Appendix H

Landscape character and visual amenity technical paper
Great Western Highway Upgrade
Katoomba to Lithgow
Hartley Valley Safety Upgrade

Review of Environmental Factors
Technical Paper

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Prepared for

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Roads and Maritime Services is seeking approval to upgrade the Great Western Highway in the Hartley Valley (the proposal). The proposal would include the upgrade of about 7.8 kilometres of the Great Western Highway from the base of Victoria Pass to the end of the River Leti Hill eastbound overtaking lane. This Landscape Character and Visual Impact Assessment Report has been prepared as part of the Review of Environmental Factors (REF) process to address the visual and landscape character issues associated with the proposal, to introduce measures to minimise its potential impact, and to provide direction for future detail design and documentation work.

The study area is predominately characterised as rural with large expanses of rolling farmland. There are large stands of native vegetation on both sides of the highway within the valley, and on the slopes of Mount Victoria, Mount York and Hassans Walls. This combines to provide an overall open, rural character with some areas enclosed by woodland, particularly at either end of the study area.

Urban Design

An urban design strategy is provided in Chapter 4. A number of urban design objectives have been developed to guide the urban design strategy. The objectives reflect the most important goals to be achieved as a result of the proposal, taking into account not only the corridor itself but also its relationship with surrounding areas.

Urban design drawings are presented in Chapter 3, in plan and cross section format, and indicatively illustrate the urban design proposal, at specific locations along the corridor, which will be further developed in the detail design phase of the project.

Landscape Character

Landscape character impact assessments are provided in Chapter 5. Landscape character assessment determines the impact of the proposal on the aggregate of built, natural and cultural aspects that make up an area and provide its unique sense of place. Although the overall character of the study area is quite similar, the analysis in Chapter 2 identifies three landscape character zones. The landscape character impact assessment identifies that the proposal would have a moderate to high to moderate character impact. As all zones have a similar scenic quality, the greatest impacts are found in the areas where the scale of the proposal is more substantial, for example, the intersection upgrades in LCZ 2 and the extensive retaining wall and realignment of the barrier curve in LCZ 3.

Visual Impact Assessment

Visual impact assessment is provided in Chapter 6, defining the day to day visual effects of a proposal on people’s views. It is based on the assessment of a number of selected key 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. A total of 14 key viewpoints form the basis of the visual impact assessment.

Out of the 14 selected viewpoints, visual impact ratings were determined as follows:

- One viewpoint has a High visual impact.
- Two viewpoints have High to Moderate visual impact.
- Five viewpoints have Moderate visual impact.
- Five viewpoints have Moderate to Low visual impact.
- One viewpoint has Negligible visual impact.

Ratings of High and High to Moderate impact occur where sensitivity to change is the highest, such as Bardens Lookout, Historic Hartley Village and residences adjacent to the road, or where a greater magnitude of the proposal is viewed, for example, the retaining wall at Historic Hartley Village. The remaining impacts result from a variety of conditions including a greater distance from the proposal, the category of viewer being a road user, and the minimal work that would be undertaken.

Mitigation Strategy

A mitigation strategy is provided in Chapter 7. It has been developed during the road concept design to mitigate landscape character and visual impacts and may be refined in the ongoing development of the design. It also includes a summary of further mitigation measures to be further investigated during the subsequent detail design phase of the project.
1. INTRODUCTION

1.1 OVERVIEW

PURPOSE

This Landscape Character and Visual Impact Assessment Report has been prepared for Sinclair Knight Merz (SKM) on behalf of Roads and Maritime Services (Roads and Maritime), by Spackman Mossop Michaels (SMM) as part of the Review of Environmental Factors (REF) for the proposed upgrading of Great Western Highway in the Hartley Valley. The proposal extends from between the base of Mount Victoria Pass and the base of River Lett Hill, a distance of 7.8 kilometres, in the Lithgow Local Government area (LGA). This document is a technical paper that supports the REF being prepared by SKM. SMM has worked on this proposal in conjunction with members of SKM and Roads and Maritime specialist advisors.

The report documents the landscape character and visual impacts of the proposal and has been prepared as part of the planning approval process. It aims to facilitate an integrated urban design and engineering design outcome for the proposal at this section of the Great Western Highway through the utilisation of visual impact assessment to identify and summarise the visual and landscape character opportunities and issues within the study area. This, in turn, has guided the development of the road concept design process by avoiding or mitigating potential impacts wherever possible.

BACKGROUND

The Great Western Highway is the principal road transport link connecting the Central West region of New South Wales (NSW), the Blue Mountains and Sydney. The highway is an important freight transport corridor and is also used by thousands of commuters each day travelling between Sydney and the towns and villages along its length. The highway also provides a vital connection for tourists to many popular destinations within the region including various Blue Mountains tourist towns and villages. Greater Blue Mountains World Heritage Area, the Hartley Valley, Jenolan Caves and further west, towns such as Mudgee, Orange and Bathurst.

Since May 2008, the Australian and NSW Governments have been investigating an area between Mount Victoria and Lithgow to determine the preferred route of an upgrade for the Great Western Highway. The Mount Victoria to Lithgow Great Western Highway upgrade is part of both governments’ commitment to improve road safety and accessibility to communities in the Blue Mountains and Central West.

Figure 1.1: Hartley Valley proposal
The Mount Victoria to Lithgow upgrade was announced in 2008 and forms part of the Penrith to Orange Transport Strategy (1998), the Sydney – Dubbo Corridor Strategy (2007) and the Central West Transport Needs Study (2009).

The objectives of the proposal, which have guided the development of the draft concept design, were to:

- Improve road safety.
- Improve road freight efficiency.
- Cater for the mix of through, local and tourist traffic.
- Be sensitive to the area’s natural environment, heritage and local communities.

Following on from this work, in July 2012, the NSW and Australian Governments announced a $250 million revised investment program for, amongst others works, the delivery of enhanced safety works packages between Katoomba and Lithgow. This decision addressed recommendations from an independent review of the proposed upgrades of the Great Western Highway west of Katoomba.

The revised package of upgrades will enhance safety outcomes and maximise benefits to the community by targeting specific deficiencies. Roads and Maritime Services will manage and deliver the following:

- Upgrading the highway at Forty Bends, east of Lithgow to three lanes on the current alignment ($120 million).
- A number of enhanced safety upgrades between Mount Victoria and Lithgow. These include Forty Bends, River Lett Hill, Hartley Valley and Mount Victoria Village Safety Upgrades ($83 million).
- Finalising the concept design and road boundaries for upgrading the highway from Mount Victoria to Lithgow and requesting councils to adopt these in their future planning.
- Using the remaining funds from the joint $250 million Australian and NSW government commitment for upgrades of the Great Western Highway between Katoomba and Mount Victoria.

HARTLEY VALLEY SAFETY UPGRADE

Roads and Maritime is proposing to upgrade the Great Western Highway in the Hartley Valley, west of Mount Victoria. The proposal would include the upgrade of about 7.8 kilometres of the Great Western Highway between the base of Mount Victoria Pass and the base of River Lett Hill (the proposal). An overview of the proposal is shown in Figure 1.1.

The proposal is needed to improve the road safety and traffic capacity along this section of road and would be consistent with other road improvement activities along the Great Western Highway.

Key features of the proposal are described in Section 3 of this report.

STUDY METHOD

The method used to undertake this study follows the ‘Guideline for Landscape Character and Visual Impact Assessment’ (Roads and Maritime, 2013) and is summarised as follows:

- Undertaking an initial site visit and field investigation, reviewing relevant literature, analysing aerial photographs and topographic maps to understand the study area.
- Reviewing the engineering concept design on a regular basis, and other supporting material to gain an appreciation of the project.
- Defining landscape character through a study area analysis, including a detailed site investigation.
- Identifying and describing landscape character zones and evaluating the proposal’s impact on them.
- Evaluating the impact of the project on these landscape character zones by combining the sensitivity of the zone and the magnitude of the works to provide an overall impact rating as indicated by the Impact Assessment Grading Matrix.
- Identifying urban design and landscape opportunities and methods of mitigating adverse visual impacts, both within and outside of the project scope, for consideration in the detail design phase of the project.

The method used to assess landscape character impact is described in Chapter 5 and visual impact is described in Chapter 6.

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Figure 1.2: Impact Assessment Grading Matrix.
2. CONTEXTUAL ANALYSIS

2.1 LOCATION

The study area for this Landscape Character and Visual Impact Assessment Report is located on the Great Western Highway, between Mount Victoria and Lithgow, beyond the western edge of the Blue Mountains, approximately 135 kilometres west of Sydney (Figure 2.1).

The Great Western Highway and the Main Western Railway Line form the primary transport corridors through the Blue Mountains, connecting Sydney to the Central West of New South Wales. Between Penrith and Lithgow, the highway is the major road freight, tourist and commercial link in the region. At the same time, it also provides the principal road access between the towns and villages along its route in the Blue Mountains. The Bells Line of Road is the only other regional road through the Blue Mountains, connecting Lithgow to Windsor.

The Great Western Highway traverses a landscape that has considerable natural, cultural, scenic and historical values. In general, the highway consists of a winding road travelling through discrete urban developments that are separated by rural lands and natural bushland. Located on the main east-west ridge through the Blue Mountains, the highway is situated between the northern and southern sections of the Blue Mountains National Park, which forms part of the Greater Blue Mountains World Heritage Area.

The Hartley Valley safety upgrade is approximately 7.8 kilometres in length, extending from the base of Victoria Pass to the end of the River Lett Hill eastbound overtaking lane (Figure 2.2).
2.2 LANDFORM AND TOPOGRAPHY

The terrain within the study area is predominantly characterised by an undulating plain surrounded by steep escarpments. The escarpments include Mount Victoria, Mount York and Sugarloaf Mountain to the east; the Newnes Plateau to the north; and Hassans Walls to the west (refer Figure 2.3). This undulating plain is intersected by a series of watercourses that feed into the River Lett, the primary watercourse in the Hartley valley. The river flows from the north east to the south west across the valley, and the topography of the plain changes from relatively flat in the north to increasingly steeply undulating in the south and west. River Lett Hill rises steeply out of the River Lett valley, forming a prominent landform to the western edge of the study area.

The Great Western Highway has been constructed to follow the gently undulating topography of the study area, meandering between the base of Mount Victoria in the east to River Lett Hill to the north west, at the southern end of the valley floor (refer to Figure 2.3). Even though there has been a moderate degree of modification to the landscape (in terms of cut and fill embankments), the associated visual impact of the existing road on the surrounding countryside is relatively low. This is also helped by the relatively narrow footprint of the existing carriageway, consisting of only one lane in each direction, with occasional overtaking or turning lanes and gravel shoulders.

![Figure 2.3: Landform and topography of the study area.](image-url)
2.3 GEOLOGY

The underlying geology of the study area is a key contributor to its dramatically varying topography. To the north, Narrabeen Group sandstone and Illawarra Coal Measures (shale) underlie the distinctive escarpment and massive sandstone cliffs at Mount Clarence, Mount York and Hassans Walls that have been strikingly etched by weathering. Within the Hartley valley, the highway route is underlain by the Shoalhaven Group (limestone and conglomerate) in the east and the west, and Kanimbla Banolith (granite), which is present from around Hartley Historic Village to River Lett Hill (refer to Figure 2.4).
2.4 HYDROLOGY AND DRAINAGE

The study area is located within the Coxs River catchment, a sub catchment of the larger Hawkesbury-Nepean catchment and Warragamba Catchment, which supplies Sydney’s drinking water.

The hydrological pattern of the study area is dominated by the River Lett, which flows in a south westerly direction across Hartley valley to its confluence with the Coxs River just upstream of Jenolan Caves Road. A number of creeks feed into the River Lett at various locations along its course north of the study area. These include: Fairy Dell Creek and its major tributary, which flow into Kerosene Creek and then into the River Lett; Butlers Creek; Blackmans Creek; Boxes Creek and other smaller tributaries. The headwaters of each of these watercourses originate in the ridges and escarpments around the eastern and northern margins of the study area. Numerous springs and hanging swamps, which feed these watercourses, are located on these elevated and steep slopes.
The topography surrounding the study area is characterised by the steep escarpments to the north and east, with the highest point at Mount Victoria being 1,064 metres above sea level. At Mount Victoria the average winter temperature is approximately 3°C, while in summer the average temperature is around 18°C. Average rainfall is approximately 1,050 millimetres per year. The study area, to the south and west of these escarpments, runs through the undulating Hartley valley, some 260 metres below Mount Victoria. This topography results in a variation in climatic factors across the study area.

Parts of the highway are considered to be potentially prone to the formation of ice or frost. This is of particular concern on the slopes of River Lett Hill and on the River Lett Bridge. Hill fog and radiation fog are other climatic factors that are likely to occur in the study area. Meteorological data from the general region indicates that strong winds do not generally occur along the study area.

Figure 2.6: Key climatic considerations of the study area.
2.6 BIODIVERSITY

Along the study area, the woodlands that once would have covered the Hartley valley area have been cleared, revealing the undulating landforms that are now covered by open grasslands and agricultural land. However, there are some areas which are relatively intact, in particular, east of Cox River Road, and around the Jenolan Caves Road intersection, supporting a diversity of grass and herb species. Key features of ecological significance that have been identified around the study area include:

- Ten vegetation communities including open forests, hanging swamps and grassy woodland communities.
- Two threatened ecological communities: Blue Mountains Swamps and Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland, listed under the NSW Threatened Species Conservation Act 1995.
- Freshwater habitats comprising hanging swamps, rivers and streams, swampy meadows and numerous headwater streams and farm dams. Of particular importance are the permanent and temporary breeding, foraging and refuge habitats associated with River Lett and Boxes Creek.
- Riparian zones associated with the River Lett and Boxes Creek.
- Threatened fauna species including the Bathurst Copper Butterfly, Giant Dragonfly, Blue Mountains Skink, Broad-headed Snake, Giant Burrowing Frog and Red-crowned Toadlet.
- Hollow-bearing trees have been observed; these are mainly restricted to areas where clearing has not occurred, such as some crown lands, riparian zones and some paddock trees.

Refer to the Mount Victoria to Lithgow Alliance, 2012, Great Western Highway Upgrade, Mount Victoria to Lithgow, Biodiversity Survey Results for a more detailed discussion on biodiversity.
There is a rich and highly valued Aboriginal and non-Aboriginal history throughout the study area. The Aboriginal Archeological Survey and Assessment Report (Comber & Stening 2011) for the Preferred Route Corridor, Great Western Highway Update, Mount Victoria to Lithgow Alliance, identifies a number of known Aboriginal sites along the highway. Areas likely to contain archaeological sites include the ridges, spur crest and saddles, watercourses and the alluvial terraces.

The arrival of Europeans to the Blue Mountains was closely followed by the building of the first road, which opened up the valley for grazing and agriculture. Eventually there were employment opportunities for shoemakers, carpenters, wheelwrights, masons, shepherds, and farm labourers. The construction of kerosene mines precipitated the establishment of many hotels and taverns throughout the valley. The rich soil and cold climate supported a very successful apple growing industry until WWII. The legacy of this historical development is evidenced by the numerous important non-Aboriginal heritage sites located throughout the study area. These include historic travel routes, buildings, cemeteries and activity areas such as those associated with slate mining.

There are many heritage items within the Hartley valley area, including heritage listing of some of the previous and current road crossings of the Blue Mountains. The items identified on the State Heritage Register and those that are listed Blue Mountains City Council and Lithgow City Council's Local Environmental Plans listed are of particular importance (refer to Figure 2.8). For detailed discussion of non-Aboriginal heritage, refer to the Non-Aboriginal Heritage Corridor Study Report (Casey & Lowe, 2011) for the Preferred Route Corridor, Great Western Highway Update, Mount Victoria to Lithgow Alliance and the Statement of Heritage Impact, Hartley Valley Safety Upgrade, Non Aboriginal Heritage (Casey & Lowe 2013).
2.8 CULTURAL AND SCENIC VALUES

Defining the experience of the drive along the Hartley valley section of the Great Western Highway are a number of factors which combine to give the road a unique character and therefore represent a set of values associated with the journey. These values derive mainly from the visual and ecological characteristics of the road corridor and surrounding landscape.

The majority of the study area lies within the highly picturesque Hartley valley. BORDERED BY dramatic sandstone escarpments to the north and east, and undulating hills to the west, the valley has a distinctive form and cultural identity that is highly valued by both residents and visitors. The densely vegetated ridges and hill slopes provide a predominantly natural character that contrasts strongly with the more open cultural landscape of the valley, which has been cleared for farming and settlement purposes. Additionally, the adjacent world heritage listed Blue Mountains National Park and numerous public reserves, such as Mount York, Hyde Park and Londonderry, add to the Hartley valley’s cultural value. There are also a number of designated lookouts located on the escarpments around the valley, which afford spectacular and panoramic views over the valley and districts beyond.

The combination of the natural and cultural scenic qualities with the abundant local heritage values establishes a unique identity to the area (refer to Figure 2.9). These values have a special meaning and provide a strong sense of place for the local inhabitants, as well as visitors and through traffic approaching and leaving the Blue Mountains National Park and beyond.

For much of its length, this section of the Great Western Highway currently consists of a three lane road (one for each direction plus overtaking lane) which in its current configuration, meandering horizontal and rolling vertical alignment and adjoining land uses, creates a distinct “country road” character.
Land use in the study area includes rural residential development, grazing, agriculture and horticulture, resource mining, tourism, and areas of conservation-related land uses within national parks.

The residents of the study area live either on rural and rural residential properties within Hartley valley. The settlement pattern generally reflects the historically central role of the Great Western Highway in the valley, as many residential properties are located in relatively close proximity to the highway (refer Figure 2.10). There is a distinct band of higher density rural residential development running in a north-south corridor between Little Hartley and Butlers Creek. The residential densities become progressively lower towards the north of the study area where the rural properties increase in size to become working farms. The study area is located between the township of Mount Victoria to the east and the city of Lithgow to the west.
The existing transport infrastructure in the area consists of the existing Great Western Highway and the Main Western Railway Line. Traffic performance of the existing highway is limited by very steep grades, tight curves and limited overtaking opportunities. Rail capacity is constrained by freight and passenger rail having to share the same track.

Local employment opportunities are provided by agricultural operations, forestry and the mining industry all of which rely on rail and/or road access. Some residents travel to the major town centres of Lithgow and Katoomba for employment. Other residents commute to Sydney by road or rail for work. Consequently, there are many daily local traffic movements within the study area and between the study area and employment centres. There is also a large amount of through traffic, including heavy freight vehicles, that utilises the highway.

A secondary road network links the highway to the Hartley valley and adjoining areas. This includes the Darling Causeway, which connects Mount Victoria to Bell, and Browns Gap Road and The Gap Road, which provide a secondary connection for the valley to Lithgow. A series of interconnecting roads intersect the valley with junctions to the highway at the Cox’s River Road, Browns Gap Road and Jenolan Caves Road. This local road network generally provides for local and tourist traffic while the Darling Causeway and Jenolan Caves Road provide for a high proportion of heavy vehicles.
3. THE PROPOSED UPGRADE

3.1 OVERVIEW OF THE PROPOSAL

Roads and Maritime is proposing to undertake safety enhancements of the Great Western Highway through the Hartley Valley, between Mount Victoria and Lithgow. The proposed safety enhancement works would include the upgrade of about 7.8 kilometres between the base of Mount Victoria Pass and the base of River Leet Hill (the proposal). The proposal includes the following:

- **Carriageway would be widened on both sides to enable:**
  - Through lanes: 3.5 metres wide.
  - Shoulders: Minimum 2 metres wide (3 metres wide adjacent to property accesses).
  - Kerb and gutter drains at cuttings, grades greater than 5% and where drainage or safety measures are required: 1 metre shallow V-shaped drains.

- **Overtaking lanes:**
  - Existing downhill overtaking lane would be extended using line marking on existing pavement between chainage 27640 and chainage 27920.
  - Overtaking lane at Hartley Historic Site curve (chainages 26430-25940) would be shortened by 490 metres to create an improved alignment in existing corridor while maintaining sufficient length in the overtaking lane.
  - Overtaking lane at Jenolan Caves Road would be shortened by 250 metres (chainage 27150-27400) to reduce traffic movement at intersection. This would prevent vehicles turning right from crossing two lanes of traffic.

- **Intersection upgrade at Coxs River Road/Ambermere Road:**
  - Dedicated right turn and left turn lanes into both roads from the highway.
  - Coxs River Road would be realigned about 55 metres to the east to form a staggered intersection with Ambermere Road.
  - Both roads would be tied into highway using vertical levels.
  - Bus bays would be located on both sides of the highway.

- **Intersection Upgrade at Baaners Lane:**
  - Dedicated right turn and left turn lanes from the highway.
  - Bus bay would be located at intersection.

- **Intersection upgrade at Browns Gap Road:**
  - Dedicated right turn and left turn lanes from the highway.
  - Bus bay would be located at intersection.
  - Vertical alignment would be improved by cutting into the existing crest by 1.3 metres to improve sight distance.

- **Intersection upgrade at Mid Hartley Road:**
  - Dedicated left turn lane from the highway.
  - Bus bay would be located at intersection.
  - Tie into vertical levels of highway.

- **Intersection upgrade at Carroll Drive:**
  - Extension of existing right turn lane from the highway.
  - Tie into vertical levels of highway.

- **Intersection upgrade at Old Bathurst Road:**
  - Hartley Historic Site curve would be realigned.
  - Existing intersection would be shifted about 12 metres to tie into realigned curve.

- **Intersection upgrade at Jenolan Caves Road:**
  - Existing right turn and left turn lanes would be retained.
  - Traffic movements would be reduced by limiting westbound traffic to one lane until after intersection.
  - Length of right turn bay into Jenolan Caves Road would be increased.
  - Tie into vertical levels of highway.
  - Widen shoulders in north-west side of intersection.
  - Minimal earthworks would be undertaken and would predominately involve trimming and shaping existing cut and fill batters to accommodate road shoulder widening and intersection upgrades. More extensive earthworks would be required to construct the realignment of the barrier curve at Historic Hartley Village, including four retaining walls, necessary to avoid encroachment on private property and the removal of a large amount of Ribbon Gum Woodland.

- **Intersection upgrade at Browns Gap Road:**
  - Retaining wall 1 - between chainage 25740 and 25850 (about 110 metres long and up to 1.7 metres high).
  - Retaining wall 2 - between chainage 25917 and 25970 (about 53 metres long and up to 3.6 metres high).
  - Retaining wall 3 - between chainage 26015 and 26105 (about 90 metres long and up to 2.6 metres high).
  - Retaining wall 4 - between chainage 26300 and 26500 (about 200 metres long and up to 7.5 metres high).

- A possible fifth retaining wall about 4.1 metres high may be necessary between chainages 26130 and 26220 next to the westbound carriageway.

- **Adjustments to property accesses, as required.**

- **Property acquisition, as required.**

- **Relocation and/or temporary diversion of existing underground utilities including water, powerlines and telephone cables.**

- **A main compound site would be located on the southern side of the highway, east of the proposed Coxs River Road realignment. In addition, three smaller stockpile areas would be provided at:**
  - The base of Mount Victoria Pass, adjacent to the eastbound lane.
  - Browns Gap Road intersection.
  - The base of River Leet Hill, adjacent to the westbound lane.
ROAD DESIGN PARAMETERS
The road works component of the project has been designed in accordance with Austroads - Guide to Road Design. The engineering design parameters for the road works component are summarised as follows:

- **Horizontal Alignment:**
  - Desirable design speed - 90km/h.
  - Minimum design speed - 80km/h.
  - Posted speed - 80km/h.

- **Vertical Alignment:**
  - Desirable design speed - 90km/h.
  - Minimum design speed - 80km/h.
  - Design speed - 80km/h.
  - Grade - maximum 6 per cent.

- **Stopping Sight Distance:**
  - Reaction time - 1.5 seconds.

- **Lanes:**
  - Traffic lane width - 2 lanes at 3.5 metres wide each.
  - Road shoulder width - minimum 2.0 metres, and 3.0 metres where property access is required.
  - Crossfall - maximum 3.0 per cent.

LANDSCAPE WORKS
In addition to the key engineering works previously outlined, the following landscape works are envisaged to be undertaken as part of the detail design phase of the project:

- Clearing of existing roadside trees and other vegetation in some locations to provide adequate space for the proposed road safety works.
- Landscape revegetation works, including trees, shrubs and groundcovers to cut and fill batters, areas of redundant pavement, stockpile areas, and roadside areas.
- Larger tree plantings to denote specific locations, i.e. villages, intersections and heritage properties.

STRUCTURES AND ROADSIDE ELEMENTS
The following structures and roadside elements have been included in the proposal and would require further investigation during the detail design phase:

- Targeted treatments to reshaped rock cuttings.
- Construction of four new retaining walls on the northern side of the highway in the vicinity of Historic Hartley Village.
- The installation of roadside elements such as safety barriers, fencing and signage.
4. URBAN DESIGN STRATEGY

4.1 OVERVIEW

A central component of the design process is the identification of urban design objectives. These objectives cover the full range of components associated with the road design including alignment, adjoining property access, road corridor character and road infrastructure elements. These elements include cut and fill batters, walling, drainage structures, fences and barriers, planting and landscaped surfaces.

The objectives reflect an essential goal to achieve a project outcome which is sensitively integrated, taking into account not only the corridor itself but also its relationship with surrounding areas. These would be implemented in accordance with the Roads and Maritime policy Beyond the Pavement (2009) performance themes of safety, cost effectiveness and sustainability.

An integrated design approach has been adopted for the Hartley valley safety works project in order to ensure that the best possible outcomes are achieved. As part of the integrated design approach, a landscape and urban design strategy has been developed to provide landscape and urban design input to the overall road concept design for the works.

The purpose of the strategy is to articulate how urban design can contribute to the successful achievement of the overall project objectives. The development of the strategy has directly influenced key engineering aspects of the concept road design to date, including road alignment, typical cross sections and retaining walls. The intention is that this urban design strategy would influence the development of the highway works when it proceeds to detailed design and construction.

The following urban design objectives have been devised to guide the development of the concept design outcome for the project.

**Objective 1: Develop an integrated concept design that fits sensitively with the existing qualities and characteristics of the Hartley Valley and its setting.**

*Design principles:*
- Minimise the physical footprint and scale of new infrastructure in order to retain the existing qualities and characteristics of the Great Western Highway as it travels through the Hartley Valley.
- Ensure that the new works are well integrated with the adjoining built areas, open space, historic and natural settings.
- Minimise negative physical impacts on parklands, open spaces, heritage items and private property.
- Minimise the extent and scale of road-related elements including retaining walls and barriers.
- Consolidate any residual land parcels into adjoining land uses as appropriate.
- Devise a planting / revegetation strategy that takes into account the long-term visual quality and biodiversity of the areas adjoining the proposal.

**Objective 2: Produce a good urban design and landscape outcome, taking into account the existing amenity, visual character and cultural landscapes of the Hartley Valley.**

*Design principles:*
- Retain and reinforce the unique landform and landscape character of the route.
- Recognise the key heritage and cultural landmarks along the route and minimise any impacts on them.
- Retain existing view corridors, particularly at elevated points, to establish a sense of place and orientation for the journey along the Great Western Highway.

**Objective 3: Maintain the integrity of cultural and historic buildings, structures, elements and spaces of the Hartley Valley.**

*Design principles:*
- Maintain the physical and visual integrity of State-significant items including heritage buildings, public spaces and their curtilage.
- Preserve the integrity of heritage items and areas of cultural importance to the local community.
- Minimise impacts on Aboriginal heritage sites and their associated heritage values.

**Objective 4: Develop a simple and unified palette of elements and details that are attractive, easily maintained and fits sensitively into the specific landscape character of this area.**

*Design principles:*
- Provide standard road elements that have been used in other upgraded sections of the Great Western Highway.
4.3 STRUCTURES AND EARTHWORKS FORMATIONS

Structures and earthworks formations are required to reconcile the upgraded highway levels with existing ground levels. While it is preferable in principle to build the new highway as close to the existing ground levels as possible, in practice this has not been possible in several locations. Instead, the concept road design requires the upgraded highway to be either slightly above or below the existing ground levels for much of the project length due to the combination of:
- The undulating shape of the existing terrain.
- The minimum geometric requirements for the horizontal and vertical road alignment to meet the relevant design standards for the highway upgrade.
- The need to balance cut and fill volumes.

The types of structures required for the proposal are:
- Retaining walls.

The types of earthworks formations required for this proposal are:
- Cuttings - where the highway would be situated below the existing ground, requiring excavation.
- Embankments - where the highway would be situated above the existing ground, requiring the road to be elevated.

## RETAINING WALLS

The highway upgrade requires a number of retaining walls to reconcile the proposed alignment levels with the existing ground. The proposed retaining walls would be located below the highway (i.e., where the highway is on fill).

Table 4.1 provides a summary of urban design recommendations for retaining walls.

### Table 4.1: Summary of urban design recommendations for retaining walls.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>LOCATION</th>
<th>RECOMMENDATIONS</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retaining walls BELOW the highway facing the surrounding landscape. These retaining walls may be required where the highway is situated above existing ground levels (highway on fill).</td>
<td>In or bordering bushland areas and semi rural areas.</td>
<td>Reinforced concrete, reinforced soil or soldier piled walls with facing panels.</td>
<td>Consistency with other sections of the Great Western Highway in the Blue Mountains.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Facing panels are to be grey concrete, with heavy horizontal ribbing and dark exposed aggregate (e.g. basalt) finish to match reinforced earth wall panels used elsewhere along the Great Western Highway in the Blue Mountains. A matching precast concrete capping unit should be used at the top of all reinforced soil walls, except where a road safety barrier is required to be integrated with the wall. Where the retaining wall is highly visible alternative finish colours could be considered.</td>
<td>The simple design expression and recessive colour allow the visual character of the surrounding bushland to dominate. This will also help to make the walls visually recede when viewed from a distance.</td>
</tr>
</tbody>
</table>

Table 4.2 provides a summary of recommendations for retaining walls included in the road concept design.

### Table 4.2: Summary of recommendations for retaining walls included in the road concept design.

<table>
<thead>
<tr>
<th>REFERENCE NUMBER</th>
<th>APPROX. CHAINAGE</th>
<th>DESCRIPTION</th>
<th>LENGTH (m)</th>
<th>MAX. HEIGHT (m)</th>
<th>PROPOSED WALL TYPE (STRUCTURAL)</th>
<th>FACED WALL TYPE</th>
<th>FACED LANDSCAPE</th>
<th>RECOMMENDED FINISH</th>
</tr>
</thead>
<tbody>
<tr>
<td>RW01</td>
<td>25740 to 25850</td>
<td>Wall below the eastbound carriageway.</td>
<td>110</td>
<td>1.7</td>
<td>Solid pile or reinforced soil wall.</td>
<td>Precast concrete panels with exposed basalt finish.</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>RW02</td>
<td>25917 to 25970</td>
<td>Wall below the eastbound carriageway.</td>
<td>53</td>
<td>3.6</td>
<td>Solid pile or reinforced soil wall.</td>
<td>Precast concrete panels with exposed basalt finish.</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>RW03</td>
<td>26015 to 26015</td>
<td>Wall below the eastbound carriageway.</td>
<td>90</td>
<td>2.6</td>
<td>Solid pile or reinforced soil wall.</td>
<td>Precast concrete panels with exposed basalt finish.</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>RW04</td>
<td>26300 to 26500</td>
<td>Wall below the eastbound carriageway.</td>
<td>200</td>
<td>7.5</td>
<td>Solid pile or reinforced soil wall.</td>
<td>Precast concrete panels with exposed basalt finish.</td>
<td>•</td>
<td></td>
</tr>
</tbody>
</table>
**CUTTINGS**

The following recommendations are for all cuttings along the highway upgrade.

Table 4.3: Summary of urban design recommendations for cuttings.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>RECOMMENDATIONS</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting finish</td>
<td>¬ Where roadside cuttings are required, the natural rock surface should be maintained wherever possible. Fissures and springs would be in-filled with either quarry rock, stabilised vegetation or shotcrete.</td>
<td>¬ Maintaining the natural rock cutting face allows the geological character of the local landscape to be expressed in the highway corridor, providing a strong sense of place.</td>
</tr>
<tr>
<td></td>
<td>¬ Where the cutting face needs to be stabilised, rock anchors are preferred over shotcrete as they allow the natural rock to remain visible.</td>
<td>¬ Use of quarry rock sourced from the site provides a consistency of rock colour.</td>
</tr>
<tr>
<td></td>
<td>¬ The use of shotcrete is to be avoided unless absolutely necessary. Where shotcrete is required, its application is to be designed to minimise its visibility. Techniques include matching the colour of the concrete to the surrounding rock, and recessing the shotcrete from the cutting face. Refer the Roads and Maritime Shotcrete Design Guidelines.</td>
<td>¬ Revegetation of cut batters should be undertaken where rock is very weak or friable and likely to require significant stabilisation. Rock surface should then be ripped and a soil medium and revegetative overlay provided.</td>
</tr>
<tr>
<td>Cutting profile</td>
<td>¬ Cutting angles should be as steep as possible, while taking into account the geotechnical constraints of each particular cutting location.</td>
<td>¬ Steep cutting angles and fewer benches reduce the overall footprint of the cutting, which in turn minimises impacts on the surrounding landscape.</td>
</tr>
<tr>
<td></td>
<td>¬ The top batters of cuttings are to be ‘rounded’ over and may often consist of residual soils, which are to be revegetated.</td>
<td>¬ Batter rounding both over and back allows for less abrupt integration with existing landform and reduces visible impact when viewed from expected road user viewing angles.</td>
</tr>
<tr>
<td></td>
<td>¬ Sides of cuttings are to be shaped back into the existing landform and progressively laid back in order to integrate with the existing contours.</td>
<td></td>
</tr>
<tr>
<td>Shoulder of cutting</td>
<td>¬ Wherever possible, provide rounding of the top edges of all batters.</td>
<td>¬ Rounding visually softens the edges of cut batters to assist with better integration with existing landform.</td>
</tr>
<tr>
<td>Toe of cutting</td>
<td>¬ Wherever possible, provide space at the base of cuttings for grassing. In such cases, over-excavation is required to provide a suitable depth planting medium.</td>
<td>¬ Grassing at the base of cuttings allow the cuttings to be integrated with the character of the surrounding landscape.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>¬ A grassing area at the base of a cutting can also function as a space to capture any loose material that is eroded from the cutting before it reaches the road surface.</td>
</tr>
</tbody>
</table>

Plate 4.1: Detail of the typical precast concrete facing panels used for reinforced soil walls along the Great Western Highway in the Blue Mountains.

Plate 4.2: If shotcrete is necessary, colour and texture match the surrounding rock, such as in this example at Mount Victoria Pass.
**FILL EMBANKMENTS**

The following recommendations are for all embankments along the highway upgrade.

Table 4.4: Summary of urban design recommendations for fill embankments.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>RECOMMENDATIONS</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generally</td>
<td>¬ Fill embankments do not generally impact on the road user as they are located below the road level. They do however provide, through the elevation of the road, an opportunity to promote views of the broader landscape.</td>
<td>¬ In open areas, limit tree planting to clusters to ensure vistas through to the broader landscape.</td>
</tr>
<tr>
<td></td>
<td>¬ Views of the fill embankment from the broader landscape also need to be considered.</td>
<td>¬ Views from the road improve the driving experience, sense of place and orientation.</td>
</tr>
<tr>
<td></td>
<td>¬ Views from the road can be improved where the embankments are integrated with the existing landscape through shaping and revegetation.</td>
<td>¬ Views of the road can be improved where the embankments are integrated with the existing landscape through shaping and revegetation.</td>
</tr>
<tr>
<td>In bushland areas</td>
<td>¬ Minimise the extent of fill embankments.</td>
<td>¬ Minimising the physical footprint of the highway reduces the need for clearing of native vegetation in bushland areas.</td>
</tr>
<tr>
<td></td>
<td>¬ In all cases, ensure that the slope angles on embankments facilitate planting. In general, a slope of 2H:1V is the steepest allowable in order to maintain several revegetation options e.g., planting.</td>
<td>¬ Revegetation of embankments allows for better integration of the embankments with the character of the surrounding landscape.</td>
</tr>
<tr>
<td></td>
<td>¬ Minimising the physical footprint of the highway reduces the need for clearing of native vegetation in bushland areas.</td>
<td>¬ Revegetation of embankments allows for better integration of the embankments with the character of the surrounding landscape.</td>
</tr>
<tr>
<td></td>
<td>¬ Revegetation of embankments allows for better integration of the embankments with the character of the surrounding landscape.</td>
<td>¬ A variety of possible revegetation techniques provides a contingency where one method may be more suitable than another.</td>
</tr>
<tr>
<td></td>
<td>¬ Flattening of batters creates a larger surface area of revegetation to occur. Do not flatten batters where additional tree loss would result as existing trees provide better initial screening than new revegetation.</td>
<td>¬ Revegetation of embankments allows for better integration of the embankments with the character of the surrounding landscape. This is further improved where vegetation is matched to the surrounding vegetation.</td>
</tr>
<tr>
<td>Outside of bushland areas</td>
<td>¬ Embankments in agricultural areas should be vegetated using species that corresponds to the adjoining landscape.</td>
<td>¬ Revegetation of embankments allows for better integration of the embankments with the character of the surrounding landscape. This is further improved where vegetation is matched to the surrounding vegetation.</td>
</tr>
<tr>
<td></td>
<td>¬ Two general responses are recommended: 1. Where the existing landform is relatively flat and space permits, provide a flatter embankment profile (4H:1V) or flatters to better fit with the surrounding landform.</td>
<td>¬ Revegetation of embankments allows for better integration of the embankments with the character of the surrounding landscape. This is further improved where vegetation is matched to the surrounding vegetation.</td>
</tr>
<tr>
<td></td>
<td>2. Where the existing landform is steep or where space is limited, provide steeper embankments to minimise extent. In all cases a minimum angle of 2H:1V is preferred to facilitate planting.</td>
<td>¬ Revegetation of embankments allows for better integration of the embankments with the character of the surrounding landscape. This is further improved where vegetation is matched to the surrounding vegetation.</td>
</tr>
</tbody>
</table>
### Table 4.5: Summary of recommendations for roadside elements within the road corridor.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>LOCATION</th>
<th>RECOMMENDATION</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BARRIERS, FENCES AND BALUSTRADES</strong></td>
<td>At the top of fill embankments and other roadside situations</td>
<td>Either W Beam guard rail or wire rope barrier as appropriate for the situation. Either barrier type should preferably be used in conjunction with planting behind. Where space is limited or where maximum visual transparency is required, the modified concrete barrier (type F) with twin rail bridge barrier should be used.</td>
<td>~ Facilitate views from the highway to the surrounding landscape, to provide a sense of connection to the local area.</td>
</tr>
<tr>
<td>Property fences</td>
<td>Where property fences are required to be replaced or relocated, they should be similar in style to existing. The use of solid fences are to be avoided.</td>
<td>~ Maintain and reinforce the existing village character by retaining a mix of individual fence styles. ~ Minimise the height of fences wherever possible. ~ Reduce the visual dominance of fences.</td>
<td></td>
</tr>
<tr>
<td>Balustrades</td>
<td>Vertical black steel rods, 1.4m high as per standard use throughout the Blue Mountains.</td>
<td>~ Reduce the visual dominance of balustrades. ~ Provides transparency to allow for adjoining vegetation to add to the character of pathways and roadways.</td>
<td></td>
</tr>
<tr>
<td><strong>LIGHTING</strong></td>
<td>Limit to major intersections or points of interest</td>
<td>Lighting to be minimised to meet requirements set out in AS1158. Ensure uniformity in size, height and spacing of lights. Use galvanised steel light posts, black or dark grey finish.</td>
<td>~ Reduce visual dominance of the works, to retain the rural character.</td>
</tr>
<tr>
<td><strong>SIGNAGE</strong></td>
<td>All areas</td>
<td>There needs to be a balance of regulatory signage and local information signage as part of the works.</td>
<td>~ The need for signage within the highway corridor should be appropriate and suitable within the context of Hartley Valley.</td>
</tr>
<tr>
<td><strong>DRAINAGE CHANNELS</strong></td>
<td>All areas</td>
<td>Drainage channels should be designed to visually integrate with their surroundings. Those at the top of cutting benches should be rock lined while visible roadside channels and channels in the median should be vegetated.</td>
<td>~ To treat run-off at or near the source and avoid the need for large detention basins elsewhere. ~ Reduce the visual dominance of drainage channels.</td>
</tr>
</tbody>
</table>

Roadside elements are ancillary items necessary for the effective operation of the roadway. These typically include roadside safety barriers, kerbs, lighting and drainage channels. The urban design recommendations presented in Table 4.5 are provided for these roadside elements and street furniture as they can contribute positively to the character of both the roadway and the local landscape. These recommendations would be refined further during detailed design and would inform the urban design and landscape plan for the project.
4.5 PLANTING

PLANTING DESIGN
The general approach to the planting design for this project is to integrate the new works into the existing landscape setting and to further define and reinforce the unique landscape character zones through the Hartley Valley. In order to do this the planting must strike a balance between screening the works from sensitive visual receptors and maintaining and enhancing key views and vistas to the surrounding landscape.

PLANTING DESIGN PRINCIPLES
The planting concept has been guided by the following design principles:

• Retain existing woodland planting where possible.
• Revegetation of all areas affected by the new works.
• Revegetation of residual land affected by the works that would not be viable for amalgamation.
• Provision of “gateway” planting at key intersections and important cultural areas to provide visual landmarks and enhance local identity.
• Provision of tree planting in verges wherever possible to help minimise the visual scale of the highway and reinforce country road character.
• Provision of planting on fill embankments and shallow cut batters to stabilise the earthworks, minimise their visual impact and integrate them with the character of the surrounding landscape.
• Provision of planting to screen the works from sensitive adjacent land uses wherever possible.
• Use of provenance plant material (plants grown from locally collected seeds) wherever possible for all native plantings, in particular native revegetation.

At the detailed planting design stage, which would include further refinement of the plant species selection, particular consideration should be made for ongoing maintenance requirements. Principles include:

• Selection of plant species that are robust, non-invasive and not fire-promoting.
• Use of local provenance plant material for native revegetation plantings.
• Use of species climatically suited to the local area for cultural plantings.
• Exclusion of all species on weed lists applicable to the local area.

Placement and species selection for planting within the road corridor (e.g. medians and verges) to be in accordance with clear zone and sight stopping distance requirements.

INDICATIVE PLANTING PALETTE
An indicative planting palette has been developed for the landscape and urban design strategy which provides the framework for detailed species selection and planting design during the detailed design phase. The indicative planting palette has been divided into two character types: native plantings and cultural (exotic) plantings. The planting concept is predominantly characterised by native plantings, with cultural plantings to highlight key cultural areas and entries to towns.

Following are indicative species for the native plantings and cultural plantings. The indicative palette for cultural plantings is based on exotic species already present in the local area, the aim being to reinforce existing local character. The native planting palette is based of the vegetation communities found along the preferred route corridor. Ten vegetation communities were mapped as part of the Biodiversity Corridor Study (Mount Victoria to Lithgow Alliance 2011), four of which are located in the study area. These vegetation communities are summarised in Table 4.6.

4.6 URBAN DESIGN STRATEGY PLANS

The following preliminary plans and sections indicatively illustrate the urban design proposal at selected key locations within the study area, including the Rosedale and Nicka Frontage, the Coxs River Road / Ambermere Drive intersection, Baerers Lane intersection, Historic Hartley Village, and Jenolan Caves road intersection. The strategies outlined have been developed as part of the road design and attempt to retain the existing character of the corridor at these locations and its connections and relationships to adjoining areas.
### Table 4.6: Existing vegetation communities (information and map unit classifications from Biodiversity Corridor Study)

<table>
<thead>
<tr>
<th>MAP UNIT</th>
<th>COMMUNITY</th>
<th>DOMINANT CANOPY SPECIES</th>
<th>OTHER CANOPY SPECIES</th>
<th>DOMINANT SHRUB SPECIES</th>
<th>COMMON GROUNDCOVER SPECIES</th>
<th>IMAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAP UNIT 5</td>
<td>MONKEY GUM - SYDNEY PEPPERMINT OPEN FOREST</td>
<td>Eucalyptus bloxlandii, Eucalyptus globulus</td>
<td>Eucalyptus blaxlandii, Acacia falciformis, Eucalyptus globulus</td>
<td>Burania speciosa subsp. leucophylla, Leucopogon lanceolatus, Lamotia saligna, Leptospermum polygalifolium, Podostemum flabelliforme, Hibbertia aspera, Pericallis esculentum</td>
<td>Joycea caffra, Bletilla striata, Pseuderanthemum hirtifolium, Poa spp., Hydrocotyle lasioides, Clematis glycyrrhiza, Antirrhinum majus, Pomoa umbellata, Dionella caerulea</td>
<td>Left to right: Eucalyptus blaxlandii (Blaxland’s Stringy Bark), Eucalyptus globulus (Mountain Grey Gum)</td>
</tr>
<tr>
<td>MAP UNIT 6</td>
<td>RIBBON GUM/WOODLAND</td>
<td>Eucalyptus viminalis</td>
<td>Eucalyptus dives, Eucalyptus blaxlandii, Acacia falciformis</td>
<td>Acacia melanoxylon, Pericallis esculentum, Persoonia linearis</td>
<td>Hydrocotyle lasioides, Microlaena atropurpurea, Themeda australis, Austrodanthonia spp., Acana nova-zelandiae, Geranium solanderi, Pterostylis reflexa, Aschersonia exserta</td>
<td>Eucalyptus viminalis (Manna Gum)</td>
</tr>
<tr>
<td>MAP UNIT 7</td>
<td>RIVER OAK FOREST</td>
<td>Casuarina cunninghamii</td>
<td>Callicoma serratifolia, Grevillea asplenioides</td>
<td>Acacia dealbata</td>
<td>Microlaena atropurpurea, Lomandra longifolia, Dichondra repens</td>
<td>Casuarina cunninghamii (River She Oak)</td>
</tr>
<tr>
<td>MAP UNIT 10</td>
<td>BRITTLE GUM - STRINGYBARK WOODLAND</td>
<td>Eucalyptus mannifera, Eucalyptus globulus, Eucalyptus eugenioides</td>
<td>Acacia falciformis</td>
<td>Daviesia lutea, Acacia baileyana, Brachylymenium daphnoides, Acacia terminalis, Cassinia sp., Exocarpos cupressiformis</td>
<td>Themeda australis, Austrostipa rustica, Austrodanthonia spp., Hardenbergia violacea</td>
<td>Left to right: Eucalyptus mannifera (Brittle Gum), Eucalyptus globulus (Mountain Grey Gum), Eucalyptus eugenioides (Thin Leaved Stringy Bark)</td>
</tr>
</tbody>
</table>
Figure 4.1: Key Plan 1 - 'Rosedale' and 'Nioka'
KEY PLAN 1 - 'ROSEDALE' AND 'NIOKA'

1. Retain existing Pine trees on the northern side of the highway. If this is not possible due to construction activities, replace with the same species.
2. Retain existing native vegetation on both sides of the highway.
3. Retain existing exotic vegetation within private properties.
4. Provide new native shrub and groundcover planting to embankments adjacent to existing native plantings.
5. Provide new exotic planting to the entrance to 'Rosedale' to replace those to be removed, in consultation with the property owners.
6. Maintain open views to Mount York from 'Rosedale'.
7. Provide pasture grasses to embankments to retain existing character.

Figure 4.2: Existing section 'K' at chainage 20960

Figure 4.3: Proposed section 'K' at chainage 20960
Figure 4.4: Key Plan 2 - Coxs River Road and Ambermere Drive
KEY PLAN 2 - COXS RIVER ROAD AND AMBERMERE DRIVE

1. Retain existing roadside planting and revegetate embankment with native shrub and groundcover planting.
2. Retain existing rolling paddock character of the intersection by reinstating pasture grasses to embankments and to the site compound area following construction.
3. Provide new native tree planting to provide shade to the bus stop west of Ambermere Drive.

Figure 4.5: Existing section 'B' at chainage 22260

Figure 4.6: Proposed section 'B' at chainage 22260
Figure 4.7: Key Plan 3 - Baaners Lane and Browns Gap Road
KEY PLAN 3 - BAANERS LANE AND BROWNS GAP ROAD

1. Provide new native tree planting to replace those to be removed at the Baaners Lane intersection.

2. Restore pasture grasses to new embankments to retain existing roadside character.

3. Provide new native tree, shrub and groundcover planting on both sides of the highway to replace vegetation to be removed, to restore the enclosed bushland character in this small section of the highway.

4. Provide new native tree, shrub and groundcover planting to the eastern side of the Browns Gap Road intersection to replicate the planting on the opposite side.

5. Retain as many existing native trees as possible by reducing the width of the disturbed area west of Browns Gap Road.
Figure 4.10: Key Plan 4 - Hartley Historic Village
KEY PLAN 4 - HARTLEY HISTORIC VILLAGE

1. Retain existing Poplar trees that denote the exit from the highway into Hartley Historic Village.
2. Provide pasture grasses to the embankments and to the section of old road pavement to maintain existing character and maintain views to the village from the west.
3. Provide native tree planting to the base of the retaining wall to screen the wall to viewers from the west whilst still allowing views to the village.
4. Provide low native groundcover planting to the batter slope above the retaining wall.

Figure 4.11: Existing section 'D' at chainage 26410

Figure 4.12: Proposed section 'D' at chainage 26410
Figure 4.13: Key Plan 5 - Jenolan Caves Road
KEY PLAN 5 - JENOLAN CAVES ROAD

1. Minimise the width of the disturbed area where possible to retain the maximum amount of existing vegetation and enclosed bushland character of this area.

2. Provide tree shrub and groundcover planting to the site compound area at the completion of construction. Maintain existing vehicular access.

3. Provide frangible shrub and groundcover planting to verges where vegetation has been removed, within the clear zone.

Figure 4.14: Existing section ‘E’ at chainage 27360

Figure 4.15: Proposed section ‘E’ at chainage 27360
Figure 5.1: The three Landscape Character Zones (LCZs)
5. LANDSCAPE CHARACTER IMPACT

5.1 LANDSCAPE CHARACTER ASSESSMENT METHODOLOGY

INTRODUCTION
Roads and Maritime’s ‘Guideline for Landscape Character and Visual Impact Assessment’ (Roads and Maritime, 2013) provides the following definition of landscape character:
‘The combined quality of built, natural and cultural aspects that make up an area and provide its unique sense of place’.
Applying this definition to the specific conditions within the study area, and the features of the proposal, the landscape character assessment also considers how the area is used and how it functions as a part of the overall Great Western Highway.

LANDSCAPE CHARACTER ZONES
The study area has been divided into three Landscape Character Zones (LCZ) as illustrated in Figure 5.1. The zones correspond to landscape character types in the area and allow for a more detailed discussion of the character of each zone, of the proposal within it, and of the likely impact on the landscape character to be experienced as a result of the proposal. Each zone has been defined through the development of an understanding of land use, topography, and vegetation in combination with other factors.
The three Landscape Character Zones are:
> LCZ 1. Butlers Creek valley.
> LCZ 2. Hartley ridge.

Generally, the existing landscape character of this section of the Great Western Highway is rural with large expanses of rolling farmland. There are large stands of native vegetation on both sides of the highway within the valley, and on the slopes of Mount Victoria, Mount York and Hassano Walls. This combines to provide an overall open, rural character with some areas enclosed by woodland, particularly at either end of the study area.

LANDSCAPE CHARACTER ASSESSMENT
The landscape character zones facilitate detailed assessment of the character of the study area, of the proposal within it, and of the magnitude, sensitivity and impact likely on the landscape character of each zone to be experienced as a result of the proposal.

Magnitude
In landscape character assessment, magnitude refers to the type of proposal and its compatibility with the existing landscape character. All anticipated elements of the proposal, including the alignment, road infrastructure, planting, lighting, etc, are considered. The scale of elements (height, length), as well as its location or setting (within woodland, rural land, or over creek crossings), all have a bearing on the magnitude of the physical presence of the proposal.
A high magnitude results if the proposal is a major development or piece of road infrastructure and contrasts highly with the surrounding landscape, or entails heavy modification of the existing landscape, for example, the large scale removal of existing vegetation. A moderate magnitude rating would result if the proposal is moderately integrated into the landscape. A low magnitude rating would occur if the proposal is of a small scale and integrates well into the landscape.
The magnitude impact rating also considers whether the proposal has a positive or negative impact on the landscape character of the zone. For example, a proposal may be of a large scale but may provide beneficial outcomes such as increased open space, enhancement of the areas ‘sense of place’, better connectivity and a safer road environment.

Sensitivity
Sensitivity refers to how sensitive the character of the setting is to the proposed change. A judgement has been made as to the quality of the landscape, its cultural and historical importance to the community, scenic quality, and overall composition of the place and its inhabitants. The following sensitivity judgements have been used as the basis for this assessment:
• Places with high social, recreational, and historical significance to local residents have higher sensitivity.
• Generally, water and natural environments are more highly valued than modified areas, though views over rolling farmland are still highly valued.
• Areas of unique scenic quality have higher sensitivity.
• A pristine environment would have greater sensitivity with less ability to absorb new elements in the landscape than modified landscapes or those areas with contrast and variety of landscape types.

Impact
Impact is the combination of the magnitude and sensitivity rating in accordance with the Impact Assessment Grading Matrix (refer to Figure 1.2).
5.2 LCZ 1: BUTLERS CREEK VALLEY

EXISTING LANDSCAPE CHARACTER
The character of this section of the highway is generally that of a country road with some open areas and others enclosed by native and exotic vegetation. The attributes that make up LCZ 1 are described below.

Topography
The highway alignment which is steep and winding as it leaves Victoria Pass, has a more gently undulating grade in this zone. There is one sizable cut embankment as the road approaches Little Hartley.

Built Form and Heritage
The land in this zone is predominately rural and is enclosed by the Mount York and Sugarloaf Mountain escarpments, which, along with stands of native vegetation, define the extent of the rural landscape. A small number of rural residential properties are located to the south of the highway, including a cluster of holiday cabins.

There are a number of heritage listed buildings adjoining the highway, including Rosedale, Nioka, Billesdene Grange and Log Cabin Farmhouse.

Spatial Quality
The spatial quality of the highway driving experience is varied. The highway is generally slightly enclosed by native and exotic roadside vegetation. There are also some minor and one sizeable cut embankments to the west of the zone, adding to the sense of enclosure. Further to the west, the highway opens as it moves into LCZ 2.

Vegetation
Roadside vegetation consists of a mixture of native and exotic trees, particularly pines. Dense native vegetation is located at the eastern end of the zone including Monkey Gum-Sydney Peppermint Open Forest on the slopes of Mount York and Ribbon Gum Woodland on the north south spur from Sugarloaf Mountain.

Connectivity and Access
There is no formal pedestrian access in this zone. Vehicular access to the residential properties is directly from the highway. There are no other public roads intersecting with the highway.

Road Environment
The highway is a generally flat two lane road, becoming two lanes eastbound, one lane westbound prior to its ascent up Victoria Pass. There are slight horizontal curves to the road. The posted speed is 80km/h in both directions.
**THE PROPOSAL**

The proposal in LCZ 1 is summarised as:

- Shoulder widening and type SO gutter to both sides of the highway.
- The installation of wire rope and w beam barriers where required to meet safety codes.
- Generally minor trimming to cut and fill embankments.
- A more substantial fill embankment occurs at the base of Mount Victoria Pass on the southern side of the highway.
- Reforming of the existing cutting between chainage 21360 and 21410.
- The removal of existing vegetation within the construction zone (generally 5 metres beyond the top and bottom of embankments).

**PROPOSED LANDSCAPE CHARACTER**

Landscape character changes and affects to LCZ 1 that would result from the project are described below.

**Topography**

The overall vertical grade of the road would remain the same. Existing cut and fill embankments would be reshaped to account for the widening of the road pavement.

**Built Form and Heritage**

The proposal would not impact on the existing properties or heritage buildings in this zone.

**Spatial Quality**

The spatial quality of the highway experience would remain similar. The highway would open in some areas, in particular at around chainage 21500, where the road slightly widens and the cut batter is extended and some trees removed.

**Vegetation**

Some roadside vegetation would be removed on the northern side of the road in the vicinity of Rosedale. Due to clear zone requirements, any replacement planting to the cut embankments in this location would be frangible.

**Connectivity and Access**

No pedestrian access is proposed.

**Road Environment**

The road environment would alter slightly with the widening of road shoulders. The lane configuration and posted speed would remain the same.

**Construction Activities**

During construction, an area of cleared land on the northern side of the highway, at about chainage 20350, would be used as a stockpile site. The site would be surrounded by temporary fencing. Following construction, the site would be dismantled and revegetated with Monkey Gum-Sydney Peppermint Open Forest species.

**LANDSCAPE CHARACTER ASSESSMENT**

**Sensitivity**

Despite being a modified landscape, the zone has an attractive rural scenic character; and the gently winding highway is predominately lined with exotic trees and woodland species, heightening the country/rural driving experience. As a result, the sensitivity of the zone to the proposal is assessed to be **Moderate**.

**Magnitude**

The proposal slightly increases the amount of road pavement, and would require minor earthworks to reshape existing cut and fill embankments, which would encroach onto adjoining open paddocks to the south. A moderate amount of roadside vegetation to the north would be removed. New shrub planting (and trees where possible) would be undertaken on the embankments, reinstating the character of the road over time as they mature.

Overall, the qualitative assessment indicates that the magnitude of the proposal would be **Low**.

**Landscape Character Impact**

The qualitative assessment indicates that the landscape character impact of the project in this zone is likely to be **Moderate to Low**.

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnitude</td>
<td>Low</td>
</tr>
<tr>
<td>Landscape Character Impact</td>
<td>Moderate to Low</td>
</tr>
</tbody>
</table>

**Plate 5.5:** Great Western Highway looking east near Rosedale

**Plate 5.6:** Great Western Highway looking west to the cutting at chainage 21340
5.3 LCZ 2: HARTLEY RIDGE

EXISTING LANDSCAPE CHARACTER

The character of this section of the highway is generally that of a rural road travelling through a picturesque valley. The attributes that make up LCZ 2 are described below.

Topography
The highway travels along the south western edge of the base of the Hartley Valley. The landform is gently undulating and there are only minor cut and fill embankments on the road edge.

Built Form and Heritage
The valley in this zone contains many smaller rural properties. These are located off a number of smaller roads in the valley including Coxs River Road and Baaners Lane to the south and Ambermere Drive and Mid Hartley Road to the north. There are a number of heritage listed buildings adjoining the highway, including Ambermere, Harp of Erin and Meades Farm.

Spatial Quality
The spatial quality of the landscape driving experience is generally open. Good views are available over the Hartley Valley from the highway over the majority of the zone, along with long distance views to the surrounding escarpments. There are occasional stands of roadside trees that break up the openness of the zone.

Vegetation
Roadside vegetation is generally a mixture of exotic and native trees. There are large stands of Brittle Gum-Stringybark Woodland near Browns Gap Road and Mid Hartley Road.

Connectivity and Access
A number of roads intersect the highway in this zone. Roads such as Browns Gap Road and Coxs River Road provide connections for travel further afield, while other roads provide access to the many properties located within the Hartley Valley. No formal pedestrian or cycle access is provided.

Road Environment
The highway is a generally flat, gently curving two lane road, becoming two lanes westbound and two lanes eastbound about 350 metres east of Mid Hartley Road, then becoming one lane westbound and two lanes eastbound about 125 metres west of Mid Hartley Road. The posted speed is 80km/h in both directions.

Plate 5.7: Great Western Highway looking west to Coxs River Road intersection
Plate 5.8: Great Western Highway looking east near ‘Adam’s Shed’
Plate 5.9: Great Western Highway looking west to Baaners Lane intersection
Plate 5.10: View to Ambermere
THE PROPOSAL
The proposal in LCZ 2 is summarised as:
• Shoulder widening and type SO gutter to both sides of the highway.
• The installation of wire rope and W beam barriers where required to meet safety codes.
• Generally minor trimming to cut and fill embankments.
• More substantial fill embankment occurs between chainage 21900 and 22160 on the northern side, and to the north western side of the Browns Gap Road intersection.
• Intersection upgrades at Coxs River Road/Ambermere Drive, Baaners Lane, Browns Gap Road and Mid Hartley Road.
• Realignment of the highway centreline 12 metres to the south in the vicinity of Adam’s Shed.
• The removal of existing vegetation within the construction zone (generally 5 metres beyond the top and bottom of embankments).

PROPOSED LANDSCAPE CHARACTER
Landscape character changes and affects to LCZ 2 that would result from the project are described below.

Topography
The overall vertical grade of the road would remain the same. Existing minor cut and fill embankments would be reshaped to account for the widening of the road pavement.

Built Form and Heritage
The proposal would not impact on the existing properties or heritage buildings in this zone.

Spatial Quality
The spatial quality of the highway experience would remain similar. The highway would open where the trees are to be removed at the Baaners Lane and Browns Gap Road intersections. Planting would be reinstated to mark the approach to these intersections.

Vegetation
Some roadside vegetation would be removed on both sides of the road around the Baaners Lane and Browns Gap Road intersections. Due to dear zone requirements, any replacement planting to the cut embankments in this location would be fragile.

Connectivity and Access
Upgrades to the intersections of Coxs River Road, Ambermere Drive, Baaners Lane and Browns Gap Road would be undertaken to improve sight distance and provide dedicated turning lanes. Coxs River Road would be realigned. No pedestrian access is proposed.

Road Environment
The road environment would alter slightly with the widening of road shoulders and the intersection upgrades. The general lane configuration and posted speed would remain the same.

Construction Activities
During construction, land east of Coxs River Road would be used as a stockpile and compound site, temporarily impacting on the rural character of the zone. The site would be surrounded by temporary fencing and consist of storage facilities, site buildings and stockpile area. A site east of Browns Gap Road would also be used as a stockpile site. Following construction, the sites would be dismantled and restored to their pre-construction state.

LANDSCAPE CHARACTER ASSESSMENT
Sensitivity
This zone typifies the experience of travelling through the Hartley Valley with its extensive views over rolling pastures dotted with properties and glistening dams, to dramatic escarpments. These views are broken up by roadside planting and stands native woodland. The experience is highly valued and as a result, the sensitivity of the zone to the proposal is assessed to be Moderate.

Magnitude
The proposal slightly increases the amount of road pavement, and would require minor earthworks to reshape existing cut and fill embankments. New shrub planting (and trees where possible) would be undertaken on the embankments, reinstating the character of the road over time as they mature. The intersection upgrades locally increase the scale of the road and require the removal of a number of trees, however there is the possibility to provide tree planting at the realigned Coxs River Road intersection.

Overall, the qualitative assessment indicates that the magnitude of the proposal would be Low.

Landscape Character Impact
The qualitative assessment indicates that the landscape character impact of the project in this zone is likely to be Moderate to Low.

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnitude</td>
<td>Low</td>
</tr>
<tr>
<td>Landscape Character Impact</td>
<td>Moderate to Low</td>
</tr>
</tbody>
</table>
5.4 LCZ 3: RIVER LETT VALLEY

EXISTING LANDSCAPE CHARACTER
The character of this section of the highway is generally that of a winding country road enclosed by bush. The attributes that make up LCZ 3 are described below.

Topography
The grade of the highway steepens in this zone as it approaches the River Lett, and then winds steeply up the River Lett Hill. The surrounding landscape topography is generally steeper in this zone.

Built Form and Heritage
There are fewer residential properties in this zone, than the previous zones, and most are located away from the highway, except for two dwellings in Historic Hartley Village and three houses off Kelly Street.

Historic Hartley Village is an important site containing a number of heritage buildings, and attracts tourists on a regular basis. The site is visually prominent to those travelling east.

Spatial Quality
The highway in this zone is adjoined by a large stand of native vegetation west of the River Lett, however the highway-spatial experience is open due to the general three lane width of road pavement. There is a greater sense of enclosure as the highway heads east over the River Lett where it reduces to two lanes. The road opens again to the north as it climbs River Lett Hill providing views over the surrounding landscape.

Vegetation
The road corridor is generally well vegetated. West of the River Lett, a large stand of Ribbon Gum Woodland adjoins the highway. River Oak Forest occurs at the River Lett bridge crossing.

Connectivity and Access
Jenolan Caves Road is the major road access, linking the highway to the southern tablelands. Other roads, such as Carroll Drive, Kelly Street and Blackmans Creek Road, service properties in the zone. Old Bathurst Road allows access to Historic Hartley Village. No formal pedestrian or cycle access is provided.

Road Environment
The highway is a generally moderately to steeply graded, curving road. It comprises two lanes eastbound and one lane westbound to just west of Old Bathurst Road, then it becomes one lane in each direction to just east of Jenolan Caves Road where it becomes one lane eastbound and two lanes westbound. The posted speed is 80km/h in both directions.

Plate 5.13: View to the Hartley Historic Village barrier from the edge of Old Bathurst Road
Plate 5.14: View to River Lett bridge from near the Royal Hotel
Plate 5.15: Old Bathurst Road, Historic Hartley Village, looking north east to the highway
Plate 5.16: Great Western Highway looking west, at River Lett bridge
THE PROPOSAL
The proposal in LCZ 3 is summarised as:
- Shoulder widening and type SO gutter to both sides of the highway.
- The installation of wire rope and w beam barriers where required to meet safety codes.
- General minor trimming to cut and fill embankments.
- Realignment of the barrier curve near Historic Hartley Village to provide larger curve radius.
- Four new retaining walls on the northern side of the highway opposite Historic Hartley Village.
- Intersection upgrades at Carroll Drive, Old Bathurst Road, Kelly Road, and Jenolan Caves Road.
- The removal of existing vegetation within the construction zone (generally 5 metres beyond the top and bottom of embankments).

PROPOSED LANDSCAPE CHARACTER
Landscape character changes and affects to LCZ 3 that would result from the project are described below.

Topography
The overall vertical grade of the road would remain the same. The barrier curve near Hartley Historic Village would be realigned to provide a safer alignment, requiring the construction of a new six metre high retaining wall, which would replace the existing grassed embankment.

Built Form and Heritage
The construction of a large retaining wall would provide a new built object where rolling grassland now exists. It would not be possible to plant in front of the wall due to space restrictions within the existing road reserve.

Spatial Quality
The spatial quality of the highway experience would remain similar. Minimal planting would be removed and the road pavement width would only slightly be increased.

Vegetation
Minimal vegetation would be required to be removed. A small number of trees would be removed due to the construction of the retaining wall.

Connectivity and Access
The Jenolan Caves Road intersection would be upgraded to improve sight distance and provide dedicated turning lanes. The left turn lane into Old Bathurst Road would be realigned. No pedestrian access is proposed.

Road Environment
The road environment would alter slightly with the widening of road shoulders, the intersection upgrades, and the realignment of the Hartley Historic Village barrier curve. The general lane configuration and posted speed would remain the same.

Construction Activities
During construction, an area of cleared land on the southern side of the highway, west of Jenolan Caves Road, would be used as a stockpile site. The site would be surrounded by temporary fencing. Following construction, the site would be dismantled and revegetated with Ribbon Gum Woodland species.

LANDSCAPE CHARACTER ASSESSMENT

Sensitivity
The existing road corridor is generally well vegetated with native woodland which has a high sensitivity. Historic Hartley Village is also a highly valued heritage site resulting in a Moderate sensitivity assessment of the zone.

Magnitude
The proposal slightly increases the amount of road pavement, and would require minor earthworks to reshape existing cut and fill embankments and a small number of trees to be removed. The large retaining wall would be over 6 metres at its highest point, making it the largest piece of road infrastructure in the proposal. It would be highly visible to nearby residents in Kelly Street and Walker Street, however it may potentially be screened from those at a distance by the existing Ribbon Gum Woodland. The intersection upgrades locally increase the scale of the roads.

Overall, the qualitative assessment indicates that the magnitude of the proposal would be Moderate.

Landscape Character Impact
The qualitative assessment indicates that the landscape character impact of the project in this zone is likely to be Moderate.
5.5 SUMMARY OF LANDSCAPE CHARACTER IMPACTS

The landscape character impact assessment of the proposal described above, represents a qualitative assessment based on the three Landscape Character Zones (LCZ). The results of these assessments range from Moderately Low to Moderate and are summarised in the following table.

<table>
<thead>
<tr>
<th>Landscape Character Zone</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Landscape Character Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCZ 1: Butlers Creek Valley</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderately Low</td>
</tr>
<tr>
<td>LCZ 2: Hartley Ridge</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderately Low</td>
</tr>
<tr>
<td>LCZ 3: River Lett Valley</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Overall, the proposal would have an adverse impact on landscape character. While the proposal, for the most part, is to take place in an established road corridor, it would impact on all Landscape Character Zones to some degree, due to the removal of trees, road realignments and intersection upgrades. As all zones have a similar scenic quality, the greatest impacts are found in the areas where the scale of the proposal is more substantial, for example, the intersection upgrades in LCZ 2 and the extensive retaining wall realignment of the barrier curve in LCZ 3.

Whilst the magnitude of some of the proposal would represent moderate adverse changes within this scenic rural setting, it will be important to reinstate the attributes that make the landscape character of the Hartley Valley special. This particularly applies to the replanting of roadside trees that would be lost during the upgrade works.
6. VISUAL IMPACT

6.1 VISUAL IMPACT METHODOLOGY

OVERVIEW
The potential visual impact of the proposal has been assessed in relation to a number of key viewpoints. It is based on the existing pattern of land use and development adjoining the road corridor. The method of assessment involved:

• Defining the scale or size, form and type of proposal within the context of the study area.
• Establishing an estimated visual catchment, through desktop analysis and groundtruthing on site.
• Identifying key viewpoints from where the proposal would be visible.
• Assessing the level of potential visual impact on viewers at these viewpoints from the proposal.

THE PROPOSAL
All elements associated with the proposal are assessed as part of this visual impact assessment. These are described in Chapter 3.

VISUAL CATCHMENT
The extent from which the proposal would be visible from adjoining areas varies along the length of the study area. It is influenced by topography, vegetation, rural properties and associated buildings. A detailed field and desktop assessment was undertaken to determine the area from where the proposal would be visible, defined as the Visual Envelope Map (VEM), as illustrated in Figure 6.1.

Views to the proposal are generally constrained by the low ridgelines associated with the rolling landscape of the valley, and large stands of native vegetation. The visual receivers of the proposal include residents, tourists, pedestrians and motorists.

VIEWPOINT LOCATIONS
Within the VEM, key viewpoints have been identified along the road corridor and at public domain areas, for example, Hassans Walls Lookout and Mount York Lookout. This involved the analysis of views from the road to identify the extent to which houses and other buildings were visible. This provided an indication of the likely level of visibility from these buildings, as it was not feasible to inspect private residences to check potential views from these properties. Locations and directions of chosen viewpoints are representative of the range of viewpoints both within and beyond the road corridor and are indicated in Figure 6.1.

VISUAL IMPACT ASSESSMENT
The magnitude to existing views and the sensitivity of the viewer has been assessed for each of the chosen viewpoints.

Magnitude
Magnitude of change to existing views refers to the nature and scale of the proposal, and the extent and proximity of the view to it. Magnitude represents the contrast in scale, form and type of proposal to the location and context to which it is to be placed. A high magnitude results if the proposal is of a major scale and is considered out of scale or uncharacteristic of the existing visual character, or if there is considerable modification to the existing landscape. A moderate magnitude would result if the proposal is prominent but not considered to be substantially uncharacteristic with the existing visual character. A low magnitude results if there is minimal alteration to the existing view and the proposal is of a scale and nature that is consistent with the existing visual character.

Sensitivity
Sensitivity is the measure of the visual importance of the view and is dependent on:

• Distance between viewer and the proposal.
• The category of viewer, for example, residence, workplace, shops, open space.
• The elements of the proposal that are visible.
• Importance of the view, for example, identified in tourist guides, do people deliberately seek the view.

Visual sensitivity includes the consideration of the perceived cultural and historical values of the visual environment and the elements within it.

Generally, viewers with the highest sensitivity include:

• Communities that place high cultural and historical significance on the visual landscape.

Viewers with the lowest sensitivity are most likely to be:

• Employees focused on their work.
• Motorists whose attention is focused on driving.

Impact
Impact is the combination of the magnitude and sensitivity rating in accordance with the Impact Assessment Grading Matrix (refer to Figure 1.2).

The following pages contain a table quantifying the visual impact at each viewpoint. The gradings are measured on their impact relative to each other within the scope of the proposal rather than to an absolute scale covering all potential forms of impact.

KEY VIEWPOINTS
A total of 14 viewpoints have been identified on the basis of the criteria outlined above. Each viewpoint comprises the following summary information:

• Location.
• Existing site description.
• Viewpoint selection rationale.
• Visual impact based on assessment of magnitude and sensitivity.
• Mitigation measures that have been incorporated into the landscape and engineering designs.

The viewpoints are as indicated in Figure 6.1 and are listed from east to west.
Figure 6.1: Visual Envelope Map (VEM) illustrating the location of key viewpoints.
**VIEWPOINT 1**
Bardens Lookout, looking south west.

**Site description**
Bardens Lookout is a popular public lookout that provides spectacular 180° panoramic views over the dramatic natural and rural landscape of the area. The proposal site is located within the entire extent of the panorama, though the highway is not highly visible from this location due to its scale.

**Viewpoint selection**
This viewpoint is from the perspective of a lookout user and provides an elevated overview of the eastern end of the proposal. It is located approximately two kilometres from the highway.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mid distance view</td>
<td>Moderate</td>
<td>Moderate</td>
<td>The realignment of Coxs River Road would be visible. A number of Poplars, to the bottom left of the views, would be removed and part of the adjacent cutting would be regraded.</td>
</tr>
</tbody>
</table>

**VIEWPOINT 2**
Great Western Highway, chainage 20450, looking east.

**Site description**
The eastern end of the study area, looking east, as the highway begins its ascent up Victoria Pass. The dense native vegetation on the escarpment contrasts with the sporadic native and exotic roadside vegetation. There are a few residential properties and holiday cabins adjacent to the viewpoint.

**Viewpoint selection**
This viewpoint is from the perspective of motorists traveling east on the Great Western Highway. It addresses foreground views to Mount Victoria Pass and foreground views to the upgrade works.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Foreground view</td>
<td>Moderate</td>
<td>Moderate</td>
<td>The road alignment moves slightly to the south to increase the radius of the curve. A fill batter would be constructed to the south requiring the removal of a number of large native trees. The number of lanes and configuration remain the same.</td>
</tr>
</tbody>
</table>

Motorists would be affected by the changes, in particular the removal of the trees which frame the entrance to Victoria Pass. The motorists’ sensitivity would be considered moderate.
The highway is flanked by a cut embankment to the south associated with a spur running north from Sugarloaf Mountain, covered by native vegetation. To the north, a thin band of native and exotic vegetation lines the highway, with rolling paddocks beyond.

**Site description**

The highwa
y shoulders would be widened and asphalted resulting in the existing cut batter to be pushed back, graded at 0.5:1 and stabilised, and would require the removal of some trees at the top of the cutting.

**Viewpoint selection**

This viewpoint is from the perspective of motorists travelling west on the Great Western Highway. It addresses foreground views to the upgrade works.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Foreground view</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to Low</td>
</tr>
</tbody>
</table>

The highway shoulders would be widened and asphalted resulting in the existing cut batter to be pushed back, graded at 0.5:1 and stabilised, and would require the removal of some trees at the top of the cutting.

**Viewpoint selection**

This viewpoint is from the perspective of pedestrians and bus users awaiting the eastbound bus service. It addresses foreground views to the upgrade works, including the realignment of Coxs River Road.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Foreground view</td>
<td>High</td>
<td>Moderate</td>
<td>High to Moderate</td>
</tr>
</tbody>
</table>

The highway would widen to accommodate left and right turn lanes into Coxs River Road and Ambermere Drive. Bus stop bays would be provided on both sides of the highway. Coxs River Road would be realigned to intersect the highway about 55 metres east of its current location. Part of the existing pavement would be removed. A site compound would be located east of the new intersection. Opportunity exists to revegetate the compound to enhance the entry to Little Hartley.
**VIEWPOINT 5**
Baaners Lane, about 200 metres from the Great Western Highway intersection, looking north east.

**Site description**
Baaners Lane contains a small number of rural residential properties close to the road, on gently undulating pasture land, with the Mount York escarpment forming a backdrop to the view.

**Viewpoint selection**
This viewpoint is from the perspective of a small group of residences adjacent to Baaners Lane and motorists on the lane. It addresses foreground views to the upgrade works.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Foreground view</td>
<td>Negligible</td>
<td>Moderate</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

**Plate 6.5: Viewpoint 5**

The works undertaken within this view would include asphalting of the road shoulders and minor fill embankments. It is unlikely that they would be visible from this location.

Residential viewers generally have a high sensitivity but due to the distance from the works and the limited visibility to the highway in this setting, sensitivity would be rated as high to moderate.

**VIEWPOINT 6**
Cul de sac of Apple Tree Lane, about 260 metres south of the Great Western Highway.

**Site description**
Apple Tree Lane contains a number of rural residential properties, including one house under construction, in a small subdivision, on gently undulating pasture land.

**Viewpoint selection**
This viewpoint is from the perspective of a group of residences on Apple Tree Lane. It addresses foreground views to the upgrade works.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Foreground view</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate to Low</td>
</tr>
</tbody>
</table>

**Plate 6.6: Viewpoint 6**

The works visible from this view may include the removal of a number of roadside trees and a small fill embankment. Other works, including asphalting of the road shoulders, would not be visible from this location.

Residential viewers generally have a high sensitivity, but due to the distance from the works and the limited visibility to the highway in this setting, sensitivity would be rated as moderate.
VIEWPOINT 7
Great Western Highway at the Browns Gap Road intersection, looking east.

Site description
The highway runs through gently undulating pasture land. A large stand of native vegetation is located at the corner of the Great Western Highway and Browns Gap Road. The Mount Victoria escarpment forms a backdrop to the view.

Viewpoint selection
This viewpoint is from the perspective of motorists travelling east on the Great Western Highway. It addresses foreground and mid distance views to the upgrade works.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Foreground and mid distance view
The intersection of the highway with Browns Gap Road and Baaners Lane widens to accommodate extended right turn lanes and acceleration lanes for both side roads, and the crest of the highway would be lowered. A number of trees on both sides of the highway would be removed, and there would be limited space in the road reserve for replanting.

Motorists would be affected by the changes, in particular the removal of the exiting roadside trees which would increase the sensitivity rating to moderate.

VIEWPOINT 8
Great Western Highway, chainage 24010, looking east.

Site description
The highway travels through land that is relatively flat with the view contained by a large stand of native trees and the Mount York escarpment to the north, and rolling pastures to the south. Large pine trees dot the roadside within the foreground of the view.

Viewpoint selection
This viewpoint is from the perspective of motorists travelling east on the Great Western Highway. It addresses foreground views to the upgrade works.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Foreground view
The road shoulders would be widened and asphalted, widening the overall extent of asphalt. Fill batters would be constructed on both sides of the road requiring the removal of the pine trees to the right of the viewpoint, and other native roadside trees in the centre of the viewpoint. Tree removal would increase the magnitude rating to high to moderate, as there would be limited space in the road reserve for replanting.

Motorists would be affected by the changes, in particular the removal of the exiting roadside trees which would increase the sensitivity rating to moderate.
VIEWPOINT 9
Mid Hartley Road, adjacent to the Hartley Community Hall, looking south.

Site description
Mid Hartley Road slopes away from the Great Western Highway into the greater Hartley Valley south of the highway. The Hartley Community Hall is located about 150 metres from the highway and a private residence is located to the east of the intersection.

Viewpoint selection
This viewpoint is from the perspective of people congregating at the entrance to the Hartley Community Hall. It addresses foreground views to the upgrade works.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate to Low</td>
</tr>
<tr>
<td>Foreground view</td>
<td></td>
<td>Community viewers generally have high sensitivity; however, due to their distance from and the limited visibility of the highway, infrequent use of the hall and their length of time estimated to be reasonably short, the rating is assessed to be moderate.</td>
<td></td>
</tr>
</tbody>
</table>

Moderate to Low
The extent of asphalt would be slightly increased by widening the existing road shoulders, in particular extending the road pavement about two metres to the north. There would be some minor reshaping to the base of the existing cut batter on the left side of the highway, which would result in the loss of some vegetation.

Viewpoint 10
Great Western Highway, chainage 25950, looking west.

Site description
The Great Western Highway approaches Hartley Historic Village, situated up the slope on the left of the viewpoint, and begins its descent to the River Lett.

Viewpoint selection
This viewpoint is from the perspective of motorists travelling west on the Great Western Highway. It addresses foreground views to the upgrade works.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to Low</td>
</tr>
<tr>
<td>Foreground view</td>
<td></td>
<td>Motorists would be affected by the changes; in particular the removal of some roadside vegetation; however, the sensitivity rating is assessed as moderate to low due to the restricted viewing time as a result of vehicle speed.</td>
<td></td>
</tr>
</tbody>
</table>
### Viewpoint Selection

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VIEWPOINT 11</strong></td>
<td>Foreground and mid distance view</td>
<td>Moderate</td>
<td>High to Moderate</td>
</tr>
<tr>
<td></td>
<td>The alignment of the highway would move north, however the extent of road pavement would be similar to existing. A retaining wall would be constructed on the northern side of the highway, requiring the removal of some Poplars and native trees. The major works, including the retaining wall, would not be visible from this viewpoint, resulting in a moderate rating.</td>
<td>High</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

### Site Description

Hartley Historic Village is located on a gentle lower slopes rising up from the River Lett. The village is generally cleared of native vegetation with limited exotic plantings, however it has a backdrop of native and exotic forest. It contains a number of important heritage buildings on land now owned by NSW National Parks and Wildlife Service.

### Viewpoint Selection

This viewpoint is from the perspective of visitors to Hartley Historic Village and residents of the village. It addresses foreground and mid distance views to the upgrade works.

- **Viewpoint 11**: Old Bathurst Road, Hartley Historic Village, adjacent to the Royal Hotel building, looking west.
- **Viewpoint 12**: Walker Street, 50 metres north of the Great Western Highway, looking east.

#### Site Description

Walker Street is a gravel road that services three residences nestled below the highway and adjacent to the River Lett.

#### Viewpoint Selection

This viewpoint is from the perspective of a small group of residences approaching the highway on Walker street. It addresses foreground views to the upgrade works.

#### Viewpoint 12

- **Foreground view**: High
  - A new retaining wall, over 6 metres at its highest point, would be constructed in front of the grassed embankment. This would require the removal of a small number of trees. The proximity of the works to viewers and the scale of the wall result in a high rating.
- **Sensitivity**: High
- **Impact**: High

- **Viewpoint 12**: Walker Street, 50 metres north of the Great Western Highway, looking east.
- **Foreground view**: High
  - Visitors to Hartley Historic Village would tend to spend a reasonable amount of time exploring the site and have expansive views over the highway, River Lett valley and beyond. This would create a high sensitivity rating.
- **Sensitivity**: High to Moderate
- **Impact**: High

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**Plate 6.11**: Viewpoint 11

**Plate 6.12**: Viewpoint 12
VIEWPOINT 13
Blackmans Creek Road, about 1.2 kilometres from the Great Western Highway, looking south east.

Site description
Blackmans Creek Road travels along the edge of the River Lett valley through scattered bushland and residential properties. Its elevated situation affords expansive views east over the Hartley Valley and good views to Historic Hartley Village.

Viewpoint selection
This viewpoint is from the perspective of a small number of residences located on the mid and upper slopes of the River Lett valley. It addresses mid distance views to the upgrade works.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

Mid distance view
The major works located within the extent of the viewpoint would be the proposed retaining wall, however, its visibility would be minimised by the distance to the wall and the existing native vegetation screening it, resulting in a moderate impact.

VIEWPOINT 14
Edge of Hassans Walls on Padleys Pedestal lookout, looking east.

Site description
The edge of the rock escarpment, south of the Padleys Pedestal lookout, is a popular public lookout that provides spectacular 270° panoramic views over the dramatic natural and rural landscape of the area. The study area is located within the entire extent of the view though only the section near Hartley Historic Village to Mid Hartley Road is noticeable.

Viewpoint selection
This viewpoint is from the perspective of a lookout user and provides an elevated overview of the entire proposal. It is located approximately 2.85 kilometres from the western extent of the proposal and about 4 kilometres to Historic Hartley Village.

<table>
<thead>
<tr>
<th>Viewpoint</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate to Low</td>
</tr>
</tbody>
</table>

Mid to long distance view
The part of the proposal being undertaken near Hartley Historic Village would be partially evident by the removal of existing vegetation and construction of the new retaining wall. Other works to be undertaken would have little visual effect due to their relatively small scale and distance from the viewer.
6.2 VISUAL IMPACT SUMMARY

A total of 14 viewpoints form the basis of the visual impact assessment. The viewpoints are focused across the range of anticipated magnitudes and sensitivities including residents, tourists and motorists, providing a more even ratings outcome.

Out of the 14 selected viewpoints, visual impact ratings were determined as follows:

• One viewpoint has a High visual impact.
• Two viewpoints have High to Moderate visual impact.
• Five viewpoints have Moderate visual impact.
• Five viewpoints have Moderate to Low visual impact.
• One viewpoint has Negligible visual impact.

Ratings of High and High to Moderate impact occur where sensitivity to change is the highest, such as Bardens Lookout, Historic Hartley Village and residences adjacent to the road, or where a greater magnitude of the proposal is viewed, for example, the retaining wall at Historic Hartley Village. The remaining impacts result from a variety of conditions including a greater distance from the proposal, the category of viewer being a road user, and the minimal work that would be undertaken.

Landscape and urban design mitigation strategies have been developed from the outcomes of the landscape character and visual assessments, as a way of mitigating the potential impacts, and should be incorporated into the overall urban and landscape concept design when it is developed. These are discussed in the following chapter.
7. MITIGATION STRATEGY

7.1 INTRODUCTION

This chapter describes the mitigation measures that have been undertaken as part of the proposal described in Chapter 3 of this report, and a summary of further mitigation measures to be considered during the detail design phase of the project. They have been developed in accordance with the urban design objectives and principles, and the urban design strategy outlined in Chapter 4.

7.2 MITIGATION INCORPORATED IN THE ROAD DESIGN

The integration of the engineering and performance objectives with urban design objectives for the Hartley Valley safety upgrade aims to produce a design outcome that fits sensitively with the existing qualities and characteristics of the Hartley Valley. In order to achieve this, a range of mitigation measures have been incorporated into the project as the road design has developed. These measures combine to develop a solution that seeks to protect and enhance the existing visual character of Hartley Valley and its surrounds, where possible.

The mitigation measures that have been undertaken during the development of the road design concept are summarised below:

• The project footprint has been minimised as a result of integrated development of the concept road design. This has lead to the width and extent of road pavement being minimised, and proposed realigned sections being kept as close as possible to the existing highway corridor to reduce impacts.
• The extent of the disturbed area has been reduced wherever possible (to 2 metres from the standard of 5 metres) to retain significant stands of vegetation.
• Retaining walls have been provided instead of fill embankments to reduce encroachment into an existing tributary of River Lett flowing parallel to the highway, and to retain existing trees.

Following the environmental approval process, it is recognised that further work will be required to develop the urban design concept plan for the proposal. Whilst development of the landscape and urban design strategy has attempted to mitigate the overall impact of the proposal, opportunities will arise during detail design to further refine and improve the design of the project to produce enhanced urban design outcomes.

Below is a summary of the key mitigation and management strategies that would be considered during the detail design phase of the project:

• Further investigate opportunities to reduce the width of the disturbed area along the length of the highway. For example:
  ¬ at the base of Mount Victoria Pass: provide revegetation with Monkey Gum - Sydney Peppermint Open Forest to the fill embankment to replace vegetation to be removed to maintain the dense backdrop of vegetation that indicates the beginning of the ascent to Mount Victoria village for motorists travelling east.
  ¬ west of Jenolan Caves Road: to retain dense stands of existing Ribbon Gum Woodland.
• Provide new native tree planting, where trees are to be removed, at intersection upgrades, to reinstate visual cues to the intersection and reduce the scale of the upgrade works.
• Provide roadside tree planting in specific locations to provide enclosure to the highway whilst allowing views out to the surrounding landscape.
• Provide appropriate planting to natural drainage channels (where SO gutters aren’t provided), to blend in with the existing landscape.
• The planting strategy for Hartley Historic Village should consider the retention of main views to the village from the west.
• Maintain the pleasant rolling pasture character at the realignment of Coxs River Road following the removal of the site compound after the completion of construction.
• Revegetate the site compound at the base of River Lett Hill with Ribbon Gum Woodland following construction.
• Further refinement of urban design elements should be undertaken including fences, balustrades and barriers to reduce their visual intrusion and better integrate them into the existing character of the Hartley valley.

7.3 MITIGATION MEASURES TO BE INCORPORATED IN DETAIL DESIGN
8. CONCLUSION

The study area for the Hartley Valley proposal adjoins a predominately rural landscape with rolling pastures broken up by large stands of woodland vegetation and surrounded by dramatic escarpments to the east, north and west. The character of the road itself is relatively constant through the valley being a gently meandering two to three lane rural highway. The highway travels through the small villages of Little Hartley and Hartley Historic Village. Settlement patterns outside these villages include rural residential areas and broad acre farms with isolated homesteads.

The proposal aims to improve road safety and efficiency and in doing this, would introduce a number of elements into the environment, as described in Section 3 of this Report, including:

- Slightly widened pavement surface.
- Realignment of Coxs River Road intersection and Hartley Historic Village barrier curve.
- Upgraded intersections at Coxs River Road, Ambermere Drive, Baaners Lane, Browns Gap Road and Jenolan Cave Road.
- Construction of new retaining wall near Hartley Historic Village.
- Reshaping of existing and construction of new cut and fill batters.

These proposed elements would affect the existing visual character but are consistent with other projects, either completed or under construction along the Great Western Highway. The urban design principles developed take into account urban design and visual character not only for the study area itself but also reflect its relationship with surrounding areas. Continued integrated design development of the project during the detail design phase will further help achieve the desired future character. The urban design will:

- Include targeted revegetation measures to maintain and enhance the vegetated character of the corridor.
- Provide opportunities to view the wider landscape from selected locations.
- Incorporate materials and finishes for new road elements that align with those elements already used along the Great Western Highway.
- Seek to limit the visual dominance of road elements relative to the wider vegetated corridor through a consistent and limited colour palette.

Concept urban design plans should be prepared in order to illustrate the proposed mitigation measures outlined in this report and ensure the successful integration of the proposed works into the road corridor and adjoining areas.
REFERENCES

Roads and Maritime Services (formerly RTA) references and guidelines
Roads and Traffic Authority of NSW, Beyond the Pavement, RTA urban design policy, procedure and design principles, July 2009.

Mount Victoria to Lithgow project reports
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Hartley Valley Safety Upgrade project reports