2. Need and options considered

This section 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 NSW State Infrastructure Strategy 2018-2038

The State Infrastructure Strategy 2018-2038 (the State Infrastructure Strategy) (Infrastructure NSW, 2018) sets the strategic vision for infrastructure across NSW over 20 years and combined with the Future Transport Strategy 2056 and the Regional Development Framework (NSW Government, 2018), brings together infrastructure investment and land-use planning for cities and regions within NSW.

The State Infrastructure Strategy outlines Infrastructure NSW's recommendations for priority transport infrastructure projects and initiatives for NSW to 2038, to ensure the transport system creates opportunities for people and businesses to access the services and support they need.

The State Infrastructure Strategy aligns with the benefits of the proposal, such as improving travel times and improving road safety within the proposal area. The Great Western Highway is identified as the main road freight corridor connecting Western NSW with Sydney and its ports. The Strategy identifies that the Great Western Highway suffers from constraints that limit freight movement, particularly for longer vehicles. The proposal is consistent with the Strategy as it would provide improved facilities for the movement of freight between Western NSW and Sydney.

The proposal would support key recommendations made for the transport sector as it would increase freight capacity and efficiency of the road network (Recommendations 41 and 42) to support the mass transit system while enhancing accessibility and improving road safety in the area (Recommendations 50 and 51).

2.1.2 Future Transport 2056

The NSW Future Transport Strategy 2056 (Transport for NSW, 2018) outlines a clear framework to address transport challenges in NSW over the next 40 years and is an update of the NSW Long Term Transport Master Plan released in 2012. It integrates planning for roads, freight and all other modes of transport and sets out initiatives, solutions and actions to meet NSW transport challenges.

Future Transport 2056 outlines six state-wide outcomes to guide investment, policy and reform and service provision. They provide a framework for planning and investment aimed at harnessing rapid change and innovation to support a modern, innovative transport network. The proposal directly aligns with the following state-wide outcomes:

- A strong economy – The transport system powers NSW's future $1.3 trillion economy and enables economic activity across the state. The proposal supports this outcome enabling growth in economic activity, including the movement of freight
- Safety and performance – Every customer enjoys safe travel across a high performing, efficient network. The proposal supports this outcome through the separation of carriageways and the implementation of contemporary design standards
- Sustainability – Making the best use of available resources and assets.

The proposal would also provide an opportunity to directly support the following regional transport customer outcomes:

- Customer Outcome 3 – The appropriate movement and place balance is established enabling people and goods to move efficiently through the network whilst ensuring local access and vibrant places – The movement and place framework is discussed further in Section 2.1.3.
- Customer Outcome 4 – Supporting centres with appropriate transport services and infrastructure – The proposal would support the access between Sydney and the Central West of NSW, including the various towns and urban centres along the alignment
- Customer Outcome 7 – A safe transport system for every customer with the aim for zero deaths or serious injuries on the network by 2056 – The proposal would improve safety via the separation of carriageways and the implementation of contemporary design standards.

2.1.3 Movement and place framework

Future Transport Strategy 2056 introduces the movement and place framework which aims to allocate road space in a way that improves the liveability of places.

The framework identifies the need to prioritise different customer groups, depending which street environment they are travelling. These environments are described in Figure 2-1.

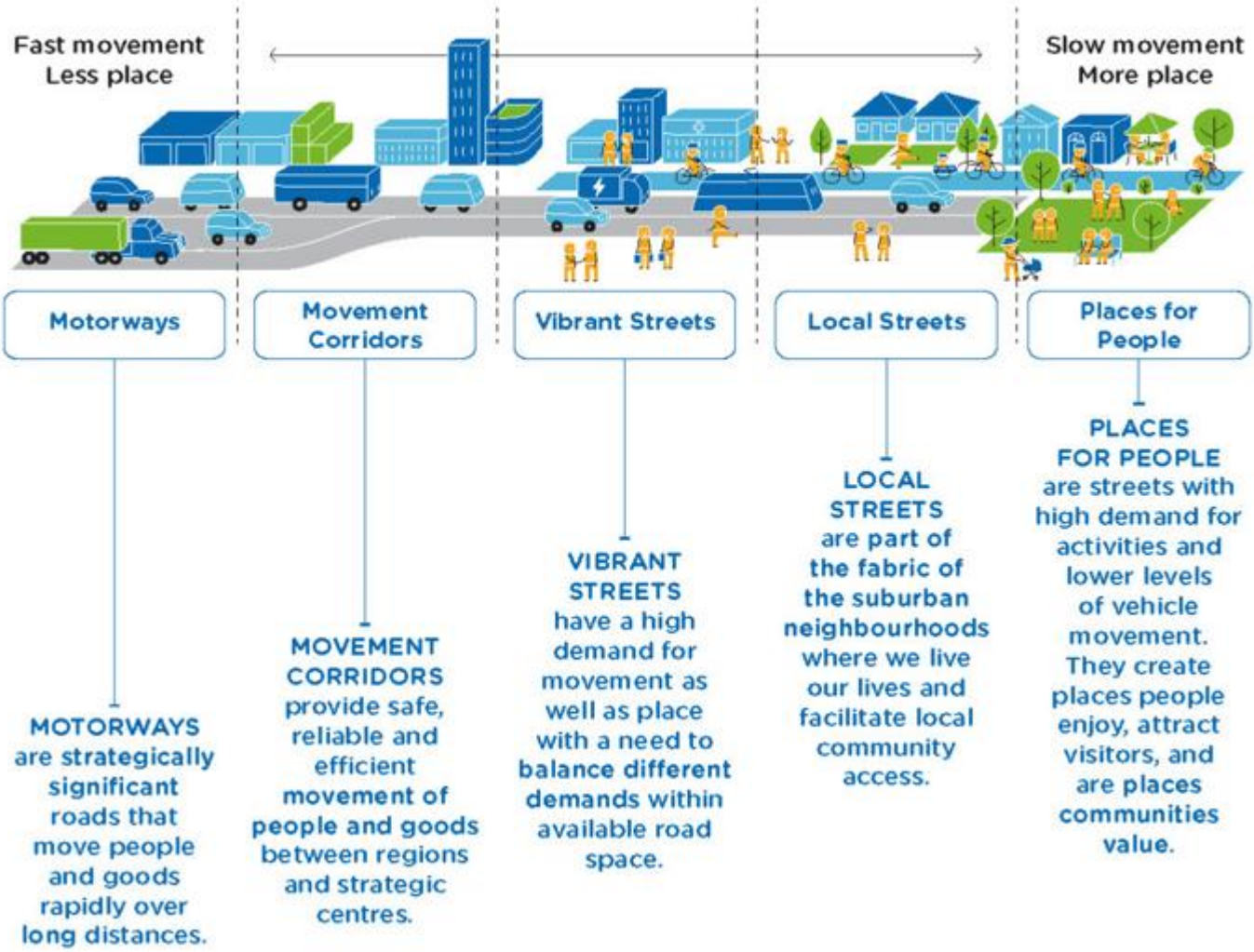

Figure 2-1 Movement and place framework

The proposal would provide an opportunity, through options selection and the design development process, to balance the movement function of the Great Western Highway with the place functions of the various towns and urban centres along the alignment.

2.1.4 Regional NSW Services and Infrastructure

The Regional NSW Services and Infrastructure Plan (Transport for NSW, 2018) supports Future Transport Strategy 2056 and is the NSW Government's blueprint for transport in regional NSW from now until 2056. The plan outlines the vision and customer outcomes that the government will use to go about its detailed transport planning in each region and also support its future decision making.

The Regional NSW Services and Infrastructure Plan aims to produce a modern multi-modal freight transport network and identify the need to lift freight productivity above previous results as a key objective. The identified vision for regional NSW is a safe, efficient and reliable network of transport services and infrastructure that recognises and reinforces the vital role of regional cities as hubs for services, employment and social interaction for their surrounding communities.

The regional customer outcomes outlined in the Regional NSW Services and Infrastructure Plan are the same as those identified in NSW Future Transport Strategy 2056, and as noted in Section 2.1.2 above, the proposal directly supports several of these customer outcomes.

The plan includes the following initiatives that are directly relevant to the proposal:

- 0 to 10 years for investigation – Great Dividing Range long term solution study
- 0 to 10 years for investigation – Great Dividing Range long term solution corridor preservation
- 20 years plus initiative – Delivery of Great Dividing Range long term solution – Delivery of solution to improve freight connectivity across the Great Dividing Range in order to connect inland areas to Sydney/Wollongong/Newcastle.

2.1.5 Road Safety Plan 2021

The Road Safety Plan 2021 (Transport for NSW, 2018) details the NSW Government's commitment to improving safety on NSW roads. It outlines how the NSW Government will work towards the State Priority Target of reducing fatalities by 30 per cent by 2021 (compared to average annual fatalities over 2008–2010). It also aligns the Towards Zero vision with Future Transport 2056, which aims to have a NSW transport network with zero trauma by 2056.

The proposal is consistent with the directions set out in Road Safety Plan 2021 because it would improve safety through the separation of carriageways and the implementation of contemporary design standards. The traffic analysis indicates that the proposal is predicted to reduce the total crash rate on the Great Western Highway by 57 per cent compared to the base case/'Do nothing' option.

2.1.6 Tourism and Transport Plan

The total number of visitors to regional NSW grew by 23 per cent from December 2010 to December 2017 or three per cent each year in compound annual growth terms. The Tourism and Transport Plan (Transport for NSW, 2018) (a companion document to Future Transport Strategy 2056) recognises the connection between transport and tourism and identifies the potential to support and enhance existing tourism as well as create new economic development opportunities.

The plan includes the following four customer outcomes:

- Customer Outcome 1: Enhancing the Visitor Experience

- Customer Outcome 2: Greater access to more of NSW
- Customer Outcome 3: Making transport the attraction
- Customer Outcome 4: A seamless experience.

By improving transport infrastructure on the main route to the Central West, the proposal aligns with Customer Outcome 2. There may also be opportunities to contribute to Customer Outcomes 1 and 3 as the proposal development process moves forward.

2.1.7 Central West and Orana Regional Plan 2036

The Central West and Orana Regional Plan 2036 (Department of Planning and Environment, 2017) provides an overarching framework to guide subsequent and more detailed land use plans, development proposals and infrastructure funding decisions for the region. The proposal is consistent with the following directions under Goal 3: Quality freight, transport and infrastructure networks:

- Direction 18: Improve freight connections to markets and global gateways
- Direction 19: Enhance road and rail freight links.

2.1.8 NSW Freight and Ports Strategy

The NSW Freight and Ports Strategy (NSW Government, 2013) targets specific challenges associated with the forecast doubling of the NSW freight task by 2031. It recognises that providing a network that minimises congestion will support economic growth and productivity and encourage regional development. In this context the strategy identifies the need to develop and maintain capacity for freight on the road network.

Objectives of the NSW Freight and Ports Strategy relevant to the proposal include:

- Delivery of a freight network that efficiently supports the projected growth of the NSW economy
- Balancing freight needs with those of the broader community and the environment.

Actions of the strategy and task actions relevant to the proposal include:

- Action 2B – Develop and maintain capacity for freight on the road network
  - Task 2B-2 Prioritise road infrastructure investments
- Action 3B – Manage congestion, noise and emission impacts of freight transport
  - Task 3B-1 Recognise costs of congestion.

The proposal is considered consistent with the objectives, actions and tasks referenced above. It would help address growth in freight demand and would enhance safety for all road users.

2.1.9 NSW Freight and Ports Plan 2018-2023

The NSW Freight and Ports Plan (NSW Government, 2018) is aligned with NSW Future Transport Strategy 2056 and has the aim of providing a network to move goods in an efficient, safe and environmentally sustainable manner, providing successful outcomes for communities and industry. One of the objectives of the plan is to ensure safe, efficient and sustainable freight access to places. The proposal is consistent with this objective because it would assist safe and efficient freight movements and provide new access for high productivity vehicles.

Another objective of the plan is to increase infrastructure and land use capacity to accommodate growth. This objective is supported by the goal to increase road freight capacity and improve safety across the

Great Dividing Range. The specific NSW Government Action relevant to this proposal is to provide capacity enhancements crossing the Blue Mountains.

2.1.10 Australian Infrastructure Plan and Priority List

The Australian Infrastructure Plan (the Plan) (Infrastructure Australia, 2016) sets out the infrastructure challenges and opportunities that Australia faces over the next 15 years and the solutions required. The plan was informed by a comprehensive review of existing and required infrastructure over the coming decades. The plan has four main themes:

- Productive cities, productive regions
- Efficient infrastructure markets
- Sustainable and equitable infrastructure
- Better decisions and better delivery.

The Infrastructure Priority List (Infrastructure Australia, 2020), which is part of the Plan, is designed to give guidance to decision makers and provide transparency for industry and the community. It is a 'rolling' list that is updated periodically as proposals move through development and delivery and in response to emerging challenges and opportunities.

The 2020 Infrastructure Priority List identifies the regional NSW road network safety improvements as a high priority initiative. The proposal would address this initiative by improving traffic flow, lane modifications that will decrease lane change crashes and improving the cycle network. The priority list provided an indicative timeframe for this initiative as 0-5 years.

The 2020 Infrastructure Priority List is available on the Infrastructure Australian website: https://www.infrastructureaustralia.gov.au/publications/infrastructure-priority-list-2020-august **.**

2.1.11 National Freight and Supply Chain Strategy

The National Freight and Supply Chain Strategy (Transport and Infrastructure Council, 2019) is the national approach to Australia's freight and supply chains. This strategy builds on the foundation laid through the National Ports Strategy (Australian Government, 2012) and National Land Freight Strategy (Australian Government, 2013), and expands freight and supply chain networks as an integrated whole. The Strategy sets an agenda for government and industry action across all freight modes over the next 20 years and beyond and is supported by the National Action Plan which details key actions to be delivered by government to achieve goals of the Strategy. The Strategy commits to action in four critical areas:

- Smarter and targeted infrastructure
- Enable improved supply chain efficiency
- Better planning, coordination, and regulation
- Better freight location and performance data.

The proposal would improve access to major freight gateways to support the critical area of smarter and targeted infrastructure investment. The proposal has been designed to accommodate heavy vehicles and will increase efficiency in freight movements.

2.1.12 National Road Safety Strategy 2021-2030

A new National Road Safety Strategy for the decade 2021-2030 is currently being developed and is expected to be finalised and approved in the first half of 2021. This new Strategy will recognise that road safety is achieved by three key themes: Safe Roads, Safe Vehicles and Safe Road Use.

The current strategy, the National Road Safety Strategy 2011–2020, represents the commitment of federal, state and territory governments to road safety by setting out an agreed set of national goals, objectives and action priorities to reduce fatal and serious injury crashes on Australian roads.

The proposal would provide the opportunity to reduce crashes, as it would improve the design of the Great Western Highway through improved curves and gradients of the highway alignment, intersection upgrades with local roads, and provision of additional local access and service roads. The design provides for two lanes in each direction, with an additional climbing lane on River Lett Hill to separate slower trucks and other vehicles and allow for safer overtaking. By improving road safety, the proposal would directly support the aims of the current National Road Safety Strategy 2011–2020.

2.1.13 Beyond the Pavement

Beyond the Pavement (Transport, 2020) is the overarching Transport policy guiding urban design on all of its projects. The following four physical design objectives have been adopted to achieve Transports commitment to providing 'successful places' with the 'liveability, amenity and economic success of communities and places enhanced by transport':

- Projects should fit sensitively into the built, natural, and cultural environment in both urban and rural locations
- Projects should contribute to the accessibility and connectivity of communities and a general permeability of movement through areas by all modes of movement
- The design and management of projects should contribute to the overall design quality of the public domain for the community, including transport users
- Projects should help revitalise areas and contribute to the local and broader economy.

An integrated design approach was taken for landscape and urban design, and road design for the proposal to integrate with the immediate and surrounding context, minimise impacts on heritage and cultural values, whilst enhancing and benefiting the community of the Hartley Valley and surrounds.

The urban design objectives for the proposal are to:

- Develop an integrated design that fits with the existing high visual qualities, ecology and character of the Hartley Valley and its setting
- Minimise impacts to the integrity of heritage sites, significant trees and cultural values of the community within the proposal
- Create a road corridor that responds to the natural and cultural environment, enhancing local and regional connectivity to evoke the underlying character of the Hartley Valley and surrounds
- Apply the principles stipulated in Transports urban design and other policies, and design principles outlined in Beyond the Pavement.

2.2 Limitations of existing infrastructure

2.2.1 Great Western Highway

The Great Western Highway is the major arterial road through the proposal area, carrying local, intra-regional and inter-regional travel. The general alignment of the Great Western Highway between Little Hartley and Lithgow is mostly a two-way undivided carriageway with one lane in each direction. There are limited overtaking lanes and sections of auxiliary lanes to facilitate overtaking and negotiation of adverse grades.

The Great Western Highway services freight, tourist, and general traffic, with varying traffic volumes from about 12,000 vehicles near Little Hartley and about 11,000 vehicles per day near Lithgow. and up to 20,000 vehicles per day in the Blue Mountains. In particular, there is a relatively high proportion of heavy vehicles (between 12 per cent and 24 per cent), reflective of the 18,000 tonnes of freight transported daily between the Central West and Sydney.

Traffic growth is expected on the Great Western Highway through the proposal area. Without the proposal, the performance of the Great Western Highway is expected to deteriorate over the next fifteen years and would approach operational capacity. Motorists travelling along Great Western Highway would experience congestion with little opportunities to overtake. Intersections would perform at levels below satisfaction resulting in delays.

The proposal would increase the capacity of the Great Western Highway which would reduce congestion and improve intersection performance. The proposal would increase the number of lanes on Great Western Highway allowing traffic to flow smoothly. This would lead to reduced travel time for motorists travelling along Great Western Highway. When considered with other upgrades to the Great Western Highway planned between Katoomba and Lithgow, it is expected that motorists would experience a reduction in travel time of up to 10 minutes.

Crashes

Table 2-1 summarises crash data recorded between January 2014 and June 2020 (six-year period) on Great Western Highway between Little Hartley and Lithgow. A total of 89 crashes were recorded of which 61 per cent resulted in a casualty. No fatal crashes were recorded.

Table 2-1 Recorded crashes on Great Western Highway (Little Hartley to Lithgow) by severity between January 2014 and June 2020

Severity of crash	Number of crashes	Per cent of crashes
Fatal	0	0 per cent
Serious injury	11	12 per cent
Moderate injury	32	36 per cent
Minor injury	8	9 per cent
Uncategorised injury	3	3 per cent
Non-casualty (towaway)	35	39 per cent
Total	89	100 per cent

Crash reduction analysis was undertaken on the Great Western Highway by comparing conditions with and without the proposal to estimate potential crash reductions based on the crash data presented above.

Analysis indicates that the proposal would reduce the total number of crashes on the Great Western Highway between Little Hartley and Lithgow by 57 per cent.

2.2.2 Local roads and intersections

Local roads connection with the Great Western Highway between Little Hartley and Lithgow include:

- Coxs River Road
- Ambermere Drive
- Baaners Lane
- Browns Gap Road
- Mid Hartley Road
- Carroll Drive
- Old Great Western Highway
- Kelly Street
- Jenolan Caves Road
- Blackmans Creek Road
- Forty Bends Road
- Daintree Close
- McKanes Fall Road
- Old Bathurst Road
- Mudgee Street

These roads are generally two-way undivided roads with one lane in each direction that provides access to local residential properties. The post speed limits range between 40 and 80 kilometers per hour.

Currently, there are 14 sign-controlled intersections with the Great Western Highway between Little Hartley and Lithgow:

- Coxs River Road / Ambermere Drive
- Baaners Lane
- Browns Gap Road (I-3)
- Mid Hartley Road
- Carroll Drive
- Kelly Street
- Old Great Western Highway
- Jenolan Caves Road / Blackmans Creek Road
- Forty Bends Road
- Daintree Close
- McKanes Falls Road
- Old Bathurst Road
- Mudgee Street
- Quarry Place.

Currently (2021), only two of the 14 intersections perform at a level considered to be below satisfactory. Intersections delays average between seven and 36 seconds per vehicle which is primarily attributed to traffic on local road connecting to the Great Western Highway. However, modelling of intersection performance indicates that level of service will continue to deteriorate and by 2036 ten of the 14 intersections would experience unsatisfactory performance with delays of over a minute per vehicle at most intersections and over three minutes per vehicle at one intersections.

The proposal would provide new intersection layouts and control measures which would operate with only minor delays at all intersections. Traffic modelling good operational performance levels and hence the proposal would provide a reliable and efficient road network between Little Hartley and Lithgow.

2.2.3 Pedestrian and cyclists

Currently active transport movements along and across the Great Western Highway between Little Hartley and Lithgow are limited by a lack of dedicated cycle and pedestrian paths with narrow should lanes restricting the use of the Great Western Highway for cycling.

The proposal would improve conditions for pedestrians and cyclists by providing a range of improvements to the existing network and facilities, including:

- A 2.5 metre nearside sealed shoulder would be provided on Great Western Highway. It is anticipated that the sealed shoulders would be sufficient to accommodate on road cyclists on both sides of each carriageway of Great Western Highway
- A two metre nearside sealed shoulder would be provided on Service Road 2 and Coxs River Road for on road cyclists
- A two metre nearside sealed shoulder would be provided on Service Roads 1 and 3 for on road cyclists
- Design development has considered the future development of shared paths in the vicinity of the proposal. The alignment and structure of the future shared paths would be developed and finalised during future design development and in consultation with Lithgow City Council and other relevant stakeholders

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The proposal objectives are summarised in Figure 2-2.

Service need themes	Program objectives	Sub-objectives
Economic development / productivity / recovery	Improve economic development, productivity and freight accessibility in and through the Blue Mountains, Central West and Orana regions	• Support economic recovery in the short term, economic development in the medium term and economic sustainability in the long term within the Blue Mountains, Central West and Orana regions through better transport connectivity • Improve the efficiency and safety of freight movement through the Blue Mountains to better link Central West and Orana region economies with domestic and international markets • Improve access and connections to tourism facilities in the Blue Mountains, Central West and Orana region
Resilience / future proofing	Improve the resilience of the corridor between Katoomba and Lithgow to ensure continuity and safety of transport and essential services	• Enable continuity of services along the corridor between Katoomba and Lithgow including during events that disrupt regular network operations • Provide capacity to meet future population growth in the Blue Mountains, Central West and Orana regions • Futureproof the corridor for emerging transport technologies and innovative solutions
Network performance	Improve transport network performance and efficiency along the corridor between Katoomba and Lithgow to meet the needs of all our customers	• Blue Mountains, Central West and Orana regional centres, social infrastructure and other services and for all customers • Improve the overall reliability and capacity of the transport network between Greater Sydney, and the Central West and Orana • Minimise peak period congestion through the Blue Mountains • Build on and maximise the efficiency of existing infrastructure
Safety	Improve the overall safety of the corridor for all transport users between Katoomba and Lithgow	• Reduce road crashes via safer physical infrastructure • Keep all our transport users safe by minimising potential conflicts between light and heavy vehicles, pedestrians, cyclists and local traffic • Improve road infrastructure that contributes to the safety and welfare of heavy vehicle drivers and the community
Movement & place / amenity	Enhance the liveability and be sensitive to the unique environmental and cultural assets along the corridor between Katoomba and Lithgow	• Better balance of local and through traffic along the Katoomba and Lithgow corridor to provide a better overall customer experience • Improve the liveability of town centres west of Katoomba and through to the Central West and Orana region • Minimise potential impacts to the unique environmental, cultural and social value of the Blue Mountains

Figure 2-2 Proposal Objectives

2.3.2 Development criteria

The key design criteria for the proposal are summarised in

Table 2-2.

Table 2-2 Design criteria

Design element	Criteria
Great Western Highway	
Design speed	• 80 to 110 kilometres per hour
Posted speed	• 80 to 100 kilometres per hour
Lane width	• 3.5 metres
Turn auxiliary lane width	• 3.5 metres
Nearside (outside) shoulder width	• 2.5 metres
Offside (median) shoulder width	• 0.5 to 1 metre
Maximum grade	• 6 per cent
Design vehicle	• 26 metre B-double • (Checking vehicle 36.5 metre A-double (12 axle))
Vertical clearance to overpass	• 5.4 metres
Flood immunity	• 1 in 100 year annual recurrence interval (ARI)
Service Roads	
Posted speed limit	• Service Road 1, 3, 6 and 8: 60 kilometres per hour • Service Road 2: 80 kilometres per hour during construction, 60 kilometres per hour during operation • Service Road 9, 10, 11, 12 and 13: 50 kilometres per hour
Lane widths	• Service Road 1, 11, 12 and 13: 3 metres • Service Road 2, 3, 6, 8 and 10: 3.5 metres • Service Road 9: 2 metres
Nearside (outside) shoulder width	• Service Road 1 and 3: 2 to 3 metres • Service Road 2, 6, 8 and 10: 2 metres • Service Road 9: 0.5 metres • Service Road 11, 12 and 13: 1.5 metres
Design vehicle	• 19 metre semi-trailer • (Checking vehicle 26 metre B-double)
Connecting Roads	
Posted speed limit	• 50 kilometres per hour

Design element	Criteria
Lane widths	• Connecting Road 1 and 4: 3.5 metres • Connecting Road 2: 4.5 metres • Connecting Road 3 and 5: 3 metres
Nearside (outside) shoulder width	• Connecting Road 1: 1 to 1.5 metres • Connecting Road 2: 2 metres • Connecting Road 3, 4 and 5: 3 metres
Design vehicle	• 19 metre semi-trailer • (Checking vehicle 26 metre B-double)
Local Roads	
Posted speed limit	• Baaners Lane and Coxs River Road: 60 kilometres per hour • Blackmans Creek Road: 40 kilometres per hour • Browns Gap Road, Jenolan Caves Road and McKanes Falls Road: 80 kilometres per hour • Forty Bends Road, Kelly Street, Mudgee Street and Old Bathurst Road: 50 kilometres per hour
Lane widths	• Baaners Lane, Browns Gap Road, Coxs River Road, Forty Bends Road, Jenolan Caves Road and McKanes Falls Road: 3.5 metres • Blackmans Creek Road Mudgee Street and Old Bathurst Road: 3 metres • Kelly Street: 2 metres
Nearside (outside) shoulder width	• Baaners Lane, Blackmans Creek Road, Browns Gap Road and Forty Bends Road: 1 metres • Coxs River Road and Jenolan Caves Road: 2 metres • Kelly Street: 0.5 metres • McKanes Falls Road: 2 metres • Mudgee Street: 1.5 metres • Old Bathurst Road: 0.5 to 1.5 metres
Design vehicle	• 19 metre semi-trailer • (Checking vehicle 26 metre B-double)
Coxs River Road on and off ramps	
Posted speed limit	• 60 kilometres per hour
Lane widths	• 3.5 metres
Nearside (outside) shoulder width	• 1 metre

2.3.3 Urban design objectives

Urban design objectives for the proposal include:

- Develop an integrated design that fits with the existing high visual qualities, ecology and character of the Hartley Valley and its setting
- Minimise impacts to the integrity of heritage sites, significant trees and cultural values of the community within the proposal
- Create a road corridor that responds to the natural and cultural environment, enhancing local and regional connectivity to evoke the underlying character of the Hartley value and surrounds
- Apply the principles stipulated in Transports urban design and other policies, and design principles outlined in Beyond the Pavement (Transport, 2020)

Further details including design principles are outlined in Appendix L Urban Design and Landscape Character Impact Assessment.

2.4 Alternatives and options considered

2.4.1 Overview of the proposal development process

The proposal development process undertaken to date has involved seven main stages and is summarised in Table 2-3.

Table 2-3 Proposal development process – key milestones

Key milestone	Description
Proposal announcement (October 2007 and May 2008)	The upgrade proposal began in May 2008 when the Australian and NSW governments announced the location of the initial study area. In June 2008 the community consultation process was initiated with the release of the Mount Victoria to Lithgow Background and Proposed Project Development Report (RTA, 2008c).
Study area investigations (May 2008)	Study area investigations aimed at facilitating the identification of potential corridors were initiated in May 2008. Following suggestions by community members, Transport agreed to investigate the feasibility of the Newnes Plateau as an alternative corridor.
Initial corridor development leading to the selection of five corridors in which routes may be feasible (November 2008)	Based on the outcomes of the aforementioned investigations, five potential corridors in which routes might be feasible were announced in November 2008. The Study Area Investigations and Corridor Identification Report (RTA, 2008b) and Strategic Evaluation of the Newnes Plateau Corridor Report (RTA, 2008c), which outlined the development of these corridors, were released in November 2008.
Corridor modification and confirmation (November 2008 to April 2009)	Following a review of the initial corridors, four modified corridors were confirmed and placed on display in April 2009, together with the Submissions Report – corridors in which routes may be feasible (RTA, 2009e). As part of the corridor confirmation process, the Transport determined that the Newnes Plateau corridor would not be taken forward for further consideration.

Key milestone	Description
Preferred corridor announcement (August 2009)	In August 2009, the NSW Minister for Roads announced that the plans for the upgrade of the Great Western Highway between Mount Victoria and Lithgow would concentrate solely on the corridor along the existing highway, known as the modified orange corridor.
Route options development (May to October 2009)	The development of route options within the modified orange corridor included community submissions and involvement in workshops, field investigations and engineering design, and culminated in the announcement of various route options and sub-options in October 2009. The Route Options Report (RTA, 2009a) and associated working papers (RTA, 2009f to r), which summarise the development of the route options were released in October 2009.
Preferred route selection (October 2009 to May 2010)	Following further community consultation and a technical workshop was held in November 2009 in which the route options were assessed based on a previously established evaluation criteria considering business impacts, residential impacts, visual impacts, heritage, ecology, sense of place and value for money. During the workshop, further refinements were identified for the routes to minimise potential environmental impacts. Finally a preferred route option was selected. The Preferred Route Report (RTA, 2010) which summarises this process was released in May 2010.
Further design refinements	The Preferred Route was used as a basis for the development of the Concept Design. A limited options development phase was undertaken prior to the development of the Concept Design. This was to ensure the most effective option that best met the proposal objectives was taken forward into design development.

2.4.2 Refinements to the concept design

The reference design developed by Transport formed the basis for the development of the concept design. This section outlines refinements made to the reference design during the development of the concept design.

Baaners Lane / Browns Gap Road Connectivity

Connectivity between Baaners Lane and Browns Gap Road and the location of the Baaners Lane and Great Western Highway intersection was raised as a key concern in the community feedback received by Transport in previous phases of the proposal. As such, a review was undertaken at a workshop held in March 2021 between Transport and its consultants to investigate alternative options around this connection. The options reviewed at the value management workshop were:

- Option 1: Right Turns in and out of Baaners Lane across the Great Western Highway (at grade intersection). Residents along Baaners Lane travelling to Browns Gap Road will need to travel via Great Western Highway.
- Option 2: Bridge across the Great Western Highway and staggered T-intersection with grade separation.
- Option 3: New service road along Great Western Highway for connection to Coxs River Road (at grade intersection).

A paired comparison and option assessment was undertaken during the workshop which resulted in both Option 1 and Option 2 having merit, and that further consultation with the community would be required.

Transport met with the Hartley District Progress Association in March 2021. Based on feedback from this meeting, it was determined that Option 1 would be developed in the concept design.

Climbing lane on River Lett Hill

A truck speed assessment for the westbound approach to River Lett Hill was carried out during design development and reviewed at a workshop held in March 2021 between Transport and its consultants. This assessment determined that truck speeds would be significantly affected by the prolonged length of steep grade necessary to traverse River Lett Hill. Trucks would reduce to below 40km/h for approximately 2km, commencing immediately west of the Twin Bridges Over Jenolan Caves Road and would not increase to the posted speed until west of Forty Bends Road, where the speed limit is reduced from 100km/h to 90km/h.

Further assessment was also carried out to determine if the truck speed reduction would significantly affect the traffic flow. The assessment was carried out using predicted traffic levels for 2026 and 2036. This assessment identified a decrease of at least two levels of service on River Lett Hill.

In accordance with Austroads Guide to Road Design (AGRD), a climbing lane is warranted if either:

- Truck speed falls to 40 km/h or less, or
- The level of service on the grade falls two levels below that on the approach to the upgrade or to level of service ‘E’.

The two warrants above are met and therefore, a climbing lane has been introduced on River Lett Hill.

Other refinements

It is recognised that substantial design effort, options analysis and independent reviews have been undertaken by Transport in the development of the Transport reference design for the proposal, including extensive consultation with the local community and key stakeholders. This has resulted in a balance between providing a high standard design incorporating wider lanes and medians and minimising impacts to the surrounding property accesses and environmentally sensitive areas. Refinements to the reference design during the development of the concept design have sought to avoid compromising that balance. Refinements have generally comprised minor adjustments to:

- The design speeds along sections of the Great Western Highway to reduce the number of speed changes
- Median and shoulder widths
- Property access and intersections
- Land acquisition extents
- Exit and entry ramps
- Road geometry, alignment and connections.