Bomaderry arrival / departure strategy
4 Bomaderry arrival / departure strategy

4.1 Bomaderry arrival / departure strategy

The connection of the project with the existing road network at Bomaderry presents particular challenges related to speed management and road safety as the project transitions from highway speeds and environment to local roads within Bomaderry. In addition this transition point would also represent:

- The southern extent of approximately 45 kilometres of continuous upgraded highway, with drivers travelling without stopping and at speeds of up to 100 kilometres per hour.
- A distinct change of highway conditions traversing rural, pastoral landscapes (rolling hills through to flat flood prone lands), transitioning into the urban context of Bomaderry.

To mitigate and manage the potential safety risks a whole project integrated response is required that considers:

- The broad landscape and regional context.
- The local topography.
- The designated speed zones, directional and informational signage.
- The existing road network (beyond the proposal).
- The overall transition to local road network.
- The adjacent land uses.
- The lighting and road side furnishings and fixings.

The following objectives form the basis for the Bomaderry arrival and entry strategy:

- To provide for a safe speed transition within a self explaining road environment.
- To create a transition carefully integrated with the varying characteristics of the existing rural and town landscape context.

The existing context of the highway arrival / departure into Bomaderry is illustrated in Figure 4.1.

4.1.1 Broad landscape and regional context

The arrival and departure transition from Bomaderry crosses between two large landscape character areas. The Berry Bolong Pastoral Landscape (as described in Section 6.3) and the Shoalhaven River landscape. The broad visual boundary of the Berry Bolong Pastoral Landscape covers the area south from Toolioja Ridge to Abernethys Creek. The southern extent of the visual catchment boundary of Berry Bolong Pastoral Landscape is formed by the remnant stand of existing vegetation to the north of the Bomaderry urban area. Refer to Section 6.4.2 for a description of the Bomaderry township.

The grade-separated half-interchange at Meroo Road and Pestells Lane is located at the southern extent of the Berry Bolong Landscape and provides the opportunity for the interpretation of this landscape as a possible landscape gateway and marker. Just south of the half-interchange is the portal point where the road user either enters or departs the Berry Bolong pastoral landscape.

This visual catchment and transition is illustrated in Figure 4.2.
4.1.2 The designated speed zones, directional and informational signage

Speed, directional and informational signage would be posted as per RMS standards on the arrival and departure from Bomaderry. Presently the Princes Highway, south of the intersection with Moss Vale Road has a posted limit of 70 kilometres per hour. There will also be signage and lighting associated with the grade-separated half-interchange at Pestells Lane and Meroo Road.

Commercial and tourism signage may be appropriate but would require consideration by Shoalhaven City Council and / or RMS.

The likely location and speed transition zones are illustrated in Figure 4.3.

4.1.3 The local topography

This southern section of the highway crosses Meroo Meadow, a flat to gently undulating and open landscape. The low point is the crossing of Abernethys Creek. South of Abernethys Creek, the topography starts to transition as it rises up to a high point close to the intersection of the Princes Highway with Cambewarra Road. The final one kilometre of the project rises up approximately 22 metres. While not steep, the overall 2.2 percent grade is noticeable to the southbound driver.

The local landscape character and topography transitions are illustrated in Figure 4.4.

4.1.4 The existing road network (beyond the proposal)

Beyond the intersection (roundabout) with Moss Vale Road and Cambewarra Road, the Princes Highway south of the intersection has a scale and corridor environment characteristic of the Bomaderry township. This corridor is defined by a central planted median, kerb and guttering, street lighting at the verges, some sections of pedestrian path and grassed verges.

The current posted speed limit for this environment is 70 kilometres per hour. The existing network interface is illustrated in Figure 4.4.

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Figure 4.3 The design speed transitions and likely signage locations on the arrival and departure from Bomaderry

Figure 4.4 Landscape character, context and topography transitions on arrival and departure from Bomaderry

Legend

- Princes Highway
- Low Point Along Alignment
- High Point Along Alignment
- Interchange / Intersection Node
- Speed Zone (Posted)
- Landscape Portal Open / Closed
- Grade + Landscape Transitions
- Creekline (Drainage)
- Remnant Eucalyptus Forest
- Flat Open Pasture + Agricultural Land

Image courtesy of Google earth 2013
4.1.5 Arrival / departure strategy summary

The strategy describes a series of integrated engineering and urban design principles which respond to the built and rural context, reinforcing a safe and self-explaining speed environment. The concept plans illustrate a range of integrated proposals including:

- Working with the natural grade, transition from half-interchange of level of 20 AHD to 48 AHD at the intersection of Cambewarra Road.
- Using the grade-separated half-interchange at Meroo Road / Pestells Lane as the first transition point and a gateway.
- Consideration of the type and transition of roadside planting character including:
  - Cultural tree plantings at half-interchange.
  - Reinforcement of native tree planting.
  - Cultural tree planting closer to the Bomaderry urban area.
- Highway furnishings and fixings including:
  - Shoulder transition from flush to kerbed on approach to Bomaderry.
  - Introduction of central median (to match the existing Princes Highway cross section south of Cambewarra Road).
  - Posted speed limit of 70 kilometres per hour.

This integrated engineering and urban solution is illustrated in Figure 4.5 and summarised in Table 4.1 for details of these considerations.

Figure 4.5 The integrated urban and landscape design responses to the arrival and departure from Bomaderry
<table>
<thead>
<tr>
<th>Potential strategy</th>
<th>Chainages (m)</th>
<th>Speed zone (km/h)</th>
<th>Extent (m)</th>
<th>Signage required</th>
<th>Illustrated in section</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entry experience</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entry experience transition commencing at grade-</td>
<td>27700 - 30200</td>
<td>100</td>
<td>2,500</td>
<td>'100'</td>
<td>Refer to Figure 3.13</td>
<td>Potential Nowra gateway, transition from the Berry Bolong Pastoral Landscape and hinterland to the Shoalhaven landscape</td>
</tr>
<tr>
<td>separated half-interchange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grade change</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change of 2.2m over 1km / grade of 2.2 percent</td>
<td>29100 - 30100</td>
<td>100</td>
<td>1,000</td>
<td>'70 ahead' -</td>
<td>Not applicable</td>
<td>Visibly discernible grade change coming into and out of Bomaderry</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>southbound traffic</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grade change</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change of 6m over 1km / grade of 1.1 percent</td>
<td>28500 - 29100</td>
<td>100</td>
<td>1,000</td>
<td>No</td>
<td>Not applicable</td>
<td>Slow transition from low point at Abernethys Creek</td>
</tr>
<tr>
<td><strong>Roadside planting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultural / feature specimens at grade-separated half-</td>
<td>27700 - 28400</td>
<td>100</td>
<td>700</td>
<td>No</td>
<td>Refer to Figures 3.14</td>
<td>Reinforcement of the unique cultural planting of the broader Berry Bolong Pastoral Landscape</td>
</tr>
<tr>
<td>interchange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>and 3.15</td>
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<tr>
<td><strong>Roadside planting</strong></td>
<td></td>
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<tr>
<td>Eucalyptus trees to reinforce adjacent and or remnant</td>
<td>28400 - 29900</td>
<td>100</td>
<td>1,500</td>
<td>No</td>
<td>Refer to Figure 3.14</td>
<td>Reinforcement of the southern catchment of the Berry Bolong Pastoral Landscape and buffer between the pastoral and urban landscape</td>
</tr>
<tr>
<td>closed forest</td>
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<tr>
<td><strong>Roadside planting</strong></td>
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<tr>
<td>Formal or structured tree planting with relevant cultural</td>
<td>29800 - 30200</td>
<td>100</td>
<td>400</td>
<td>'70' - southbound</td>
<td>Refer to Figure 3.15</td>
<td>Provide form and structure to the road edge to reinforce the transition from highway to local road conditions and speeds</td>
</tr>
<tr>
<td>species</td>
<td></td>
<td></td>
<td></td>
<td>traffic</td>
<td></td>
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<td></td>
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<td>'100' - northbound</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>traffic</td>
<td></td>
<td></td>
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<tr>
<td><strong>Roadside planting</strong></td>
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</tr>
<tr>
<td>Median planting consistent with the existing planting</td>
<td>29900 - 30200</td>
<td>70</td>
<td>300</td>
<td>No</td>
<td>Refer to Figure 3.15</td>
<td>Provide form and structure to the road edge to reinforce the transition from highway to local road conditions and speeds</td>
</tr>
<tr>
<td>south of the Cambewarra Road</td>
<td></td>
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</tr>
<tr>
<td><strong>Highway furnishings and fixings</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Transition to kerb and gutter to roadside</td>
<td>29300 - 30100</td>
<td>70</td>
<td>800</td>
<td>No</td>
<td>Refer to Figure 3.15</td>
<td>Provide form and structure to the road edge to reinforce the transition from highway to local road conditions and speeds</td>
</tr>
</tbody>
</table>
Urban and landscape design strategy
5 Urban and landscape design strategy

5.1 Urban and landscape design process

Urban and landscape design objectives / issues and the goal of reducing visual impacts have been integral to the design process at all stages to date, and the development of the concept design has been continually assessed against these urban design objectives. A ‘Gerringong to Bomaderry Princes Highway upgrade Preliminary Urban and Regional Design Strategy’ report was prepared by AECOM in November 2007 prior to the identification of route options. This report informed the development of route options and the preferred option selection process.

This assessment was refined based on the:
- Urban design objectives and principles for the proposal study area as described in Section 2.0.
- Contextual analysis (based on landscape character units) of the proposal study area as described in Section 6.0.
- Landscape character and visual impact assessment and suggested mitigation measures (based on landscape character units and view shed analysis) of the proposal study area as described in Section 7.0.

5.2 Urban and landscape design assessment

The tables shown in the following pages provide an assessment of the proposed concept design route against the urban design objectives and principles, and the design responses to that ongoing assessment.

<table>
<thead>
<tr>
<th>Table 5.1 Design assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
</tr>
</tbody>
</table>
| 1) Respond to the grain of the landscape in route selection, including following the edge of valleys and hills, and avoiding disruption of stands of vegetation, both natural and cultural planting. | The proposal comprises an upgrade of the existing alignment, south of Berry to Bomaderry at Cambewarra Road. The proposal would generally follow the alignment of the existing Princes Highway. Widening would occur on one or both sides of the existing alignment. The surrounding landscape has developed around the existing road for the past 80+ years. The proposal involves the widening of the existing corridor and improvements to the vertical geometry. The proposal would therefore have potential impact on any adjacent stands of cultural vegetation plantings and remnant plantings within the existing road reserve. The vertical alignment has been designed to improve grades and road safety. The alignment generally covers flat to gently undulating agricultural and pasture land. The overall vertical alignment is generally elevated to improve flood immunity. Nevertheless, the road generally responds to the natural grain of the landscape by following the existing contours through the landscape and utilising the existing road alignment where possible. | The proposal would include small integrated cut and fill slopes and revegetation to essentially preserve the existing cultural landscape patterns. This would be achieved by reinforcing the patterns within the broader landscape context. Strategies for integration include:
- Reinforcing planting at drainages and or fence lines and property boundaries.
- Using culturally relevant and locally endemic planting.
- Re-establishing pasture grasses. |
| 2) Integrate cut and fill embankments with surrounding terrain by grading out and varying slopes. | Cut and fill embankments would integrate with the adjacent landscape and be assessed at a detail level in each case based on geotechnical conditions, slope, aspect and existing adjacent landscape character. The most prominent embankments are required at the proposed interchange at Strongs Road (cut and fill) and half-interchange at Meroo Road (fill). | The impact of prominent features would be minimised as far as practicable without compromising road safety. The alignment would have some impact to existing properties and how they presently function and operate. Consideration to mitigating these impacts is ongoing. While there are no specific prominent features impacted, consideration needs to be given to the cumulative effects in regard to the removal of some extensive areas of existing roadside vegetation and cultural landscape. Where possible, reinstatement of vegetation in these areas should be considered. |
| 3) Preserve cultural patterns in the landscape. | The proposal would include small integrated cut and fill slopes and revegetation to essentially preserve the existing cultural landscape patterns. This would be achieved by reinforcing the patterns within the broader landscape context. Strategies for integration include:
- Reinforcing planting at drainages and or fence lines and property boundaries.
- Using culturally relevant and locally endemic planting.
- Re-establishing pasture grasses. |
| 4) Avoid, where possible, impact to prominent features of the areas through which the alignment passes. | The proposal would include small integrated cut and fill slopes and revegetation to essentially preserve the existing cultural landscape patterns. This would be achieved by reinforcing the patterns within the broader landscape context. Strategies for integration include:
- Reinforcing planting at drainages and or fence lines and property boundaries.
- Using culturally relevant and locally endemic planting.
- Re-establishing pasture grasses. |
| 5) Vary the gradient of the earthworks to provide visual interest and reflect the characteristics of the surrounding landform and landscape. | Earthworks would be integrated as much as possible based on constraints identified by the detailed geotechnical investigations. A number of embankment strategies have been developed to:
- Increase the usability of pasture land adjacent to the road and integrate the highway with the surrounding landscape.
- Reduce the visual impact of cuttings and embankments by introducing plantings to the base and top of new batter where practicable. |
| 6) Grade out cuttings and embankments, wherever practicable, to best fit the characteristics of the local landform, returning the land to either its former use or replacing vegetation lost to the proposal. | The proposed alignment has a vertical geometry that is generally elevated from the existing alignment to improve the flood immunity, resulting in more fill embankments than cut batters. There is a large cutting required at the Jaspers Brush Road grade-separated facility. At this location the alignment makes use of the small ridge line between Jaspers Brush and Meroo Meadow for an overpass of the highway. Cuttings and embankments would be graded out where possible to be integrated with the local landform, land coverage and land use. Areas of vegetation lost would be reinstated where practicable. |
**Objective two**

**Protect the natural systems and ecology of the corridor**

<table>
<thead>
<tr>
<th>Design principle</th>
<th>Design response</th>
</tr>
</thead>
</table>
| **1) Avoid areas of natural vegetation, particularly those containing threatened species and communities.** | Since much of the existing landscape has been cleared for agricultural purposes the landscape is generally open in character, especially on the east and south sides of the highway. There are some extensive stands of remaining vegetation within the current road reserve which would be impacted during construction, including:  
  • At Jaspers Creek between Ch 21300 and Ch 21500.  
  • At the proposed grade-separated facility at Jaspers Brush Road and Strongs Road Ch 21700 – Ch 21950.  
  • Between Turners Lane (Ch 24400) and Devitts Lane (Ch 25050).  
  • Between Ch 26500 and Lamonds Lane (Ch 26900).  
  • Between Ch 29350 and Ch 29650.  
Impact to threatened species and communities would be minimised, and any removed vegetation would be replaced and rehabilitated, where practicable.  
This strategy would also apply in the reinforcement of riparian vegetation at each of the Creek crossings along the corridor. |
| **2) Minimise disruption to natural drainage patterns both through route selection and road design.** | Existing drainage systems would be retained and improved, where appropriate. Upgraded crossings of creek lines and drainage lines would have negligible impact on natural drainage patterns. |
| **3) Minimise the number of creek crossings in the study area.** | The proposal follows the alignment of the existing Princes Highway and existing creek crossings would need to be upgraded. The proposal does not require additional creek crossings over and above those existing.  
Existing waterway crossings at Flying Fox, Jaspers Brush and Abernethys creeks are all currently spanned by bridges. These three bridges would be replaced as part of the proposal. The remainder of the existing waterway crossings are culverts. New bridges would be constructed at these locations. |
| **4) Integrate the landscape qualities and characteristics of the highway corridor with the landscape form and character.** | The proposal passes through three identified landscape character unit types. These have subtle differences in land use, land form, aspect and slope and landscape character. The highway corridor would reflect the differences in these landscape units and their associated patterns. The highway alignment is located roughly along the edge of the lower Broughton Creek Floodplain, where the lower slopes of the Cambewarra Range start. In this instance the highway fits well into the landscape. |
| **5) Integrate water quality basins with the landscape form and character.** | Water quality basins would be integrated into the landscape to best represent how water bodies appear in the natural / cultural landscape context. This could be done by creating organic shapes, a low profile form by reducing steep batters, placing naturalistic objects in and around the basins and planting throughout the basin with native grass and / or ephemeral plant species. There is the opportunity to use a mix of swales and water quality basins to treat and improve water quality discharged from the proposal. |
Objective three
Protect and enhance the heritage and cultural values of the corridor

<table>
<thead>
<tr>
<th>Design principle</th>
<th>Design response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Avoid items of identified European and Aboriginal heritage and cultural value.</td>
<td>The proposal has avoided impacts to identified European and Aboriginal heritage and cultural value where feasible and reasonable by following the existing Princes Highway. Refer to Appendix I: Aboriginal (Cultural) Heritage and Appendix J: Non-Aboriginal (Historic) Heritage, of the Review of Environmental Factors for the proposal.</td>
</tr>
<tr>
<td>2) Acknowledge and respond to the heritage and cultural values of the rural landscape.</td>
<td>Important values and connections to the cultural landscape would be maintained by using a range of strategies. The harmonious balance of the cultural and rural landscape that is widely recognised and acknowledged would be reinforced by the urban and landscape design related works as outlined in the concept design. The listed 'Berry Bolong Pastoral Landscape' (refer Section 6.3) would be reinforced by the urban design related works as outlined in the concept design.</td>
</tr>
<tr>
<td>3) Acknowledge and respond to indigenous value placed on the broader landscape.</td>
<td>Consultation with Aboriginal stakeholders has been undertaken at all steps of the proposal development and has included walk overs of the study area to identify key constraints and broader landscape values. The proposal acknowledges and responds to constraints identified by following the existing alignment and minimising disturbance of the surrounding landscape as much as possible.</td>
</tr>
<tr>
<td>4) Consider the important value of the productive landscapes.</td>
<td>As the proposal is largely widening of the existing alignment, it will only impact on relatively small areas that are presently utilised as productive landscapes. New works would be integrated with the surrounding landscape to maximise productive use of land, for example, by merging landscape to the edge of the road formation and flattening batter slopes where possible to allow grazing.</td>
</tr>
</tbody>
</table>

Objective four
Respect the communities and towns along the highway

<table>
<thead>
<tr>
<th>Design principle</th>
<th>Design response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Minimise the impact of the proposal on the amenity of residents of Bomaderry.</td>
<td>The impact of the proposal to the residents of Bomaderry will be moderate in its magnitude of change. Amenity and visual impacts will be greatest for residents on the eastern side of the existing highway, north of Cambewarra Road.</td>
</tr>
<tr>
<td>2) Provide effective and efficient access to Bomaderry.</td>
<td>The number of access movements for entering and exiting Bomaderry would be unchanged. Accesses via Meroo Road would be made safer by introducing a grade-separated half-interchange at this location.</td>
</tr>
<tr>
<td>3) Design new town access points as an important and integral part of the town, ensuring clear and consistent way finding.</td>
<td>There would be no new town access points into Bomaderry. The existing accesses would be retained and continue to perform their current function.</td>
</tr>
<tr>
<td>4) Minimise the disruption and loss of amenity to rural communities in the study area.</td>
<td>Disruption to rural communities would be expected to some degree during construction. Ongoing disruption is expected to be minimal during operation and limited to some modified property access as discussed in Appendix A: Traffic and Transport of the REF for the proposal. Amenity impacts would vary depending on proximity to the proposal but the revegetation strategy would provide a balance of visual screening and reinforcement of the existing landscape character to minimise potential loss of amenity to rural communities.</td>
</tr>
</tbody>
</table>
Consider the heritage of the highway in the proposal so that users may experience it.

Consideration of potential impacts to both Aboriginal and European heritage has been integral to the development of the Concept Design and Urban Design and Landscape Strategy. Much of the heritage value along the proposal is able to be experienced by the user through the broader visual engagement with the landscape.
Contextual and landscape character analysis
6 Contextual and landscape character analysis

6.1 Regional context

The Princes Highway is the main north-south corridor between Sydney, the Illawarra and the South Coast of NSW, through to Victoria. It is a critical link for both passenger and freight transport and is a major route for tourism, with considerable peaks in holiday periods.

6.2 Local context

The proposal is located south of Berry between Schofields Lane and the intersection of the Princes Highway and Cambewarra Road in Bomaderry. The proposal passes through Jaspers Brush, south of Berry, then across Meroo Meadow before it rises up into the urban area of Bomaderry and the larger Nowra urban area. The proposal is located wholly within the Shoalhaven Local Government Area.

The area immediately surrounding the proposal has been strongly influenced both culturally and physically by the dairy industry. This activity has defined the general pattern of vegetation clearance and rural boundaries with linear cultural plantings, and has influenced the distribution of laneways and rural houses and farm buildings.

The existing highway generally follows the interface between lower Broughton Creek floodplain and the lower elevations of the foothills of the Illawarra and escarpment. The land to the east and south-east of the highway is generally flat to very flat, while the land to the west and north-west is gently undulating and more vegetated.

The road user experience is generally of wide open spaces with the occasional section of existing highway being enclosed by roadside vegetation.

6.3 Cultural landscape context

The significance of this natural and cultural landscape has been widely acknowledged and recorded. Navin Officer Heritage Consultants Pty Ltd (NOHC) has prepared the Berry to Bomaderry upgrade – Princes Highway upgrade, Cultural Heritage Assessment (Non-Aboriginal) Report (NOHC, 2013), which describes in detail the recorded cultural landscape framework. This report defines the broader region, including the proposal study area, as the Southern Illawarra Coastal Plain and Hinterland Cultural Landscape (SICPCL). The recording of the landscape values associated with the SICPCHL are listed in Table 6.1. Consistent with all of these recordings is the recognition that the region retains a unique, aesthetically balanced and fundamentally nineteenth century pastoral structure.

Within the study area, the combination of the natural and cultural landscape forms a uniquely rich, engaging and tangibly enjoyable experience. This harmonious and attractive character is strongly identified by local residents and more widely recognised as a key regional asset.

The working and natural landscape interaction between agricultural floodplain, open pasture, rolling hills and forested ridges and escarpments has greatly influenced the settlement patterns and land use types. The qualities of this interaction between the natural and cultural landscape are a defining feature for those who live and work within the study area and its broader surrounds.

The valleys are verdant green and generally open, the ridges and escarpment encircle the landscape and reinforce its intimate and engaging properties while the trees are generally large and grand in stature. The cultural plantings and farming practices have developed in what appears as a harmonious and balanced way. The existing highway is very much part of this cultural landscape following each of the twists, bends and undulations. The highway also serves as direct access for many residents and has developed and influenced much of the local landscape response.

For road users, there are many experiences and interpretations, with the highway revealing a complex and harmonious landscape to its users. The coast and fertile coastal plains are often present in distant views across the rural landscape. There is a sense of prosperity due to the many well-established, stately trees (both indigenous and exotic) planted in both random and more formal arrangements. These create the ‘portal’ experience of travelling from open landscape with broad views to enclosed tunnel where canopies almost enclose the road corridor, before opening up again. Views also encapsulate the tree covered ridges and escarpments and meandering creeks and rivers that flow into the fertile coastal plains, lakes and wetlands.

The immediate study area associated with the proposal is set within the coastal hinterland between the open pastureland of the lower reaches of Broughton Creek to the east, south of Berry, the ridges and escarpment to the west and the Shoalhaven River and urban area of Nowra - Bomaderry to the south. The topography is varying from flat to gently undulating, graduating to relatively steep slopes further to the west on the lower slopes. Immediately adjacent to the highway are strong cultural patterns in the landscape associated with ownership and the agricultural and pastoral land use.

The assessment of the landscape context is explored by its component parts of topography (slope), water courses, vegetation cover and land use. A visibility analysis has also been undertaken to assess the level of visibility of the proposal elements.

Table 6.1 - Cultural landscape framework

<table>
<thead>
<tr>
<th>Southern Illawarra Coastal Plain and Hinterland Cultural Landscape framework Identification</th>
<th>Recording background</th>
<th>Extents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berry Bolong Pastoral Landscape</td>
<td>Defined by the Shoalhaven City Council heritage study.</td>
<td>Extends south from the Southern Illawarra Range and includes the landscape between Mt Pleasant to the east, Browns Mountain to the west and Greenwall Point and the Shoalhaven River to the south. Refer Figure 6.1</td>
</tr>
<tr>
<td>Berry District Landscape Conservation Area</td>
<td>Defined by the National Trust of NSW.</td>
<td>Refer Figure 6.1</td>
</tr>
<tr>
<td>Berry Township Urban Conservation Area (BTUCA)</td>
<td>Defined by the Shoalhaven City Council heritage study. Listed on the National Trust register in 2011</td>
<td>Refer Figure 6.1</td>
</tr>
</tbody>
</table>
6.3.1 Topography (slope analysis)

There are two main topographic features that influence the landscape character and visual qualities of the study area.

The first is the flat open floodplain of the lower reaches of Broughton Creek. This area occupies the land between the lower undulating hills of the escarpment to the west and Mt Coolangatta to the east. In some areas the width of the flood plain (less than 5 percent slope) approaches three kilometres.

The second feature is the escarpment and hills to the west and north. The lower parts of these hills cross over the existing highway at a number of points.

Figure 6.2 illustrates the relationship between the proposal route (in red) and the surrounding topography.

6.3.2 Land use

The main human influence on the landscape within the study area has been the agricultural practices that have occurred since European settlement. During early settlement of the Shoalhaven area, agricultural estates were established on land grants and much of the study area was progressively cleared for agricultural purposes. The predominant form of agriculture since the second half of the nineteenth century has been dairying, resulting in a characteristic landscape of cleared rolling to flat pasture with prominent cultural plantings marking farmhouse locations and in some cases, property boundaries. There are no prominent corridors of native vegetation. The more dominant plantings are cultural wind breaks, hedges and cultural plantings.

Historically, the scale and character of settlement patterns were dependent on the distribution of small dairy farms. The settlement pattern today generally conforms to this historical pattern.

Figure 6.3 illustrates the location of the proposal (in red) in relation to adjacent land uses.

6.3.3 Vegetation cover

Over time, the immediate area surrounding the proposal has been cleared for agricultural and pastoral use, resulting in vast areas of grazing land. Only very small and isolated areas of native vegetation still remain on the lower slopes, while the higher ridge lines and steeper slopes and escarpments are all well forested.

Figure 6.4 illustrates the location of the proposal (in red) in relation to the overall vegetation cover.

6.3.4 Water courses

There are a total of eight water courses within the study area. These follow a north-west south-east direction as they form tributaries to the lower reaches of Broughton Creek before it flows into the Shoalhaven River.

The existing drainages vary in the level of vegetation that line the banks. Currently most of the drainage lines pass underneath the highway in culverts.

Figure 6.5 illustrates the relationship between the proposal route (in red) and the drainage lines/associated tributaries.
The slope analysis clearly illustrates the proposed alignment traversing the edge of the escarpment slopes just above the floodplain of Broughton Creek. Generally east and south of the alignment it is very flat while to the north and west there are low rolling hills and ridge lines.

The vegetation cover is limited along the proposal. To the south and east, the landscape is dominated by broad agricultural fields with the only sizable vegetation cover occurring along creek lines and row plantings that either define property boundaries, laneways or function as windbreaks. The vegetation to the north and west of the proposal retains a mix of remnant trees and other cultural plantings that define property lines, laneways and windbreaks. Moving north-east as the elevation gets steeper, the landscape becomes more heavily forested.

The land use diagram illustrates that the proposal passes almost exclusively through farm and agricultural land. The proposal terminates in the residential / urban township of Bomaderry. Considered more broadly with the bypasses of Kiama, Gerringong and Berry, Bomaderry is the first urban area on the network south of Albion Park / Oak Flats.

There are a number of water courses that cross the proposal, these generally all travel in a north-west to south-east alignment and connect into the lower Broughton Creek catchment and ultimately the Shoalhaven River.
6.4 Built form context

The built form and landscape elements together define the local character of the region. The towns that have developed in support of farming and dairy industries (and later tourism) have evolved in harmony with the surrounding landscape.

6.4.1 The Princes Highway

The southern limit of the proposal is the gateway to the greater Shoalhaven region and the transition from the broader rural south coast landscape (generally identified between Kiama and Bomaderry). Travelling south from Berry, the landscape generally becomes broader and more open as the floodplain over the lower Broughton Creek opens up prior to its confluence with the Shoalhaven River. The slopes are generally gentler, and the creek crossings, while more frequent, are smaller in scale than the extent of vegetation to the west.

6.4.2 Bomaderry township

Bomaderry forms the southern extent of the study area and is located on the northern shore of the Shoalhaven River, across the river from Nowra, the region’s major centre. In this context, Bomaderry is considered more as a suburb of Nowra. Bomaderry is part of the Shoalhaven City Council District. Bomaderry has a population of approximately 6500 residents.

The majority of the residential area of Bomaderry is on the eastern side of the existing Princes Highway. Based on this function, a number of local residents access the existing highway via Meroo Road.

The Bomaderry area is generally residential with associated sporting fields, facilities and schools. The commercial areas are mainly located along the Princes Highway corridor south of the intersection with Cambewarra and Moss Vale Roads. The eastern edge of Bomaderry has a small commercial, light industrial zone. The train station is also located at the eastern edge of the town and is the terminus for the South Coast Railway Line. This area also includes a range of related light industrial and rural supply businesses.

To the west of the existing highway is a small pocket of larger lot residential properties accessed off Moss Vale Road.

Entering into the Bomaderry / Nowra urban area from the north there is an abrupt change as the road transitions from bushland fringed road to a more suburban character.

Immediately south of the existing highway is characterised by a mixture of strip style development including motels, car yards, wholesalers, nurseries, services and some residential. The roadway includes a central planted median, grassed verges and footpaths generally on both sides. There are very few street tree plantings. Continuing south, the character becomes dominated by the existing bushland of Bomaderry Creek reserve.

Bomaderry - constraints and opportunities

The following constraints have been identified:

• Safe transition from a highway environment into an urban environment.
• Safe access for existing properties on approach to Bomaderry.
• Potential noise impacts based on increased traffic levels.

The following opportunities have been identified:

• Reinforcement of vegetation buffer between rural landscape and urban landscape.
• Use of urban design interventions to assist in the transition from highway environment to local road networks, including planting and road furnishings and fixings.
• Enhancing the arrival and departure experiences to the Shoalhaven region.

The landscape context of Bomaderry is illustrated in Figure 6.6.

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Figure 6.6 Bomaderry context - Image source: Google 2013

Legend:
- The proposal
- Existing highway
- Main arterial road
- Drainage line / creek
- River
- Open space
- Rural / pastoral landscape
- Urban / residential zone
- Future residential zone
- Tree / vegetation buffer
6.5 Landscape character units

Three landscape character units are identified within the proposal study area. These are described below and illustrated in Figure 6.7.

6.5.1 Jaspers Brush

The Jaspers Brush landscape character unit occupies the landscape south of Berry up to the low ridge at Jaspers Brush Road. The landscape is generally rural in character. There are a number of small plots and dams. Four small drainage line / creeks cross the highway travelling in a north-west to south-east direction. The laneways which run in a perpendicular alignment to the highway provide access to the rural residences and generally run along the top of the higher ground separating the drainage lines and creeks.

6.5.2 Meroo Meadow

South of Jaspers Brush the landscape becomes flatter and generally more open. To the east the are only a few isolated residences as much of the ground is flat and low lying. South of Turners Lane the existing highway is enclosed by a thin line of vegetation located immediately adjacent to the alignment on either side of the road corridor (refer to Figure 6.7). The western and northern sides of the road, occupying the higher ground, have numerous residences, farmhouses and distinctive cultural plantings defining entries, property boundaries and fence lines.

Old pine trees, Hoop Pines and remnant Eucalyptus dot the roadside corridor and adjacent access laneways. Hedges and agricultural plot plantings including grapes and other crops form distinctive patterns.

6.5.3 Bomaderry gateway

South of Meroo Road the open pastoral and agricultural landscape begins to rise up towards the Shoalhaven. From the low point at Abernethys Creek to the intersection of Cambewarra Road, the level changes by about 40 metres. Travelling south across Abernethys Creek, the backdrop is dominated by a broad stand of remnant Eucalyptus high forest. The strong line of vegetation forms a screen between the Bomaderry urban area and the open pastoral landscape (refer to Figure 6.7).

6.6 Contextual and landscape character analysis: summary of findings

The study area can essentially be broken into three closely interrelated landscape character units:

• Jaspers Brush.
• Meroo Meadow.
• Bomaderry Gateway.

The approximate extents of these three character units are illustrated in Figure 6.7. The southern end of the proposal site is the gateway to the greater Shoalhaven region, the majority of the landscape is a broad scale of escarpment hills, gently rolling valleys, small drainage lines, open pasture and rural plots, that are contained to the east by lower Broughton Creek. The arrangement of this landscape forms an attractive and harmonious composition where any intervention would require careful integration with the southern extents of the broader Berry Bolong Valley cultural landscape.

The landscapes that are in close proximity to the existing highway have been modified for agricultural purposes and the patterns of tree planting reflect this intervention. These are balanced with the forested hills of the escarpment to the west. The cultural landscape pattern strongly dominates the context of the proposal highway.

The study area is divided between three visual catchments. The broader Berry Bolong Pastoral Landscape forms two catchments, Jaspers Brush to the north and Meroo Meadow to the south. This is separated by a low saddle in the vicinity of Strongs Road, running in a south-easterly direction toward Broughton Creek refer to (Figure 6.11). From Meroo Meadow there is a transition from the open pastoral landscape into the forest landscape of the Shoalhaven. This forms the third visual catchment.

The study area passes mostly through agricultural / dairy farming land and the ground plane is dominated by pasture grasses and isolated specimens and clumps of trees (refer to Figures 6.8-6.12). Much of the vegetation that remains along the corridor is located in close proximity to the highway and is very narrow in width. The dominant species are:

• Araucaria cunninghamiana (Hoop Pines) mostly isolated specimens or small clumps.
• Ficus macrophylla (Moreton Bay Figs) - as isolated specimens.
• Pinus radiata (Radiata Pine tree ) either row or avenue plantings.
• Eucalyptus species (Gum trees) – in isolated clumps, road side specimens (possibly as regrowth following original clearing). Refer to Figure 6.12.

The township of Bomaderry is visually contained to the south of the study area by the existing vegetation and future growth is planned to the north-west of the existing town. This can be seen in Figure 6.10. Bomaderry has developed and functions as an extension of the urban area of Nowra. The intersection of the Princes Highway and Cambewarra Road / Moss Vale Road forms the entrance into the greater Nowra urban area. The proposal would have little impact on the functioning of these routes within Bomaderry.
Figure 6.7 Landscape character units within the proposal study area
Figure 6.8 Commercial forest plantings, Meroo Meadow

Figure 6.9 Roadside vegetation between Turners Lane and Devitts Lane

Figure 6.10 Bomaderry residential areas with line of remnant vegetation clearly visible

Figure 6.11 Jaspers Brush - gently undulating with numerous creeklines, drainages and dams. Trees mainly contained to drainage lines

Figure 6.12 Meroo Meadow, open flat agricultural and pastoral landscape
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Landscape character and visual impact assessment
7 Landscape character and visual impact assessment

7.1 Methodology

The methodology for the landscape character and visual impact assessment is based on RMS’ Environmental Impact Assessment Guidance Note – Guidelines for Landscape Character and Visual Impact Assessment (RTA, 2013). The impact grading matrix for the relevant levels of impact is illustrated in Table 7.1.

The assessment has been divided into two parts, the first is an overall assessment of the proposal and the second is an assessment of the three key landscape character units. The three landscape character units as described in the Section 6.0 are:
- Jaspers Brush
- Meroo Meadow
- Bomaderry Gateway

The following methodology was used in assessing landscape character and visual impact for each of those units:
- A description of the proposal components within each of the three landscape units.
- Assessment of existing landscape character.
- Description of the impacts of the proposal.
- Description of the visibility of the proposal.
- Assessment of sensitivity to proposed change.
- Assessment of the magnitude of proposed change.
- The overall assessment of the impact.
- The recommended mitigation strategies.

These are supported by figures that illustrate the following:
- The context of the landscape character unit and visual catchment of that landscape character unit in relation to the proposal.
- The existing landscape context of the landscape character unit.
- The proposal design (generated from the 3D model of the proposal).

Table 7.1 Landscape character and visual impact assessment: overall proposal

<table>
<thead>
<tr>
<th>Potential visual impact</th>
<th>Sensitivity</th>
<th>Magnitude of change</th>
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</thead>
<tbody>
<tr>
<td>High</td>
<td>High</td>
<td>High impact</td>
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<td>High to moderate</td>
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<td>Moderate impact</td>
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<tr>
<td>Low</td>
<td>Low</td>
<td>Moderate impact</td>
</tr>
</tbody>
</table>

Artist’s impressions from a series of selected viewpoints are included, illustrating the likely final built outcome and suggested mitigation measures. The artist’s impressions are represented with before and after images, in Section 7.7.

7.2 Landscape character and visual impact assessment: overall proposal

General

Each landscape character unit is assessed in detail in Section 7.3 to Section 7.5. The overall ratings for sensitivity to change and magnitude of the proposed change are a consolidation of the detailed findings for each of the landscape units assessed.

Existing landscape character

The immediate study area associated with the proposal is set within what is widely recognised as the Berry Bolong Pastoral Landscape. The existing landscape is a rich mosaic that balances cultural and natural patterns forming an engaging experience at both the intimate and large scale levels. The topography is generally gently undulating to flat. In the valleys and adjacent to the highway, strong cultural patterns in the landscape associated with ownership and the agricultural and pastoral land use dominate. The backdrop of the forested hills and escarpment is ever present to the west.

The existing highway corridor responds to the local topography skirting the lower, flatter slopes of the escarpment while staying above the floodplain of Broughton Creek. The cultural landscape planting and structure of laneways, fence lines and road side access directly respond to the alignment of the highway.

7.3 Detailed proposal description

Refer to Section 3.2 for a detailed description of the proposal design elements.

Impacts

Works associated with the proposal that would have a landscape character and visual impact on the three landscape character units would include:
- The relative scale of the proposal. This includes footprint (width), structure (bridges, grade separated facilities and grade-separated half-interchange) and in general elevation (flood mitigation).
- The loss of some prominent sections of roadside vegetation associated with the widening.
- The impact on cultural planting and landscape embellishments located immediately adjacent to the exiting highway that reinforce the broader rural character.
- The potential visual impact of the heavy vehicle inspection bay at Jaspers Brush.
- The potential noise impacts within the urban area of Bomaderry.

Visibility

Based on the generally open nature of the landscape and the variation in the localised topography, the proposal is situated within areas that have moderate visibility. Visibility and viewer sensitivity to the proposal and modifications required for the proposal were analysed from the perspective of assumed viewer groups. These are primarily adjacent rural residents and users of the corridor itself.

### Table 7.1 Landscape character and visual impact grading matrix - source RTA (2008)

<table>
<thead>
<tr>
<th>Potential visual impact</th>
<th>Sensitivity</th>
<th>Magnitude of change</th>
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</thead>
<tbody>
<tr>
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<td>Moderate impact</td>
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<tr>
<td>Low</td>
<td>Low</td>
<td>Moderate impact</td>
</tr>
</tbody>
</table>
7.3.1 Sensitivity to proposed change

As discussed in Section 6.0, the existing highway and its setting and integration with the existing landscape character are inseparable. The development of the cultural landscape interface at the edges of the existing road has evolved over many years. A large number of residences directly access the highway, many with defined hedge rows, avenue plantings, fencing types and entry gates. Agricultural plots are established to the road edge in some cases, while in others remnant stands of vegetation occupy the thin strips of road verge and in some places completely envelop the highway. These interactions are all important contributors to the overall landscape character and experience of the place, providing immediate detail and framing broader district views.

There is also the need to recognise the greater level of separation that residents along the highway may feel as the additional highway width, speed and changed access provisions will likely increase the sense of severance. The larger, broader landscape experiences would still be evident, including visual engagement with the ridges and escarpments, but the rich roadside detail presently experienced would be reduced in some places.

The viewer/user sensitivity (adjacent rural residents and road users) to the detail presently experienced would be reduced in some places.

There is also the need to consider the likely time frames for construction and the requirement for ancillary facilities during the construction period, which are all likely to add to the magnitude of change, especially in the short term.

7.4 Magnitude of proposed change

Closely aligned with the impacts on the sensitivity of the place to proposed change, the impacts from the magnitude of the change generated by the proposal would be substantial. The magnitude of upgrading from a two lane highway to a four lane highway with central median and a speed limit of 100 kilometres per hour requires substantially more footprint than the existing highway. Much of the intimate landscape interactions presently experienced in the vicinity of the highway (by both residents and road users) would be either lost or greatly modified.

The scale of the proposal would result in changes to residents’ interactions with the highway, from day to day direct highway access, agricultural operations and neighbourly connectivity, to larger scale physical relationship with alterations including cultural planting and visual outlook.

There is also the need to consider the likely time frames for construction and the requirement for ancillary facilities during the construction period, which are all likely to add to the magnitude of change, especially in the short term.

7.4.1 Assessment of impact

The overall impact assessment was based on the average assessments completed for each of the three landscape character units:

- Jaspers Brush.
- Meroo Meadow.
- Bomaderry Gateway.

For the detailed assessment of each of these refer to Sections 7.5 through Section 7.6.

The impacts are summarised below in Table 7.2 below.

Based on the overall scale of the proposed intervention and the relative distance that the majority of users would experience these interventions from, the overall impact is rated as high to moderate.

Overall rating - Moderate

7.4.2 Mitigation strategy

The recommended environmental management measures and mitigation strategies to minimise impacts to the landscape and visual character of the proposal include:

- Minimise the apparent width of the corridor and reinforcement of the existing landscape patterns would be paramount in integrating the proposal into the existing landscape context.
- Integrate new vegetation with the existing landscape character.
- Design potential retaining wall structures in accordance with the urban design strategy.
- Integrate large fill embankments and cut slopes by reducing steepness of slope where possible.
- Batter slopes to grades equal to or flatter than 3:1 this could be achieved by using poor quality structural fill soils more appropriate for landscape purposes.
- Engage adjacent land owners and community groups in assessing whether early works mitigation (e.g. landscape planting) can be achieved to help soften or decrease likely impacts of the proposal.
- Reinforce the broader Berry Bolong Pastoral Landscape through the use of key tree specimens at selected locations along the corridor and re-establishment of pastoral grasses.
- Define minimum design standards for the bridge structures.
- Develop a gateway / transition into Bomaderry as an arrival experience into the Shoalhaven region.
- Use appropriate urban design interventions to provide for a safe transition for southbound arrivals into Bomaderry. Appropriate urban design interventions might include integrated signage, tree planting, median planting and lighting.

These mitigation strategies would require further refinement and resolution in both the detailed design stage and would in many cases also require coordination and consideration during the construction phase.

Table 7.2 Landscape and visual impact summary table

<table>
<thead>
<tr>
<th>Category</th>
<th>Jaspers Brush</th>
<th>Meroo Meadow</th>
<th>Bomaderry Gateway</th>
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<td>High to Moderate impact</td>
<td>Moderate impact</td>
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<td>Overall</td>
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<tr>
<td>Overall (All units)</td>
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<td>Moderate impact</td>
<td>Moderate impact</td>
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</table>
7.5 Landscape character and visual impact assessment: Jaspers Brush

7.5.1 Existing landscape character

Refer to Section 6.5 for a description of the existing landscape character and Figure 7.2 for an illustration of the existing landscape character of Jaspers Brush landscape character unit.

7.5.2 Proposal components

The proposal requires increasing the width of the existing corridor and would include:

- A grade-separated facility at Jaspers Brush Road and Strongs Road.
- U-turn facilities at Mullers Lane (to travel southbound) and at Croziers Road (to travel northbound).
- Protected right hand turn bays at
  - Mullers Lane (northbound).
  - Croziers Road (southbound).
- A large cutting at Strongs Road, of about 300 meters long and up to ten meters deep.
- Four bridges:
  - Creek crossing No. 1 – Unnamed drainage line at chainage 19350, a three span concrete structure around 44 metres long and three metres high.
  - Creek crossing No. 2 – Unnamed drainage line at chainage 19800, a single span concrete structure around 33 metres long and four metres high.
  - Creek crossing No. 3 – Flying Fox Creek, a single span concrete structure around 18 metres long and seven metres high.
  - Creek crossing No. 4 – Jaspers Brush Creek, a three span concrete structure around 44 metres long and six metres high.
- A flood mitigation bridge - located just south of O’Keefes Lane at chainage 21200, a three span concrete structure around 45 metres long and 3.5 metres high.
- Modifications at the tie-ins to Jaspers Brush Road and Strongs Road.
- A northbound heavy vehicle inspection bay, staffed as needed and locked when not in use.

7.5.3 Impacts

Works associated with the proposal that would have a landscape character and visual impact on the Jaspers Brush landscape character unit would include:

- Increased footprint width of the proposal.
- Increased visibility of the highway infrastructure located on the ridge line.
- Increased cut batters to the east and west facing slopes.
- Loss of roadside vegetation associated with the widening of the corridor.

7.5.4 Visibility

The visual catchment of Jaspers Brush is relatively contained and the number of viewers is relatively low. Most impacts will be on some of the rural homesteads which are adjacent to the existing highway. The cutting at Jaspers Brush Road and Strongs Road grade-separated facility would be reasonably well screened and allows for the over bridge to be set into the landscape. The road is also widened considerably around chainage 21000 to allow for the heavy vehicle inspection bay.

The five bridges will be set down in the landscape and nestled within the creek line and flood plain landscape. For road users, the main feature will be the increased scale and size of the cutting through the ridge line between Jaspers Brush Road and Strongs Road and widened footprint.

Figure 7.1 illustrates the visibility of the Jaspers Brush landscape character unit.

7.5.5 Sensitivity to proposed change

The proposal would impact on the well established cultural landscape relationship that has evolved between the existing corridor and the adjacent land uses. This relationship will be modified by the proposal. Establishment of the new relationship and interface between the adjacent landscape and road corridor will take some time. The long term preservation and reinforcement of the pastoral landscape character is a key driver of the urban design and landscape strategy.

Rating - Moderate.

7.5.6 Magnitude of proposed change

The experience of the Jaspers Brush landscape is a balance between the foreground detail of the agricultural and pastoral landscape and the dramatic backdrop of the forested hills and escarpment. The changes are mainly related to the widening of the road corridor and the earthworks around the new grade-separated facility at Jaspers Brush Road and Strongs Road. The magnitude of this change would have a moderate impact.

Rating - Moderate.

7.5.7 Assessment of impact

Based on the overall scale of the proposed works, and the relative distance from which the majority of users will experience them, the overall impact is rated as high to moderate.

Overall rating - Moderate.

Refer to Table 7.3 for the impact assessment.

7.5.8 Mitigation strategy

The recommended mitigation strategy to minimise impacts to the landscape and visual character of the Jaspers Brush landscape character unit include:

- Replace any trees / shrub vegetation lost as part of the proposal, where possible.
- Establishment of vegetation around the grade-separated facility on the ridge line, where possible.
- Establishment of slopes flatter than 2:1 adjacent to the road corridor where possible, and reinstate the rural landscape character as close to the highway as is practicable.
- Use of culturally relevant planting.
- Reinforcement of vegetation at drainages.
- Simple unobtrusive bridge designs that are complementary and consistent with the network-wide approach.

For the application of these mitigation strategies and the concept design illustrated in Section 3.0, refer to Figure 3.2 to Figure 3.15.
Figure 7.1 Visual catchment and key viewpoints of the Jaspers Brush landscape character unit

Figure 7.2 Jaspers Brush landscape character unit - looking west

Table 7.3 Impact assessment table for the Jaspers Brush landscape character unit

<table>
<thead>
<tr>
<th>Potential visual impact</th>
<th>High</th>
<th>High to moderate</th>
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<th>Moderate to low</th>
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<td>Moderate to low impact</td>
<td>Low impact</td>
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</tbody>
</table>
7.6 Landscape character and visual impact assessment: Meroo Meadow

7.6.1 Existing landscape character

Refer to Section 6.5 for a description of the existing landscape character and Figure 7.4 for an illustration of the existing Meroo Meadow landscape character unit.

7.6.2 Proposal components

The proposal requires increasing the width of the existing corridor and would include:

- A grade-separated facility at Morschels Lane and Devitts Lane.
- A U-turn facility between Strongs Road and Turners Lane at about chainage 23200 (to travel southbound) and
- A U-turn facility between Strongs Road and Turners Lane at about chainage 24050, adjacent to Silos Winery (to travel northbound).
- A U-turn facility at Lamonds Lane (to travel southbound).
- Protected right hand turn bays at
  - Between Strongs Road and Turners Lane at about chainage 23200 (northbound).
  - Between Strongs Road and Turners Lane at about chainage 24050, adjacent to Silos Winery (southbound).
  - Lamonds Lane (northbound).
- Three bridges over waterways:
  - Creek crossing No. 5 – Wileys Creek, a five span concrete structure around 76 metres long and five metres high.
  - Creek crossing No. 6 – Tandingulla Creek, a three span concrete structure around 44 metres long and three metres high.
  - Creek crossing No. 7 – Tullian Creek, a three span concrete structure around 44 metres long and five metres high.
- Modifications at the tie-ins to Morschels Lane and Devitts Lane.
- Embankments to elevate road corridor and provide flood immunity.

7.6.3 Impacts

Upgrades associated with the proposal that would have a landscape character and visual impact on the Meroo Meadow landscape character unit would include:

- Increased footprint width of the proposal.
- Increased visibility of the elevated highway infrastructure.
- Loss of a prominent stand of roadside vegetation between Turners Lane and Devitts Lane.
- Loss of roadside vegetation associated with the widening of the corridor.

7.6.4 Visibility

The visual catchment of Meroo Meadow is relatively contained and the number of viewers is relatively low. Figure 7.3 illustrates the visibility of the Meroo Meadow landscape character unit.

7.6.5 Sensitivity to proposed changes

The views to Meroo Meadow landscape are mostly experienced by road users and an isolated number of rural residents. The proposal would impact on the well established cultural landscape relationship that has evolved between the existing corridor and the adjacent land uses. This relationship will be modified by the proposal. Establishment of the new relationship and interface between the adjacent landscape and road corridor will take some time. The long term preservation and reinforcement of the pastoral landscape character is a key driver of the urban design and landscape strategy.

Rating - High to moderate.

7.6.6 Magnitude of proposed changes

The experience of the Meroo Meadow landscape is a balance between the foreground detail of the agricultural and pastoral landscape and the dramatic backdrop of the forested hills and escarpment. The changes are mainly related to the widening of the road corridor and the loss of roadside vegetation and engagement with adjacent land uses. The magnitude of this change would have a moderate impact.

Rating - Moderate.

7.6.7 Assessment of impact

Based on the overall scale of the proposal, and the relative distance from which the majority of users will experience it, the overall impact is rated as high to moderate.

Overall rating - High to moderate.

Refer to Table 7.4 for the impact assessment.

7.6.8 Mitigation strategy

The recommended mitigation strategies to minimise impacts to the landscape and visual character of the Meroo Meadow landscape character unit include:

- Reinstatement of a treed corridor between Turners Lane and Devitts Lane.
- Establishment of slopes flatter than 2:1 adjacent to road corridor where possible for rural landscape character as close to the highway as is feasible.
- Use of culturally relevant planting.
- Integration of water quality treatment basins.
- Reinforcement of vegetation at drainages.
- Simple unobtrusive bridge designs that are complementary and consistent with the network-wide approach.

For the application of these mitigation strategies and the concept design illustrated in Section 3.0, refer to Figure 3.2 to Figure 3.15.
Table 7.4 Impact assessment table for the Meroo Meadow landscape character unit

<table>
<thead>
<tr>
<th>Potential visual impact</th>
<th>High</th>
<th>High to moderate</th>
<th>Moderate</th>
<th>Moderate to low</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High impact</td>
<td>High to moderate impact</td>
<td>Moderate impact</td>
<td>Moderate impact</td>
<td>Low impact</td>
</tr>
<tr>
<td>High to moderate</td>
<td>High impact</td>
<td>High to moderate impact</td>
<td>High to moderate impact</td>
<td>Moderate impact</td>
<td>Moderate impact</td>
</tr>
<tr>
<td>Moderate</td>
<td>High to moderate impact</td>
<td>High to moderate impact</td>
<td>Moderate impact</td>
<td>Moderate impact</td>
<td>Moderate to low impact</td>
</tr>
<tr>
<td>Moderate to low</td>
<td>High to moderate impact</td>
<td>Moderate impact</td>
<td>Moderate impact</td>
<td>Moderate to low impact</td>
<td>Moderate to low impact</td>
</tr>
<tr>
<td>Low</td>
<td>Moderate impact</td>
<td>Moderate impact</td>
<td>Moderate to low impact</td>
<td>Moderate to low impact</td>
<td>Low impact</td>
</tr>
</tbody>
</table>
7.7 Landscape character and visual impact assessment: Bomaderry gateway

7.7.1 Existing landscape character

Refer to Section 6.5 for a description of the existing landscape character and Figure 7.6 for an illustration of the existing Bomaderry gateway landscape character unit.

7.7.2 Proposal components

The proposal requires increasing the width of the existing corridor and would include:

- A grade-separated half-interchange at:
  - Pestells Lane and Meroo Road.
- Two bridges over waterways:
  - Creek crossing No. 7 – Tullian Creek, a three span concrete structure around 44 metres long and five metres high.
  - Creek crossing No. 8 – Abernethys Creek, a three span concrete structure around 76 metres long and two metres high.
- A U-turn facility south of Abernethys Lane at about chainage 28590 (to travel southbound).
- A protected right turn bay south of Abernethys Lane at about chainage 28590 (northbound).
- A major drainage and flood mitigation structure at Pestells Lane - eight box culverts, around 2.5 metres wide, 1.5 metres high and 130 metres long.
- Tie-in with the existing highway at the Cambewarra Road / Moss Vale Road roundabout.

7.7.3 Impacts

Interventions associated with the proposal that would have a landscape character and visual impact on the Bomaderry gateway landscape character unit would include:

- Loss of some vegetation associated with corridor widening.
- Introduction of large scale infrastructure (with the grade-separated half-interchange) into a flat open landscape.

7.7.4 Visibility

The visual catchment of the Bomaderry gateway landscape is relatively contained and the number of viewers is relatively low. The greater majority of Bomaderry residents are screened by the existing remnant vegetation along the northern edge of the urban area.

Figure 7.5 illustrates the visibility of the Bomaderry gateway landscape character unit proposal.

7.7.5 Sensitivity to proposed changes

The views to the Bomaderry gateway landscape are mostly experienced by road users and an isolated number of rural residents and the cluster of residents located at the southern end of the proposal close to Bomaderry.

The changes impact on the well established cultural landscape relationship that has evolved between the existing corridor and the adjacent land uses. This relationship will be modified by the proposal. Establishment of the new relationship and interface between the adjacent landscape and road corridor will take some time.

The long term preservation and reinforcement of the pastoral landscape character is a key driver of the urban design and landscape strategy.

Rating - Moderate.

7.7.6 Magnitude of proposed changes

The experience of the Bomaderry gateway landscape is a balance between the foreground detail of the agricultural and pastoral landscape, the dramatic backdrop of the forested hills and escarpment, and the forested transition into and out of the Bomaderry / Nowra urban area.

The changes are mainly related to the widening of the road corridor and the loss of roadside vegetation and engagement with adjacent land uses. The other considerable change is the footprint and physical size of the proposed grade-separated half-interchange at Pestells Lane and Meroo Road.

The magnitude of this change would have a moderate impact.

Rating - Moderate.

7.7.7 Assessment of impact

Based on the overall scale of the proposed intervention and the relative viewer distance, the overall impact is rated as moderate.

Overall rating - Moderate

Refer to Table 7.5 for the impact assessment.

7.7.8 Mitigation strategy

The recommended mitigation strategies to minimise impacts to the landscape and visual character of the Bomaderry gateway landscape character unit include:

- The establishment of slopes flatter than 2:1 adjacent to the road corridor where possible to reinstate the rural landscape character as close to the highway as is feasible.
- Use of culturally relevant planting.
- Reinforcement of vegetation at drainage lines.
- Simple unobtrusive bridge designs that are complementary and consistent with the network-wide approach.
- A gateway / transition into Bomaderry as an arrival experience into the Shoalhaven region.
- Use of appropriate urban design interventions to provide for a safe transition for southbound arrivals into Bomaderry and safe transition to the highway environment travelling north.

For the application of these mitigation strategies and the concept design illustrated in Section 3.0, refer to Figure 3.2 to Figure 3.15.
Figure 7.5 Visual catchment and key viewpoints of the Bomaderry gateway landscape character unit

Figure 7.6 Bomaderry Gateway landscape character unit - looking north towards Meroo Meadow

Figure 7.7 Bomaderry Gateway landscape character unit - looking south towards Nowra

Table 7.5 Impact assessment table for the Bomaderry gateway landscape character unit

<table>
<thead>
<tr>
<th>Potential visual impact</th>
<th>Sensitive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td>High</td>
<td>High impact</td>
</tr>
<tr>
<td>High to moderate</td>
<td>High impact</td>
</tr>
<tr>
<td>Moderate</td>
<td>High to moderate impact</td>
</tr>
<tr>
<td>Moderate to low</td>
<td>High to moderate impact</td>
</tr>
<tr>
<td>Low</td>
<td>Moderate impact</td>
</tr>
</tbody>
</table>
7.8 Artist’s impressions

Artist’s impressions have been developed throughout the design process to:
• Help define the likely visual impacts.
• Inform the assessment of design options.
• Help clearly communicate and illustrate the landscape and urban design concepts.

To support the concept design a series of artist’s impressions are included in the following pages. Refer to Figure 7.3 through to Figure 7.20.

Figure 7.11 identifies the locations of artist’s impressions along the route.

Location 1 and 2 viewpoints are taken from locations along the existing highway.

The aerial artists impression images A-D, have been produced to illustrate the design in locations where it is difficult to see the overall impact from ground level. These also use before and after figures for comparison.

7.8.1 Viewpoint locations

Artist’s impressions

Viewpoint location 1: Corner of Jaspers Brush Road on existing Princes Highway looking south west.

Viewpoint location 2: On existing Princes Highway looking north to Meroo Road.

Aerial perspective artist’s impressions

Viewpoint location A: View looking north across Jaspers Brush

Viewpoint location B: View looking north east over Meroo Meadow

Viewpoint location C: View looking south of Meroo Meadow towards Bomaderry

Viewpoint location D: View looking north from Bomaderry towards Meroo Meadow

Figure 7.8 Image sequence for artist’s impressions

Figure 7.9 Location of artist’s impressions along the route
Figure 7.10 Existing view

Figure 7.11 Site photo showing extent of intervention (wireframe) / 12D model

Figure 7.12 Artist's impression from viewpoint location 1 (not representative of time of opening - vegetation will need time to establish)
Viewpoint location 2

Figure 7.13  Existing view

Figure 7.14 Site photo showing extent of intervention (wireframe) / 12D model

Figure 7.15  Artist's impression from viewpoint location 2 (not representative of time of opening - vegetation will need time to establish)
Figure 7.16 Before and after Jaspers Brush looking north - artist’s impressions illustrating the proposed mitigation measures*
Figure 7.17 Before and after Meroo Meadow looking north-east - artist’s impressions illustrating the proposed mitigation measures *

Figure 7.18 Before and after Meroo Meadow / Bomaderry looking south - artist’s impressions illustrating the proposed mitigation measures*

*Note: Aerial photographs used in the preparation of these artist’s impressions were taken in 2007.
Figure 7.19 Before and after Bomaderry looking north - artist's impressions illustrating the proposed mitigation measures*
Mitigation and management measures
8 Mitigation and management measures

Landscape character and visual impacts from the proposal are described in Section 7.0 with recommended mitigation measures outlined. In this section, actual mitigation and management strategies are identified for each of the viewpoints considered in the assessment. In general, the mitigation measures would seek to:

- Reduce the physical impacts of the proposal to the minimum required to achieve the proposal objectives.
- Facilitate landscape and urban design outcomes that resolve other opportunities and constraints including:
  - Balancing cut and fill earthworks quantities.
  - Utilising RMS-owned land along the corridor to flatten 2:1 batters, minimising the long term footprint and therefore maintenance requirements primarily through the return and re-establishing of pasture land as far as practicable.
- Integrate new vegetation with the existing landscape character by using culturally relevant species planted to existing patterns.
- Engage with the local community to gather feedback as the design develops, foster broader community support and ownership for the design outcome and facilitate integration with the existing environment.
- Utilise urban design measures to define where the transition points occur between the highway and local street networks.
- Design retaining wall structures, cut embankments, fill slopes and bridges and associated elements in accordance with the Urban and Landscape Design Strategy (refer to Section 5.0).
- Engage adjacent land owners to assess whether early works mitigation (e.g. landscape planting) can help reduce or soften the visual impacts of the proposal.
- Minimise any lighting impacts for the proposal by designing in accordance with Australian Standard 1158 Road Lighting. Lighting around the interchanges would be designed for a non-intrusive angle to minimise light spill impacts on adjoining residential properties as far as practicable.
- Clarify minimum reference design requirements for the major structures required for the proposal including the waterway bridges, overpasses and underpasses.

Table 8.1 sets out the specific mitigation and management measures that would be implemented in response to the impacts at the viewpoints analysed in Section 7.0.

These mitigation measures are implemented in the Concept Urban Design plan in Section 3.0 and shown on the artist’s impressions for each of the eight viewpoints in Section 7.0.

Further development of the Bomaderry arrival / departure strategy would be undertaken during the detailed design phase of the proposal to ensure integration with the varying characteristics of the existing rural and town landscape context, providing a safe and legible transition from highway conditions to local roads. Development of the strategy would occur in consultation with Shoalhaven City Council.

It is assumed in this assessment that all of the relevant environmental management requirements relating to sound, dust control, minimum buffer distances, noise and vibration will be met. The landscape and urban design recommendations are focused on requirements that would integrate with and support the proposed broader environmental management strategies.

8.1 Reference design parameters

During the concept design process, it was determined that the following components of the proposal would be required to meet a set of minimum reference design requirements. These components include:

- Eight bridges over waterways.
- Two overpasses.
- One underpass.

Table 8.2 outlines the reference design parameters for each of these bridge structures.

8.2 Ancillary sites

Temporary construction ancillary facilities (such as compound sites, stockpiles and sediment basins) would be required for the Berry to Bomaderry upgrade (the proposal).

Locations for potential construction ancillary facilities have been identified, in consultation with RMS and the relevant specialists, through a preliminary environmental constraints analysis on land within a 200 metre buffer of the proposal corridor. These locations are identified in the REF.

The landscape and urban design recommendations for visual mitigation are focused on meeting the environmental requirements and minimising the potential visual impacts.

To minimise visual impacts the mitigation measures would require:

- Mounding and cover crop planting (where space permits).
- Screening planting.
- A combination of screen planting and mounding.
### Table 8.1 Mitigation measures

<table>
<thead>
<tr>
<th>Landscape character unit and artist’s impression viewpoint number:</th>
<th>Potential impacts identified in landscape character and visual impact assessment</th>
<th>Design response mitigation and management measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viewpoint 1</strong></td>
<td>• Increased footprint width of the proposal.</td>
<td>• Roll back top of cutting where practicable to reduce the overall appearance of the cut.</td>
</tr>
<tr>
<td>Looking south-west from corner of Jaspers Brush Road.</td>
<td>• Visual impact from new grade-separated facilities and associated earthworks at Strong Road</td>
<td>• Reinstate and reinforce vegetation to top of cuttings (whilst maintaining a five metres space for the catch drain and associated maintenance of the drain) and in space between access ramps for Strongs Road and Jaspers Brush Road.</td>
</tr>
<tr>
<td>- Landscape character unit - Jaspers Brush</td>
<td>• Removal of existing vegetation on the ridge line south of Jaspers Brush Creek.</td>
<td>• Reinforce, where possible the existing rhythmic pattern of the rural landscape in the broader context by including cultural plantings to articulate property boundaries and waterways.</td>
</tr>
<tr>
<td></td>
<td>• Cutting up to 10 meters deep.</td>
<td>• Stone pitching to abutment underneath bridge structure.</td>
</tr>
<tr>
<td><strong>Viewpoint 2</strong></td>
<td>• Increased footprint width of proposal.</td>
<td>• Visual impact from new grade-separated half-interchange over the highway at Meroo and Pestells Lane.</td>
</tr>
<tr>
<td>Looking north to Meroo Meadow. - Landscape character unit -</td>
<td>• Visual impact from new grade-separated half-interchange over the highway at Meroo</td>
<td>• Consider gateway cultural planting at grade-separated half-interchange as arrival or departure experience from the greater Shoalhaven region.</td>
</tr>
<tr>
<td>Meroo Meadow and Bomaderry Gateway</td>
<td>Road and Pestells Lane.</td>
<td>• Roll out embankments to slopes that can be reinstated with turf grass.</td>
</tr>
<tr>
<td></td>
<td>• The proposed half-interchange will be occurring in a flat open landscape and require extensive earthworks including fills and embankments resulting in visual impacts.</td>
<td>• Use lighting of half-interchange as part of the transition experience and speed control measures approaching Bomaderry.</td>
</tr>
<tr>
<td></td>
<td>• Lighting required for the half-interchange.</td>
<td>• Use culturally relevant and suitable species to screen the permanent stockpile site from road users.</td>
</tr>
<tr>
<td></td>
<td>• Permanent stockpile site.</td>
<td></td>
</tr>
<tr>
<td><strong>Aerial viewpoint A</strong></td>
<td>• Increased footprint width of proposal.</td>
<td>• Reinforce planting at Abernethys Creek.</td>
</tr>
<tr>
<td>Looking north across Jaspers Brush Landscape character unit -</td>
<td>• Grade-separated facility at Jaspers Brush Road and Strong Road.</td>
<td>• Consider gateway cultural planting at grade-separated half-interchange as arrival or departure experience from the greater Shoalhaven region.</td>
</tr>
<tr>
<td>Meroo Brush - Jaspers Brush</td>
<td>• Creek crossings at Flying Fox and Jaspers Brush creeks.</td>
<td>• Roll out embankments to slopes that can be reinstated with turf grass.</td>
</tr>
<tr>
<td></td>
<td>• Large cutting, up to 10 meters in depth in the ridge line south of Jaspers Brush Creek.</td>
<td>• Use lighting of half-interchange as part of the transition experience and speed control measures.</td>
</tr>
<tr>
<td><strong>Aerial viewpoint B</strong></td>
<td>• Increased footprint width of proposal.</td>
<td>• Use culturally relevant and suitable species to screen the permanent stockpile site from road users.</td>
</tr>
<tr>
<td>Looking north-east across Meroo Meadow - Jaspers Brush</td>
<td>• Visual impact from new grade-separated half-interchange over the highway at Pestells Lane and Meroo Road.</td>
<td>• Reinforce where possible the existing rhythmic pattern of the rural landscape in the broader context by including cultural plantings to articulate property boundaries and waterways.</td>
</tr>
<tr>
<td></td>
<td>• Removal of large length of existing vegetation adjacent to highway between Turners Lane and Devitts Lane.</td>
<td>• Embankment slopes associated with the raised highway would not exceed 2:1 where feasible and reasonable and would be sympathetic with the adjacent landscape, using techniques such as varied embankment slopes and blending to the edge of the infrastructure as far as practicable.</td>
</tr>
<tr>
<td></td>
<td>• Visual impact from new grade-separated facilities and associated earthworks at Morschels Lane and Devitts Lane.</td>
<td>• Include culturally relevant plantings along the tops of the embankments on the ridge line south of Jaspers Brush Creek.</td>
</tr>
<tr>
<td></td>
<td>• Roadside landscape relationship with large extents of 2:1 embankments to improve highway flood immunity and vertical alignment.</td>
<td>• Reinforce planting at Abernethys Creek.</td>
</tr>
<tr>
<td></td>
<td>• Potential visual impacts to isolated rural properties along the corridor.</td>
<td>• Design embankment slopes associated with the raised highway to not exceed 2:1 where feasible and reasonable and to be sympathetic with the adjacent landscape, using techniques such as varied embankment slopes and blending to the edge of the infrastructure as far as practicable.</td>
</tr>
<tr>
<td><strong>Aerial viewpoint C</strong></td>
<td>• Increased footprint width of proposal.</td>
<td>• Reinforce, where possible the existing rhythmic pattern of the rural landscape in the broader context by including cultural plantings to articulate property boundaries and waterways.</td>
</tr>
<tr>
<td>Looking north-east across Meroo Meadow towards Bomaderry</td>
<td>• Visual impact from new grade-separated half-interchange over the highway at Pestells Lane and Meroo Road.</td>
<td>• Embankment slopes associated with the raised highway to not exceed 2:1 where feasible and reasonable and to be sympathetic with the adjacent landscape, using techniques such as varied embankment slopes and blending to the edge of the infrastructure as far as practicable.</td>
</tr>
<tr>
<td>- Landscape character unit - Meroo Meadow / Bomaderry Gateway</td>
<td>• The proposed half-interchange will be occurring in a flat open landscape and requires extensive earthworks including fills and embankments resulting in visual impacts.</td>
<td>• Use lighting of half-interchange as part of the transition experience and speed control measures.</td>
</tr>
<tr>
<td></td>
<td>• Lighting required for the half-interchange.</td>
<td>• Use culturally relevant and suitable species to screen the permanent stockpile site from road users.</td>
</tr>
<tr>
<td></td>
<td>• Permanent stockpile site.</td>
<td>• Consider any early (in the construction phase) forward planting opportunities to minimise potential visual impacts on rural properties.</td>
</tr>
<tr>
<td><strong>Aerial viewpoint D</strong></td>
<td>• Increased footprint width of proposal.</td>
<td>• Design embankment slopes associated with the raised highway to not exceed 2:1 where feasible and reasonable and to be sympathetic with the adjacent landscape, using techniques such as varied embankment slopes and blending to the edge of the infrastructure as far as practicable.</td>
</tr>
<tr>
<td>Looking north-east across Meroo Meadow - Meroo Meadow</td>
<td>• Potential visual impact from widened infrastructure on residents of Bomaderry.</td>
<td>• Reinforce, where possible the existing rhythmic pattern of the rural landscape in the broader context by including cultural plantings to articulate property boundaries and waterways.</td>
</tr>
<tr>
<td></td>
<td>• Loss of roadside vegetation.</td>
<td>• Stone pitching to abutment underneath bridge structure.</td>
</tr>
<tr>
<td></td>
<td>• Reinstate vegetation to road side corridor on entry into Bomaderry to reinforce buffer between pastoral open landscape and urban area of Bomaderry.</td>
<td>• Use lighting of half-interchange as part of the transition experience and speed control measures.</td>
</tr>
<tr>
<td></td>
<td>• Further develop the design of the approach into Bomaderry as an integrated engineering and urban design outcome responding to the built and rural context, reinforcing a safe speed environment.</td>
<td>• Use culturally relevant and suitable species to screen the permanent stockpile site from road users.</td>
</tr>
<tr>
<td></td>
<td>• Include transition planting (roadside tree planting and central median) to match street character of existing urban area.</td>
<td></td>
</tr>
</tbody>
</table>
Table 8.2 Reference design requirements proposed bridges

<table>
<thead>
<tr>
<th>Bridge Id</th>
<th>Bridge 1 Creek crossing 1 - unnamed drainage line</th>
<th>Bridge 2 Creek crossing 2 - unnamed drainage line</th>
<th>Bridge 3 Flying Fox Creek</th>
<th>Bridge 4 Jaspers Brush Creek</th>
<th>Bridge 5 Willeys Creek</th>
<th>Bridge 6 Tandangulla Creek</th>
<th>Bridge 7 Tullian Creek</th>
<th>Bridge 8 Aberimbys Creek</th>
<th>Bridge 9 Strongs Road overpass</th>
<th>Bridge 10 Pestells Lane underpass</th>
<th>Bridge 11 Devills Lane overpass</th>
<th>Flood Mitigation Bridge O'Keefe Lane crossing</th>
<th>Pestells Lane Culvert O'Keefe Lane ramp off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chainage (kilometres)</td>
<td>19350</td>
<td>19800</td>
<td>1</td>
<td>21450</td>
<td>24300</td>
<td>26600</td>
<td>27800</td>
<td>28600</td>
<td>180 Strongs Road</td>
<td>280 (Pestells Lane)</td>
<td>25130</td>
<td>21200</td>
<td>28100</td>
</tr>
<tr>
<td>Context</td>
<td>Open landscape</td>
<td>Open landscape</td>
<td>Creek crossing open landscape with dense vegetation over creek line only</td>
<td>Creek crossing open landscape with dense vegetation over creek line only</td>
<td>Open</td>
<td>Creek crossing open landscape with dense vegetation over creek line only</td>
<td>Open pastoral landscape and well vegetated creek line</td>
<td>Vegetated ridgeline</td>
<td>Open landscape elevated context</td>
<td>Open landscape</td>
<td>Open landscape</td>
<td>Open landscape</td>
<td></td>
</tr>
<tr>
<td>Visibility</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low to medium</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Low to medium</td>
<td>Low to medium</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td>Make the bridge as unobtrusive as possible to hide it within the landscape.</td>
<td>Make the bridge simple and as elegant as possible to complement the landscape.</td>
<td>Make the bridge as unobtrusive as possible to hide it within the landscape.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likely bridge type</td>
<td>Pre-stressed concrete plank</td>
<td>Simply supported super T - 1,500mm deep</td>
<td>Pre-stressed concrete plank</td>
<td>Simply supported super T - 1,500mm deep</td>
<td>Steel girders (TBC)</td>
<td>Simply supported super T - 1,500mm deep</td>
<td>Pre-stressed concrete plank</td>
<td>Pre-stressed concrete plank</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Bridge Dimensions</td>
<td>Approximate width (m)</td>
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<td>24</td>
<td>24</td>
<td>2.4</td>
<td>9.5</td>
<td>12.9</td>
<td>26.5</td>
<td>20</td>
<td>13</td>
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<td>46</td>
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<td>Likely no. of spans</td>
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<td>1</td>
<td>3</td>
<td>N/A</td>
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<tr>
<td>Design elements</td>
<td>Abutment</td>
<td>Spill through – equal proportion</td>
<td>Stone pitched embankment underneath bridge on 2:1 slope</td>
<td>Spill through – equal proportion</td>
<td>Spill through – equal proportion (TBC)</td>
<td>Spill through – equal proportion</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Pier form and dimensions</td>
<td>Circular - 900mm diameter</td>
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<td>Not applicable</td>
<td>Circular - 900mm diameter</td>
<td>Circular - 900mm diameter</td>
<td>Circular - 900mm diameter</td>
<td>Circular - 900mm diameter</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Circular - 900mm diameter</td>
<td>Not applicable</td>
<td></td>
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<tr>
<td>Headstocks (exposed)</td>
<td>Expressed</td>
<td>None</td>
<td>None</td>
<td>Expressed</td>
<td>Expressed</td>
<td>Expressed</td>
<td>Expressed</td>
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<td>Expressed</td>
<td>None</td>
<td>None</td>
<td>TBC</td>
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<td>Safety screens</td>
<td>Not required - TBC</td>
<td>Required</td>
<td>Required</td>
<td>Not required - TBC</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Not required - TBC</td>
<td>TBC</td>
<td>TBC</td>
<td></td>
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<tr>
<td>Lighting</td>
<td>Not required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
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*Note: Design requirements subject to ongoing consultation and review during the detailed design phase.