mitigate impacts on their property.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Pre construction / detailed design</td>
<td>Additional safeguard SE5</td>
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<tr>
<td>SE-5</td>
<td>Consultation – business and industry</td>
<td>Consultation will be carried out with business, industry, freight transport providers and managers of tourism related businesses about the timing and duration of construction activities.</td>
<td>Roads and Maritime and Construction Contractor</td>
<td>Pre construction / detailed design</td>
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<tr>
<td>SE-6</td>
<td>Complaints</td>
<td>A complaints handling procedure and register will be included in the CEMP.</td>
<td>Construction Contractor</td>
<td>Construction</td>
<td>Additional safeguard SE8</td>
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**Waste**

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<tr>
<th>W-1</th>
<th>Waste</th>
<th>A Waste Management Plan will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</th>
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<td>- Measures to avoid and minimise waste associated with the project</td>
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<td>- Classification of wastes generated by the project and management options (re-use, recycle, stockpile, disposal)</td>
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<td>- Classification of wastes received from off-site for use in the project and management options</td>
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<td>- Identifying any statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions</td>
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<td>- Procedures for storage, transport and disposal</td>
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<td>Contractor</td>
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<td>Pre construction / detailed design</td>
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<td>Core standard safeguard W1</td>
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<td>Section 4.2 of QA G36 Environment Protection</td>
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<td>W-2</td>
<td>Existing condition of ancillary sites</td>
<td>Prior to land being used for ancillary construction purposes (compounds, storage, parking, etc) a pre-construction land assessment will be carried out to identify the presence of any pre-existing wastes. The assessment will be prepared in accordance with the Roads and Maritime Environmental Procedure - Management of Wastes on Roads and Maritime Services Land and relevant Roads and Maritime Waste Fact Sheets, as well as the adopting the Resources Management Hierarchy principles of the WARR Act.</td>
</tr>
<tr>
<td>W-3</td>
<td>Excavated material</td>
<td>Opportunity to reuse material between Golden Highway upgrades will be considered to minimise waste to landfill. This is should be viable where the is excessive cut material at Winery Hill and a deficit of cut to fill material for the proposal.</td>
</tr>
<tr>
<td>W-4</td>
<td>Final condition of ancillary sites</td>
<td>A post-construction land assessment will be carried out of land that was used for ancillary construction purposes (compounds, storage, parking, etc) to determine the suitability for hand-back to the landowner.</td>
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</table>

**Other impacts**

<p>| NAH-1 | Non-Aboriginal Heritage | The Standard Management Procedure - Unexpected Heritage Items (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered | Contractor | Detailed design / pre-construction | Core standard safeguard H2 Section 4.10 of QA G36 |</p>
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| AQ-1| Air quality                        | • Work will only re-start once the requirements of that Procedure have been satisfied.  
• An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to:  
  • Potential sources of air pollution  
  • Air quality management objectives consistent with any relevant Published EPA and/or OEH guidelines  
  • Mitigation and suppression measures to be implemented  
  • Methods to manage work during strong winds or other adverse weather conditions  
  • A progressive rehabilitation strategy for disturbed areas. | Contractor | Detailed design / pre-construction | Core standard safeguard AQ1  
Section 4.4 of QA G36 Environment Protection |
| U-1 | Utilities                          | Prior to the start of works:  
• The location of existing utilities and relocation details will be confirmed following consultation with the affected utility owners  
• If the scope or location of proposed utility relocation works falls outside of the assessed proposal scope and footprint, further assessment will be carried out. | Contractor | Detailed design / pre-construction | Core standard safeguard U1 |
| Haz-1| Hazards and risk management        | A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to:  
  • Details of hazards and risks associated with the activity  
  • Measures to be implemented during construction to minimise these risks  
  • Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials | Contractor | Detailed design / pre-construction | Core standard safeguard HAZ1 |
<table>
<thead>
<tr>
<th>No.</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
<th>Standard / additional safeguard</th>
</tr>
</thead>
</table>
|     |                                            | • A monitoring program to assess performance in managing the identified risks  
• Contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations.  
The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or OEH publications. |                |        |                                 |
| C-1 | Cumulative impacts from construction of multiple projects | The CEMP will be updated as required to address cumulative impacts as other projects/activities begin. This will include a process to review and update mitigation measures as new work begins or if complaints are received. | Contractor      | Pre-construction /Construction | Additional safeguard |
| C-2 | Cumulative traffic and access impacts       | The TMP will be prepared in consultation with the Transport Management Centre and Muswellbrook Shire Council.                                                                                                          | Contractor      | Pre-construction               | Additional safeguard |
| C-3 | Cumulative construction impacts             | To minimise potential impacts during construction, construction of the proposal would be staged to enable work to be completed safely while maintaining traffic flows at all times. Construction would involve building one lane at a time, and moving traffic between the lanes to keep the traffic flows for the duration of work. This approach will ensure that negative cumulative impacts on both the function of the Golden Highway and the surrounding environment will be minimised where possible. | Roads and Maritime | Detailed design, pre-construction | Additional safeguard |
### 7.3 Licensing and approvals

Licences and approvals required for the proposal are listed in Table 7-2.

**Table 7-2: Summary of licensing and approvals required**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Requirement</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection of the Environment Operations Act 1997</strong></td>
<td>Environment protection licence (EPL) required for scheduled activities (road construction / extractive activities / crushing, grinding or separating waste processing or storage) &gt;30,000t/pa from the EPA.</td>
<td>Prior to start of the activity.</td>
</tr>
<tr>
<td><strong>Roads Act 1993</strong></td>
<td>Road Occupancy Permit would need to be obtained as necessary prior to construction commencing.</td>
<td>Prior to start of the activity.</td>
</tr>
<tr>
<td><strong>Permission to enter from private landowners and residents</strong></td>
<td>Permission to enter from private landowners and residents must be obtained to access proposal work sites. This would likely be obtained through temporary lease arrangements or land acquisition.</td>
<td>Before accessing any private property.</td>
</tr>
<tr>
<td><strong>Water Act or Water Management Act</strong></td>
<td>Licence/permit to extract water from waterway.</td>
<td>Prior to start of activity.</td>
</tr>
</tbody>
</table>
8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

8.1 Justification

The Golden Highway is one of only three east-west B-Double routes north of Sydney over the Great Dividing Range and is an important freight distribution route linking the Port of Newcastle to the Upper Hunter, Dubbo, central western and far western NSW.

This section of the Golden Highway at Ogilvies Hill is currently a single lane highway with narrow shoulders, non-compliant clear zones and limited overtaking opportunities. This results in heavy and oversize vehicles travelling slowly which impacts on average travel speeds and decreases productivity of the highway. Within this context, the proposal is required to improve road safety and traffic and freight efficiency for oversize vehicles using the highway.

The proposal would:

- Provide safe and efficient travel by providing climbing lanes in each direction as well as wide paved shoulders
- Preserve and improve the condition of structures, cuttings and embankments
- Improve travel efficiency by providing a route with improved overtaking opportunities
- Reduce fuel consumption and vehicle operating costs by providing consistent road conditions
- Cater for higher productivity vehicles including up to PBS Class 2B of up to 30 metre in length
- Maintain and improve the ability to cater for over dimension and over mass loads.

This is consistent with the NSW and Australian governments’ strategic priorities of improving the road’s safety performance and efficiency needs.

While there would be some environmental impacts as a consequence of the proposal such as temporary traffic delays, amenity impacts, vegetation clearing and property acquisitions, they have been avoided or minimised wherever possible through design and site-specific safeguards. The beneficial effects of improving safety and travel efficiency are considered to outweigh the mostly temporary adverse impacts and risks associated with the proposal.

8.1.1 Social factors

As documented in Section 6.9, the proposal would have some minor short-term negative social impacts as a result of the disturbance and change that would occur during construction. The combined effect of construction noise, dust, local access changes, and general disturbance caused by construction activity, construction traffic and machinery movements would result in a general loss of amenity for residents, motorists, workers and others who live near the proposal area and those who visit the proposal area on a regular basis during the construction period.

However, the long-term effect would be an overall social benefit, through improved safety and efficiency of the Golden Highway at Ogilvies Hill.
8.1.2 Biophysical factors

The proposal involves widening the existing Golden Highway at Ogilvies Hill along its existing alignment. The proposal would therefore minimise the amount of land required for its development and the consequential impact on adjoining land uses and ecosystems. The proposal would generally follow the existing topography and existing alignment and would thereby minimise the need for major earthworks.

Some clearing of native vegetation would be required to construct the proposal. However, as discussed in Section 6.3, the overall area of vegetation clearing would be relatively minor, and would be offset by Roads and Maritime through a separate strategic program of biodiversity offsets that would address vegetation clearing across a number of Roads and Maritime proposals in the Hunter region.

As part of the design criteria presented in Section 3.2, the proposal has been designed to accommodate stormwater volumes during a 100 year storm event, and the proposed design would incorporate measures to protect in-stream water quality and prevent scour and erosion so as to protect aquatic ecosystems.

8.1.3 Economic factors

The proposal would be constructed largely within the existing road corridor, with minimal land acquisition required. The upgrade of an existing road corridor would minimise long-term disruption and economic impacts on residents, businesses and motorists.

The proposal would deliver long-term economic benefits on its own and as part of the broader Golden Highway Corridor Strategy. It would improve traffic conditions and reduce travel times for the Golden Highway road users.

8.1.4 Public interest

The public interest is best served through the equitable distribution of resources, and investment in public infrastructure that fulfils the needs of the majority. The proposal represents a cost-efficient investment in public infrastructure that would maximise the long-term social and economic benefits, while minimising the long-term negative impacts on communities and the environment. By improving local and regional transport facilities, the proposal would better enable the movement of people, goods and services.

Although the proposal, during the construction phase, would result in some short-term impacts on amenity, accessibility and transport efficiency, these impacts would be outweighed by the long-term benefits once the proposal is operational.

As a result, the proposal is considered to be in the public interest.
### 8.2 Objects of the EP&A Act

<table>
<thead>
<tr>
<th>Object</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State’s natural and other resources.</td>
<td>The proposal would also improve the social and economic welfare of the community by improving the road safety on this section of the Golden Highway. The proposal design, impact, safeguards and management measures detailed in this REF allow for the proper management, development and conservation of natural and artificial resources.</td>
</tr>
<tr>
<td>1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.</td>
<td>Ecologically sustainable development is considered in Sections 8.2.1 to 8.2.4 below.</td>
</tr>
<tr>
<td>1.3(c) To promote the orderly and economic use and development of land.</td>
<td>The proposal would not impact on the economic use of land. However, the proposal would improve the economic use of the road by improving freight efficiency for the local mines and freight industry.</td>
</tr>
<tr>
<td>1.3(d) To promote the delivery and maintenance of affordable housing.</td>
<td>Not relevant to the project.</td>
</tr>
<tr>
<td>1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.</td>
<td>Impacts to native animals and plants, including threatened species, populations and ecological communities and their habitats were considered in Section 6.3. The majority of the proposal footprint is within road reserve and within areas that are already cleared, consequently vegetation clearing is minimised. However, the proposal would still remove about 5.67 hectares of vegetation of which up to 4.96 hectares is comprised of two overlapping EECs including about:</td>
</tr>
<tr>
<td></td>
<td>• 4.08 hectares of Hunter Valley Footslopes Slaty Gum Woodland listed as endangered under the TSC Act</td>
</tr>
<tr>
<td></td>
<td>• 5.53 hectares of Central Hunter Valley eucalypt forest and woodland listed critically endangered under the EPBC Act (refer to Section 6.3).</td>
</tr>
<tr>
<td></td>
<td>Assessments of significance carried out as part of the Biodiversity Impact Assessment (Jacobs, 2018c) (refer to Section 6.3, found that the proposal is unlikely to have a significant impact to any threatened species, population or ecological communities. Safeguards and management measures would be implemented to manage impacts to biodiversity and cleared areas would be appropriately revegetated at the completion of works.</td>
</tr>
<tr>
<td></td>
<td>The 4.08 hectares of remnant vegetation meeting the description of the vulnerable TSC Act Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion would be removed by the proposal. This does not trigger the need for offsets as it is not listed as a critically endangered ecological communities (CEEC). However, this woodland vegetation also applies to the EPBC Act listed endangered Central Hunter Valley eucalypt forest and</td>
</tr>
<tr>
<td>Object</td>
<td>Comment</td>
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<tr>
<td>1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).</td>
<td>The proposal has been designed to avoid as many as possible known Aboriginal archaeological sites located near the Golden Highway at Ogilvies Hill. Refer to Section 6.2. Not relevant to the proposal.</td>
</tr>
<tr>
<td>1.3(g) To promote good design and amenity of the built environment.</td>
<td>Not relevant to the proposal.</td>
</tr>
<tr>
<td>1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.</td>
<td>Not relevant to the proposal.</td>
</tr>
<tr>
<td>1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.</td>
<td>Not relevant to the proposal.</td>
</tr>
<tr>
<td>1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.</td>
<td>The proposal development process has involved consultation with relevant stakeholders. Consultation carried out and proposed is outlined in Chapter 5.</td>
</tr>
</tbody>
</table>

### 8.2.1 The precautionary principle

This principle states: “if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation”.

The evaluation and assessment of alternative options within the proposal have also aimed to reduce the risk of serious and irreversible impact on the environment as a result of the proposal.

The proposal has sought to take a precautionary approach to minimising environmental impact. This has been applied through the development of a range of environmental safeguards, as summarised in Chapter 7. These safeguards would be implemented during construction and operation of the proposal.

No safeguards have been postponed as a result of lack of scientific certainty. The selected construction contractor would be required to prepare a CEMP before commencing construction. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

### 8.2.2 Intergenerational equity

The principle states: “the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations”.

The proposal would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations.

The proposal – together with other planned road upgrades under the Golden Highway Corridor Strategy would cater for traffic growth in the region. The proposal would benefit future generations by addressing the future increases in traffic volumes and traffic congestion associated with movement of traffic, including road freight between the Port of Newcastle to the Upper Hunter, Dubbo, central western and far western NSW.
While the proposal would have some adverse impacts, they are not considered to be of a nature or extent that would result in disadvantage to any specific section of the community or to future generations.

Should the proposal not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a freight highway with heavy and oversize vehicles travelling slowly with impacts on average travel speeds and decreases productivity of the route.

8.2.3 Conservation of biological diversity and ecological integrity

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

The proposal is located in an area that has previously been modified as a result of the construction of the existing Golden Highway and nearby agricultural activities. However, remnant areas of native vegetation and associated habitats remain next to the existing highway.

A key objective of the project is to minimise adverse impacts on the environmental values of the area. Conservation of biological diversity and ecological integrity has been considered during all stages of the proposal’s development. Potential impacts have been avoided where possible and safeguards and management measures have been included where necessary.

The biodiversity assessment (refer to Section 6.3 and the Biodiversity Impact Assessment Technical Paper in Appendix E) concluded that the proposal would not have a significant impact on any existing flora or fauna species, biodiversity communities or the overall biological integrity of the proposal and nearby areas. The findings of the biodiversity assessment indicate that the potential impacts would be acceptable and minimised through the proposed safeguards (refer to Chapter 7).

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle is defined as:

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

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Environmental and social issues were considered in the strategic planning and establishment of the need for the proposal, and in consideration of various proposal options. The value placed on environmental resources is evident in the extent of the planning and environmental investigations, and in the design of the proposed mitigation measures and safeguards.

Implementation of these mitigation measures and safeguards would result in an economic cost to Roads and Maritime, which would be included in both the capital and operating cost of the proposal.
8.3 Conclusion

The proposed Golden Highway upgrade at Ogilvies Hill is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the TSC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts on traffic, amenity, biodiversity and property. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve safety and travel efficiency for road users. On balance the proposal is considered justified and the following conclusions are made.

**Significance of impact under NSW legislation**

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

**Significance of impact under Australian legislation**

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

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

Tina Donovan
Senior Environmental Scientist
Jacobs
Date: 16/07/2018
I have examined this review of environmental factors and accept it on behalf of Roads and Maritime.

Ryan De Carteret
Roads and Maritime
Project Manager
Date: 31/07/2018
10. References


Department of Environment, Climate Change and Water 2010a, Aboriginal Cultural Heritage Consultation Requirements for Proponents, Sydney.


DECCW. (2010b). Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales. Sydney: Department of Environment, Climate Change and Water NSW.


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Jacobs 2018b, Golden Highway - Aboriginal Cultural Heritage Assessment Report (Stage 3 PACHCI) (CHAR), prepared on behalf of NSW Roads and Maritime, Sydney.

Jacobs 2018c, Golden Highway - Ogilvies Hill Biodiversity Assessment, prepared on behalf of NSW Roads and Maritime, Sydney.

Jacobs 2018e, HW27 - Golden Highway Upgrades Diversion Construction noise review prepared on behalf of NSW Roads and Maritime, Sydney.

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Roads and Maritime 2010, Aboriginal cultural heritage consultation requirements for proponents.

Roads and Maritime 2011, Procedure for Aboriginal Cultural Heritage Consultation and Investigation, Sydney.


Roads and Maritime Services 2011b, Roads and Maritime Guideline for Biodiversity Offsets.


Roads and Traffic Authority NSW 2009a, Beyond the Pavement – Roads and Traffic Authority of NSW urban design policy, procedure and design principles, Sydney.


Transport for NSW 2012, NSW Long Term Transport Master Plan, Sydney.

## Terms and acronyms used in this REF

<table>
<thead>
<tr>
<th>Term / Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADT</td>
<td>Average Daily Traffic</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian Height Datum</td>
</tr>
<tr>
<td>AHIMS</td>
<td>Aboriginal Heritage Information Management System</td>
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<tr>
<td>AHIP</td>
<td>Aboriginal Heritage Impact Permit</td>
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<tr>
<td>AHMP</td>
<td>Aboriginal Heritage Management Plan</td>
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<tr>
<td>AQMP</td>
<td>Air Quality Management Plan</td>
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<tr>
<td>ARI</td>
<td>Annual Reoccurrence Interval</td>
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<tr>
<td>BAR</td>
<td>Biodiversity Assessment Report</td>
</tr>
<tr>
<td>BBAM</td>
<td>BioBanking Assessment Methodology</td>
</tr>
<tr>
<td>BC Act</td>
<td><em>Biodiversity Conservation Act 2016</em></td>
</tr>
<tr>
<td>CEMP</td>
<td>Construction environmental management plan</td>
</tr>
<tr>
<td>CEP</td>
<td>Communications Engagement Plan</td>
</tr>
<tr>
<td>DCA</td>
<td>Detailed Cultural Assessment</td>
</tr>
<tr>
<td>DPI</td>
<td>Department of Primary Industries</td>
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<tr>
<td>EBPC</td>
<td>Environment Protection and Biodiversity Conservation</td>
</tr>
<tr>
<td>EEC</td>
<td>Endangered Ecological Community</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental impact assessment</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>EPL</td>
<td>Environmental Protection License</td>
</tr>
<tr>
<td>EP&amp;A Act</td>
<td><em>Environmental Planning and Assessment Act 1979</em> (NSW). Provides the legislative framework for land use planning and development assessment in NSW</td>
</tr>
<tr>
<td>ESD</td>
<td>Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased</td>
</tr>
<tr>
<td>FM Act</td>
<td><em>Fisheries Management Act 1994</em> (NSW)</td>
</tr>
<tr>
<td>HML</td>
<td>Higher Mass Limit</td>
</tr>
<tr>
<td>HRMP</td>
<td>Hazard and Risk Management Plan</td>
</tr>
<tr>
<td>HSSVP</td>
<td>Heavy Vehicle Safety and Productivity Program</td>
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<tr>
<td>Term / Acronym</td>
<td>Description</td>
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<tr>
<td>HYS</td>
<td>Have your say</td>
</tr>
<tr>
<td>ICNG</td>
<td>Interim Construction Noise Guidelines</td>
</tr>
<tr>
<td>ISEPP</td>
<td>State Environmental Planning Policy (Infrastructure) 2007</td>
</tr>
<tr>
<td>LALC</td>
<td>Local Aboriginal Land Council</td>
</tr>
<tr>
<td>LCU</td>
<td>Landscape character units</td>
</tr>
<tr>
<td>LGA</td>
<td>Local government area</td>
</tr>
<tr>
<td>LTTMP</td>
<td>Long Term Transport Master Plan</td>
</tr>
<tr>
<td>NPW</td>
<td>National Parks and Wildlife</td>
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<tr>
<td>NES</td>
<td>Matters of national environmental significance under the Commonwealth <em>Environment Protection and Biodiversity Conservation Act 1999</em>.</td>
</tr>
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<td>NVMP</td>
<td>Noise and Vibration Management Plan</td>
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<td>Noxious Weeds Act</td>
<td><em>Noxious Weeds Act 1993 (NSW)</em></td>
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<td><em>National Parks and Wildlife Act 1974 (NSW)</em></td>
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<td>OEH</td>
<td>Office of Environment and Heritage</td>
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<td>PACHCI</td>
<td>Procedure for Aboriginal Heritage Consultation and Investigation</td>
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<td>PAD</td>
<td>Potential archaeological deposits</td>
</tr>
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<td>PBS</td>
<td>Performance Based Standards</td>
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<tr>
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<td>PEMP</td>
<td>Project Environmental Management Plan</td>
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<td>Protection of the Environment Operations</td>
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<td>REF</td>
<td>Review of Environmental Factors</td>
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<td>RFPSP</td>
<td>Regional Freight, Pinch Point and Safety Program</td>
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<td>RMS</td>
<td>Roads and Maritime Services</td>
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<td>ROL</td>
<td>Road Occupancy License</td>
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<td>QA Specifications</td>
<td>Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Roads and Maritime Services.</td>
</tr>
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<td>Roads and Maritime</td>
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</tr>
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<td>Description</td>
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<tr>
<td>SMZ</td>
<td>Select material zone</td>
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<tr>
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<td>Soil and Water Management Plan</td>
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<td>TEC</td>
<td>Threatened Ecological Communities</td>
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<td>TMP</td>
<td>Traffic Management Plan</td>
</tr>
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<td>TSC Act</td>
<td><em>Threatened Species Conservation Act 1995 (NSW)</em></td>
</tr>
<tr>
<td>VIS</td>
<td>vegetation information system</td>
</tr>
<tr>
<td>VMRM</td>
<td>Value Management and Risk Management</td>
</tr>
<tr>
<td>VMS</td>
<td>Variable Message Signs</td>
</tr>
<tr>
<td>WARR</td>
<td>Waste Avoidance and Resource Recovery</td>
</tr>
<tr>
<td>WMP</td>
<td>Waste Management Plan</td>
</tr>
</tbody>
</table>