Gerringong upgrade
Princes Highway
Review of Environmental Factors
APPENDIX K - URBAN AND LANDSCAPE DESIGN ASSESSMENT
JUNE 2010
Gerringong Upgrade
Princes Highway Upgrade
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7.0 Mitigation and management measures
Executive Summary

This report

> Describes the Gerringong upgrade and the process to develop the project to the concept design stage
> Assess the urban and landscape design of the proposed upgrade route and new town access points for 7.5km of highway between Mt Pleasant and Toolijooa Road.
> Makes recommendations to mitigate impacts

Whilst a specific ‘Urban Design Framework’ does not yet exist for the whole Princes Highway, the design objectives outlined in this report (Section 2.0) are derived from the RTA’s policies regarding Urban Design as published in Beyond the Pavement RTA urban design policy, procedures and design principles (RTA July 2009) and are also consistent with the Gerringong to Bomaderry Princes Highway Upgrade Preliminary Urban and Regional Design Strategy (AECOM November 2007).

Evaluation of the proposal

The project has been assessed in regard to;
> The project urban design objectives and principles
> The contextual and landscape character analysis
> The landscape character and visual impact assessment

In general the proposal satisfies the project urban design objectives and principles. There would be landscape character and visual impacts, some more significant than others. While the scale of the interventions required with the upgrade in what is generally a rich open pastoral landscape is an overall impact, more particular impacts would include;
> The removal of two culturally significant fig trees and encroachment on to the Renfrew Park Estate at the proposed Rose Valley Road interchange.
> The raising of the highway (up to 4m above existing) across Omega Flat to ensure 100 year flood immunity;
> The new bridge over the South Coast railway line on Fern Street;
> The new interchange at Belinda Street that elevates the proposed highway up to 5m above the existing alignment;
> The removal of vegetation and cultural landscape patterns that have evolved over a long period of time.

The integrated urban design concept plan represents the recommended mitigation strategies for minimising the impact on landscape character and the visual environment.

Four landscape character units were identified, described and assessed in terms of the landscape character and visual impact of the proposal. These four landscape character units are;
> Mt Pleasant;
> Rose Valley and Omega Flat;
> Gerringong and
> Crooked River.

The assessment of the overall proposal identifies an impact rating category of high to moderate. Five existing viewpoints accompanied by an artist’s impression are presented to illustrate the mitigation measures derived from the urban design strategy and illustrates the likely outcomes.

These impressions and the urban and landscape concept design plan illustrate the key urban design initiatives, including;
> The minimisation of the apparent width of the corridor and reinforcement of the existing landscape patterns into the existing landscape context.
> The use of culturally significant tree species strategically along the corridor;
> The maintaining of the perpendicular patterns within the landscape;
> The selective and prudent screening of some of the new infrastructure associated with the upgrade;
> The integration of cut batters and fill slopes and;
> The holistic and considered integration of bridge and retaining elements into the urban design.
1.0 Introduction

1.1 The proposal

The Roads and Traffic Authority of NSW (RTA) is proposing to upgrade the Princes Highway between Mount Pleasant and Toolijooa Road (Gerringong Upgrade, the Proposal). The proposal is part of the RTA’s program to upgrade the Princes Highway between Gerringong and Bomaderry, providing increased road safety and traffic efficiency in the South Coast region.

The horizontal and vertical alignments of the existing largely two-lane highway between Mount Pleasant and Toolijooa Road require upgrading to meet current design safety and traffic efficiency requirements. The highway has limited overtaking opportunities, many junctions with rural roads and private, uncontrolled accesses. The existing road also incorporates two access opportunities for the town of Gerringong, one at the northern end of town, at Fern Street and one at the southern end of town at Belinda Street.

The preferred option for the proposal has been selected as that which best meets the project objectives. The preferred option performs well across a combination of the technical input gathered through investigations carried out to date (including a review of studies from previous investigations into the upgrade), community feedback and the findings of the value management process.

1.1.1 The study area

The proposal study area extends from the termination of the existing four lane configuration at Mount Pleasant Lookout in the north, to Toolijooa Road in the south, refer to figure 1.1. The study area varies in width from approximately one to three kilometres and is influenced by natural landform and cultural infrastructure features. To the north and west the study area is bordered by the southern end of the Illawarra Escarpment and Currys Mountain. To the east and south the it is bordered by the town of Gerringong and the South Coast Railway Line.

From north-east to south-west the study area passes over Omega Flat, past Werri lagoon, through the town of Gerringong and terminates at Toolijooa Road in Toolijooa. The pastureland and rural settlement patterns of the study area are defining features. The rural landscape that exists today is highly reflective of agricultural activities that have been occurring since the first half of the nineteenth century.

The largest agricultural influence has come from dairying activities. These activities have defined the general pattern of vegetation clearance, rural boundaries (by linear cultural plantings) and the distribution of rural houses and farm buildings.

Within the pasture landscape the major source of variation is the topography of the study area. The character of the rural backdrop is markedly different between the undulating higher elevations associated with the foothills of the Illawarra Escarpment, Rose Valley, Willow Vale and Currys Mountain; and the coastal plain that occurs generally east of the existing Princes Highway.

The rural backdrop is slowly changing and the partial decline in the dairying industry has created a more complex landscape pattern. A wider variety of agricultural activities is resulting in more areas under cultivation.
Figure 1.1 - The Princes Highway Upgrade between Gerringong and Bomaderry

Gerringong upgrade

Future Princes Highway Upgrade

Major Town

Figure 1.1 - The Princes Highway Upgrade between Gerringong and Bomaderry
1.1.2 Design constraints

Significant constraints which influence the location and design of the proposal include:

> The existing highway corridor;
> Sub-standard road geometry of the existing highway;
> Floodplains and soft soil conditions;
> The South Coast Railway Line;
> Agricultural industry including dairy and vineyards;
> The Eastern Gas Pipeline;
> Aboriginal and European cultural heritage at various locations across the study area; and
> Residences and communities.

1.1.3 Design elements

The proposal is approximately 7.5km in length. **Figure 1.1** highlights the Gerringong upgrade in the context of the Princes Highway between Gerringong to Bomaderry. **Figure 1.2** illustrates the proposed route and the key elements of the upgrade as they relate to the urban and landscape design. The Gerringong upgrade is part of the overall Princes Highway upgrade, the overarching objectives of which are to improve road safety and reduce travel times. The proposal would include the following design elements:

> Construction of two lanes in each direction between Mount Pleasant and Toolijooa Road.
> Grade separated interchange at Rose Valley Road incorporating four way traffic access to and from Gerringong via a two-way service road and an overbridge spanning the South Coast Railway at Fern Street.
> Extensive drainage structures maintaining cross drainage flow in the low lying area of Omega Flat.
> Grade separated interchange at Belinda Street providing four-way, 1:100 year flood free traffic access to and from Gerringong and incorporating a two-way service road connecting to Willow Vale Road.
> Bridge structure spanning the Crooked River and incorporating Baileys Road and an existing cattle underpass.
> Additional northbound climbing lane between Rose Valley Road and the top of Mount Pleasant.
> Additional southbound climbing lane for approximately 800 metres from Belinda Street on load ramp.
> Property acquisition and the setting of corridor boundaries for the provision of future widening to six lanes (three in each direction).
> Provision for future widening where the design is constrained by topography and alignment eg. the ‘slot’ and bridge structure at the Rose Valley Road interchange.
Major Intersection / Access point

Project Alignment

Overpass

Bridge

Embankment

Cutting

Figure 1.1 - The Gerringong upgrade and the key elements associated with the proposed route
1.2 Study methodology

Early planning is the key to achieving an integrated urban design strategy for major infrastructure projects. The Gerringong Upgrade would ultimately become part of the fabric of the community and landscape in which it is integrated. Establishment of a multidisciplinary collaborative design team early in this project (prior to route selection) has ensured consistent, high level awareness of the landscape and urban design objectives in order to achieve a ‘whole of corridor’ integrated outcome for the Gerringong Upgrade in the context of the entire Princes Highway.

Development of the concept urban design has been a process of informing and being informed by each of the design team disciplines to ensure a holistic integrated solution. In this report the following studies are documented as part of the design process:

- The Urban and Landscape Design Objectives and Principles that were developed prior to project commencement and were used to develop and assess the concept design in line with the RTA’s overall strategy for urban design.
- A contextual analysis of the Princes Highway was documented to assist in understanding the environment around the proposed upgrade. This analysis was undertaken through field surveys, and desktop studies to determine character units and identify site opportunities and constraints.
- A landscape character assessment and visual analysis was also undertaken to identify the key landscape character units and viewpoints within the study area. The visual analysis was used to identify impacts to the study area from the proposed engineering concept design and work towards treatments and mitigation measures to achieve an integrated design solution.

In order to realise the full potential of this integration and leave a positive legacy within the landscape and community, the collaborative process will be continued through detailed design to ensure that ‘whole of corridor’ landscape and urban design objectives are met.
1.3 Structure of this report

This assessment uses both desktop and field studies to define the contextual landscape, physical characteristics and visual analysis. Information was gathered from the site by undertaking field surveys (including photographing the area) in public areas including local roads, Gerringong Township and along the existing Princes Highway corridor to assess likely view points and impacts. Private properties were not accessed for this study although likely impacts to adjacent properties have been considered throughout the assessments and in the concept design.

The structure of the report is as follows:

> Section 1.0 - Introduction
> Section 2.0 - Urban design objectives and principles
> Section 3.0 - Concept design description
> Section 4.0 - The landscape and urban design strategy for the Gerringong Upgrade
> Section 5.0 - Contextual and landscape character analysis

> Section 6.0 - Landscape character and visual impact Assessment: describing the likely visual impacts of the project through a review of the four identified landscape character units along the corridor
> Section 7.0 - The integrated design, mitigation and management measures

**Figure 1.3** below identifies the key requirements for the Urban Design report and landscape character and visual impact assessment as outlined in figure 5-1 of Environmental Impact Assessment Guidance Note - E1A-N04, Guidelines for landscape character and visual impact assessment.

<table>
<thead>
<tr>
<th>Urban design report and landscape character &amp; visual impact assessment component *</th>
<th>Relevant sections in this report</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Contextual analysis including the landscape character analysis</td>
<td>Section 1.0 and Section 5.0.</td>
</tr>
<tr>
<td>2. Urban design objectives and principles</td>
<td>Section 2.0</td>
</tr>
<tr>
<td>3 Urban design concept (description and illustrations of the whole project including mitigation measures)</td>
<td>Section 3.0, Section 4.0 and Section 7.0</td>
</tr>
<tr>
<td>4. Landscape character impact assessment</td>
<td>Section 6.0</td>
</tr>
<tr>
<td>5. Visibility of proposal (including key viewpoints)</td>
<td>Section 6.0</td>
</tr>
<tr>
<td>6. Visual impact assessment</td>
<td>Section 6.0</td>
</tr>
<tr>
<td>7. Landscape character and visual impact mitigation strategy</td>
<td>Section 6.0 and Section 7.0</td>
</tr>
</tbody>
</table>

* Items as listed on page 15 of the E1A-N04 Guidelines for landscape character and visual impact assessment. Figure 5-1 Titled - Recommended structure for combined urban design and impact assessment report.
Urban design objectives and principles
2.0 Urban design objectives and principles

2.1 Purpose of urban design objectives and principles

Whilst a specific ‘Urban Design Framework’ does not yet exist for the whole Princes Highway, the design objectives outlined in this report (Section 2.0) are derived from the RTA’s policies regarding Urban Design as published in Beyond the Pavement RTA urban design policy, procedures and design principles (RTA July 2009). This is explained in more detail below in Section 2.2 and in Section 4.0 - Urban and landscape design strategy.

The Purpose of defining urban design objectives + principles

Design objectives and principles provide a framework for designing the proposal to integrate harmoniously within the context of the natural and cultural landscape. The intent of the objectives and principles is to guide high level design processes while allowing room to refine the fine details of design to achieve a best-for-project outcome. The objectives and design principles encourage integration with other recent road infrastructure upgrades within the region including the North Kiama bypass, Oak Flats to Dunmore and Sea Cliff Bridge, which provide successful precedents for culturally relevant urban design in the area.

The objectives and principles, along with the visual assessment and landscape character assessment (refer to Sections 4.0 and 5.0), are used to assess the preferred route and concept design of the Gerringong Upgrade throughout this report. They will also continue to be used to assess future stages of the project design development.

2.2 Proposal objectives and principles

The RTA’s overall philosophy and approach to the urban and regional design of its roads is expressed in Beyond the Pavement RTA urban design policy, procedures and design principles (RTA July 2009). The objectives that make up the urban and regional design framework for the proposal are supported by specific design principles to guide achievement of the objectives. The overarching objectives and principles are consistent with the RTA’s general philosophy and the Preliminary Urban and Regional Design Strategy. These framework objectives and the principles are as follows:

Objective 1: Provide a flowing highway alignment that is responsive and integrated with the natural landscape

> Respond to the grain of the landscape in the route selection, including following the edges of valleys and hills and avoiding disruption of stands of vegetation including both natural and cultural plantings.

> Integrate cut and fill embankments with surrounding terrain by grading out and varying slopes.

> Consider independently grading carriageways.

> Preserve cultural patterns in the landscape.

> The alignment should avoid as much as possible significant features of the areas through which it passes.

> Vary the gradient of earthworks to provide visual interest and reflect the characteristics of the surrounding landform and landscape.

> Cuttings and embankments should be graded out, wherever practicable, to best fit the characteristics of the local landform, returning the land to its former use or replacing vegetation lost to the highway upgrade.
Objective 2: Protect the natural systems and ecology of the corridor
> Avoid areas of natural vegetation, particularly those containing threatened species and communities.
> Minimise disruption to natural drainage patterns both through route selection and road design.
> Minimise the number of creek crossings.
> Use medians and road verges to maximise habitat value and maintain pollination paths and wildlife movement patterns where feasible.
> The landscape qualities and characteristics of the highway corridor landscape should respond to and be integrated with the areas through which it passes.
> Water quality basins should be integrated with the landscape form and character.

Objective 3: Protect and enhance the heritage and cultural values of the corridor
> Avoid areas of identified European and Aboriginal heritage and cultural value.
> Acknowledge and respond to the heritage and cultural values of the rural landscape.
> Acknowledge and respond to Aboriginal cultural values placed on the broader landscape.
> Reduce the visual and noise impact of the highway through the design of the upgrade project.
> Consider the important value of the productive landscape.

Objective 4: Respect the communities and towns along the highway
> Minimise the impact of the highway upgrade on the amenity of residents of local townships.
> Provide safe and efficient access to townships.
> New town access points to be designed as an important and integral part of the town, ensuring a clear and consistent way showing.
> Where appropriate, consider the design and treatment of the highway bypass corridor to relate back to the town.
> Minimise the disruption and loss of amenity to rural communities in the study area.

Objective 5: Provide a safe, enjoyable and interesting highway with strong visual connections to the Pacific Ocean, immediate hinterland, and mountains to the west
> Acknowledge the role of this section of the Princes Highway as an important part of a longer scenic drive along the New South Wales South Coast.
> Maximise the opportunities for high quality and varied views of the coast, the rural landscape and adjacent mountain ranges.
> Provide visual connections and easy well marked access to the towns along the route.
> Use landscape treatments to soften the appearance of the road for road user without compromising opportunities for key views.
> Consider the heritage of the highway in the upgrade so that where practicable road users may experience it.
Objective 6: Develop a simple and unified palette of elements and details that are easily maintained

> Develop a consistent approach to the development of bridges along the highway upgrade. Urban design principles to be consistent with those outlined in the RTA document Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW (2003).

> Develop a consistent approach to the design of noise walls along the highway upgrade. Urban design principles to be consistent with those outlined in the RTA document Noise Wall Design Guidelines: Design guidelines to improve the appearance of noise walls in NSW (RTA 2005).

> Develop an integrated strategy for the avoidance, minimisation and improved appearance of shotcrete as outlined in the RTA document Shotcrete Design Guidelines: Design guidelines to avoid, minimise and improve the appearance of shotcrete (RTA 2005).

> Develop a consistent approach to the design of soft landscape along the highway upgrade. Planting design principles to be consistent with those outlined in the RTA document Landscape Guideline (RTA 2008).

The unifying philosophy behind these objectives (and the associated design principles) is the goal to develop an upgraded highway that not only meets functional and engineering criteria, but one that respects the environment in which it is situated. The urban and regional design framework is intended to be a fundamental component of all stages of highway planning and design.
3.0 Concept design description

3.1 The concept plan

The Gerringong upgrade road design is illustrated and described in Figure 3.1. This figure illustrates that the basic functionality of the road formation and has been integrated with the overall design solution. The overall concept urban and landscape design is illustrated in Figure 3.2 and 3.3. Additional sections and typical treatment plans are provided in Figure 3.4 through Figure 3.14 to further illustrate the concept plan.

3.2 The design components

> Construction of two lanes in each direction between Mount Pleasant and Toolijooa Road.
> Grade separated interchange at Rose Valley Road incorporating four way traffic access to and from Gerringong via a two-way service road and an overbridge spanning the South Coast Railway at Fern Street.
> Extensive drainage structures maintaining cross drainage flow in the low lying area of Omega Flat.
> Grade separated interchange at Belinda Street providing four-way, flood free traffic access to and from Gerringong and incorporating a two-way service road connecting to Willow Vale Road.
> Bridge structure spanning the Crooked River and incorporating, Bailey’s Road and an existing cattle underpass.
> Additional northbound climbing lane between Rose Valley Road and the top of Mount Pleasant.
> Additional southbound climbing lane for approximately 800 metres from Belinda Street on load ramp.
> Property acquisition and the setting of corridor boundaries for the provision of future widening to six lanes (three in each direction).
> Provision for future widening where the design is constrained by topography and alignment e.g. the ‘slot’ and bridge structure at the Rose Valley Road interchange.
3.3 The urban design and landscape concept plan

The concept urban and landscape design is illustrated in Figure 3.2 and 3.3 on the following pages. The concept design responds to the urban Design Strategy (Section 4.0), which was informed by the visual assessment and contextual analysis as documented on Sections 4.0 and 5.0 of this report. The visual assessment and contextual analysis identify impacts from the proposed engineering concept design and the Urban Design Strategy proposes the treatments and mitigation measures that have been integrated into the concept design illustrated here.

3.4 Application of the urban and landscape design principles

The concept design uses the elements of the existing landscape to integrate a design response which is sensitive to the surrounding landscape context. The main design elements that relate to the overall strategy are:

- Minimising slopes to cuts, embankments and reducing size and scale of the structural elements in the landscape;
- Establishing culturally significant plantings such as Moreton Bay Figs, Norfolk Island Pines and Cabbage Tree palms at each interchange to create an identifiable landmark;
- Reinforcing the cultural landscape by planting trees perpendicular to the carriage way at the interface of the creeks fence lines and existing vegetation lines and extending the avenue of trees along Fern Street;
- Extending the pastoral landscape to the edges of the road engaging the motorists with the contextual landscape;
- Responding the open nature of the broader landscape setting.
- Integrating the design to minimise impacts to landscape character.
Figure 3.4 Section A-A Crooked River / Willow Vale

Figure 3.5 Section B-B Belinda St

Typical Sections to Gerringong Upgrade

Figure 3.2 Concept for Southern side of Gerringong and the Gerringong Southern entry precinct (Belinda Street)

Figure 3.4 Section A-A Crooked River / Willow Vale

Figure 3.5 Section B-B Belinda St
Casuarina planting expressing the property boundary / fence lines

Livistona community at the converging of rose valley, omega flats, proposed road alignment and rail crossing

Lines of Norfolk Island Pines, organisation reflecting the township of Gerringong

Supplement existing Fig tree with additional plantings for future legacy in consultation with property owners

Figure 3.3 Concept for northern side of Gerringong and Gerringong northern entry precinct (Rose Valley Road and Fern St)

Typical Sections to Gerringong Upgrade

Figure 3.6 Section C-C Bridge at Fern St

Figure 3.7 Section D-D Intersection at Rose Valley Road
Typical treatment to Gerringong Upgrade - Fills

> Minimises intervention in the existing landscape.
> Maintains consistency with the existing landscape character and patterns.
> Engages road user with the landscape.
> Reduces road width corridor by returning land to its former use and the land owner.
> Integrates the corridor with the landscape.
> Reduces total area of maintenance.

* N.G: Natural Ground

- Minimises intervention in the existing landscape.
- Maintains consistency with the existing landscape character and patterns.
- Engages road user with the landscape.
- Reduces road width corridor by returning land to its former use and the land owner.
- Integrates the corridor with the landscape.
- Reduces total area of maintenance.

Figure 3.8 Section - Typical corridor approach (Fills) - Gerringong Upgrade

Figure 3.9 Typical corridor approach (Fills) - Gerringong Upgrade
Typical treatment to Gerringong Upgrade - Cuts

**Proposed Treatment**

- Varied slope to fill embankments
- Varied slope to cut embankments (based on potentials and constraints of the materials)
- Opportunity to use land
- Opportunity to reinforce the existing patterns of the landscape and soften the intervention
- slopes of 1:3 or less can potentially be returned to existing use better integrating the landscape character of the corridor

![Diagram of Typical corridor approach (cuts) - Gerringong Upgrade](image-url)
**Cut Treatment**

If the capability of the underlying material is not considered - slopes can;

- require stabilisation - eg: shotcrete
- be too steep to support any quality vegetation or get a sufficient depth of soil
- be difficult to maintain

> slopes of 1:3 or less can potentially be returned to existing use better integrating the landscape character of the corridor
Visible element beyond cut face reduces the overall scale of the cut and becomes less overwhelming

Vertical rock face / retaining structure

N.G

* N.G: Natural Ground

Figure 3.14 Section - Deep cutting - in suitable rock

Room for vegetation at the base of cut

Figure 3.15 Section - Deep cutting - in suitable rock - planting corridor to base

Cut Treatment
Where suitable rock exists;
> prepare close to vertical cuttings
> leave room at the base of the cutting for vegetation
> where cuttings are made for ultimate widening there is the opportunity to add more significant vegetation
Urban and landscape design strategy

4.0
4.0 Urban and landscape design strategy

4.1 Urban and landscape design process

Urban and landscape design issues and the reduction of visual impacts have been integral to the design process at all stages of the project to date. A ‘Preliminary Urban and Regional Design Strategy’ was prepared in November 2007 prior to the identification of route options and informed the evolution of the route options development and selection process.

The continual assessment of the developing concept design against the urban design objectives has been undertaken.

This assessment was informed and refined based on:

- Objectives and Design Principles for the whole Princes Highway Upgrade (Section 2.0)
- Contextual analysis (based on landscape character units) of the Gerringong Upgrade study area (Section 5.0)
- Landscape Character and Visual impact assessment and suggested mitigation measures (based on landscape character units and visual impact analysis) of the Gerringong Upgrade study area (Section 6.0)
- An outline of the specific mitigation measures required the describe and illustrate the urban design integration of the proposed upgrade (Section 3.0 and Section 7.0)

4.2 Urban and landscape design assessment

The tables shown in the following pages provide an assessment of the proposed route against the urban design principles. The design responses undertaken as part of the design development are listed for each of the principles associated with the six key objectives.
# Objective #1
Provide a flowing highway alignment that is responsive and integrated with the landscape

<table>
<thead>
<tr>
<th>Design principles</th>
<th>Design responses</th>
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<tbody>
<tr>
<td><strong>1)</strong></td>
<td>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 including both natural vegetation and cultural plantings</td>
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<td></td>
<td>The preferred option comprises an upgrade, including widening, of the existing highway alignment. The surrounding landscape has developed around the existing road for the past 80+ years. The widening of the new alignment would therefore have impact on any adjacent stands of cultural vegetation that have evolved over time. At the Rose Valley Road interchange, the alignment has been designed to preserve the most established fig tree which has cultural significance for both Aboriginal and European heritage, see Section 4.0 for discussion. The vertical alignment has been designed to improve grades and improve road safety. 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.</td>
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<tr>
<td><strong>2)</strong></td>
<td>Integrate cut and fill embankments with surrounding terrain by grading out and varying slopes.</td>
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<td></td>
<td>Cut and fill embankments would integrate with the adjacent landscape and be assessed at a detail level in each case based on geotechnical options, slope, aspect, existing adjacent landscape character.</td>
</tr>
<tr>
<td><strong>3)</strong></td>
<td>Consider independently grading carriageways.</td>
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<td></td>
<td>Generally, the nature of the landform surrounding the proposal does not require the consideration of independently graded carriageways.</td>
</tr>
<tr>
<td><strong>4)</strong></td>
<td>Preservation of cultural patterns in the landscape.</td>
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<td></td>
<td>The widening of the existing highway footprint would have an impact on the existing landscape cultural patterns, small integrated interventions to cut and fills slopes and revegetation would essentially preserve the cultural patterns. This would be achieved by reinforcing the patterns of the broader landscape context.</td>
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<td><strong>5)</strong></td>
<td>The alignment should avoid as much as possible significant features of the areas through which it passes</td>
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<td></td>
<td>The impact of significant features would be minimised as far as practicable without compromising road safety. The interchange at Rose Valley Road has been designed to minimise the impact on a culturally sensitive area comprising Mature Ficus macrophylla trees and Renfrew Park Estate. The healthiest of the three Ficus macrophylla trees would be preserved and become part of the landscaping ‘gateway’ introducing motorists to Gerringong. See Section 4.0 for a discussion on the preservation of cultural heritage values at this interchange.</td>
</tr>
<tr>
<td><strong>6)</strong></td>
<td>Vary the gradient of the earthworks to provide visual interest and reflect the characteristics of the surrounding landform and landscape.</td>
</tr>
</tbody>
</table>
| | Earthworks would be integrated by understanding the opportunities and constraints identified by the 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; and  
• Reduce the visual impact of cuttings and embankments by introducing plantings to the base and top of new batter where practicable. |
| **7)** | Cuttings and embankments should be graded out, 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 highway upgrade |
| | Cuttings and embankments would be graded out to be integrated with the local landform, land coverage and land use. Areas of vegetation lost would be reinstated and fauna connections would be integrated as recommended in the ecological report. |
**Objective #2**
**Protect the natural systems and ecology of the corridor**

<table>
<thead>
<tr>
<th>Design principles</th>
<th>Design responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Avoid areas of natural vegetation, particularly those containing threatened species and communities</td>
<td>Since much of the landscape has been cleared for agricultural purposes, some of the remaining vegetation is within the current road reserve and would be impacted during construction. However, threatened species and communities would not be impacted and any natural vegetation removed would be replaced and rehabilitated.</td>
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<tr>
<td>2) Minimise disruption to natural drainage patterns both through route selection and road design.</td>
<td>Existing drainage systems would be retained and improved where appropriate. Undersized existing drainage structures would be upgraded to meet capacities required to minimise disturbance and reduce flooding during peak rain events particularly to the Omega Flat area. New bridges would traverse the Crooked River, see Figure 3.2 and 3.3.</td>
</tr>
<tr>
<td>3) Minimise the number of crossings of Broughton Creek and other creeks in the study area.</td>
<td>Creek crossings would be kept to a minimum in this section of upgrade.</td>
</tr>
<tr>
<td>4) Use medians and road verges to maximise habitat value and maintain pollination paths and wildlife movement patterns where feasible.</td>
<td>The areas for planting included the embankments associated with new interchanges at Rose Valley Road, Belinda Street and Willow Vale Road, new embankments along Omega Flat and ribbon plantings along property boundaries and waterways. Plantings would also be made at the base of new cuttings where possible. Median widths are not sufficient to support plantings. Generally the median would consist of pastoral grass reestablishment which reinforces the landscape context.</td>
</tr>
<tr>
<td>5) The landscape qualities and characteristics of the highway corridor landscape should respond to and be integrated with the areas through which it passes.</td>
<td>This proposed route passes through 4 landscape unit types, see Section 5.5 for descriptions. These differ in vegetation type, land use and land form. The highway corridor would reflect the differences in these landscape units and their associated patterns.</td>
</tr>
<tr>
<td>6) Water quality basins should be integrated with the landscape form and character.</td>
<td>Water quality basins would be integrated into the landscape to best represent how water bodies appear in the natural landscape. 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 ephemeral plant species.</td>
</tr>
</tbody>
</table>

**Objective #3**
**Protect and enhance the heritage and cultural values of the corridor**

<table>
<thead>
<tr>
<th>Design principles</th>
<th>Design responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Avoid items of identified European and Indigenous heritage and cultural value.</td>
<td>The intersection of Rose Valley Road and the Princes Highway is located adjacent to Renfrew Park and close to three mature Ficus macrophylla trees. Due to safety concerns, the interchange design would impact on two of the Fig trees but preserve the most established specimen which has indigenous and European cultural value (to Renfrew Park Estate). Strip acquisition of the Renfrew Estate Park grounds, including one Fig tree, would be required to accommodate the new interchange.</td>
</tr>
<tr>
<td>2) Acknowledge and respond to the heritage and cultural values of the rural landscape.</td>
<td>Important views and connections to the broader landscape would be maintained by using ribbon plantings to emphasise property boundaries and waterways and reducing continuous roadside plantings that restrict broader views. The harmonious balance of the cultural and rural landscape would be reinforced by the new urban design related works as outlined in the concept design in Section 3.0.</td>
</tr>
<tr>
<td>3) Acknowledge and respond to indigenous value placed on the broader landscape.</td>
<td>The design would consider the recommendations of the Indigenous Heritage Consultant and the Aboriginal Focus Group.</td>
</tr>
</tbody>
</table>
4) Reduce the visual and noise impact of the highway through the design of the upgrade project.

Visual and noise impact to local residents would not be significant as the upgrade is mostly separated from residents in Gerringong by the rail corridor. Sections of the upgrade adjacent to the most populated section of Gerringong would be in cutting which would reduce visual and noise impacts on Gerringong.

1. Consider the important value of the productive landscape within the landscape.

As the upgrade is essentially a widening of the existing alignment the amount of productive landscape impacted would be minimised. New works would be integrated with the surrounding landscape to maximise productive use of land, for example, by merging landscape to the road edge, reducing slopes to batters to allow grazing of rural animals on edges.

Objective #4
Respect the communities and towns along the highway

<table>
<thead>
<tr>
<th>Design principles</th>
<th>Design responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Minimise the impact of the highway upgrade on the amenity of residents of Gerringong.</td>
<td>The visual impact of the upgrade itself on Gerringong would be minimised by providing suitable cultural and indigenous planting, providing a refined, simple bridge connection to Fern Street over the railway line. See Figure 3.2 and 3.3 for concept drawing.</td>
</tr>
<tr>
<td>2) Provide effective and efficient access to Gerringong.</td>
<td>The number of access movements for entering and exiting Gerringong has been increased from 7 to 8. The upgraded interchanges would include landscaping and plantings to provide a legible gateway at the Rose Valley Road Interchange and at the Belinda Street Interchange to include way-finding and visual connectivity. See Figure 3.2 and 3.3 for concept drawing.</td>
</tr>
<tr>
<td>3) New town access points to be designed as an important and integral part of the town, ensuring a clear and consistent way showing</td>
<td>The new town access points add the largest new footprint to the highway upgrade. This space would be part of a combined strategy for providing connection to the towns and would include the use of cultural plantings and locally derived materials (stone and gravels). In the case of Gerringong the strong historical plantings of Norfolk Island Pines are a distinctive identifying feature and would be reiterated at the interchanges and access points.</td>
</tr>
<tr>
<td>4) Minimise the disruption and loss of amenity to rural communities in the study area</td>
<td>There would be a small loss of amenity to rural communities with the increased footprint of the expanded highway. Access points are provided at Rose Valley Road and Willow Vale Road. The revegetation strategy would provide a balance of visual screening and reinforcement of the existing landscape character to minimise the loss of amenity to rural communities.</td>
</tr>
</tbody>
</table>

Objective #5
Provide a safe, enjoyable and interesting highway with strong visual connections to the Pacific Ocean, immediate hinterland and mountains to the west

<table>
<thead>
<tr>
<th>Design principles</th>
<th>Design responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Acknowledge the role of this section of Princes Highway as an important part of a longer scenic drive along the New South Wales south coast.</td>
<td>This section of the route has visual connection to the ocean, township, rural land and forested escarpment. The descent from Mt Pleasant provides the first real experience of the rural landscape south of Sydney and is a gateway to the rural south coast. The urban design strategy takes advantage of this by maximising broader views, integrating the upgrade with the existing landscape and using planting and design techniques for infrastructure that are culturally and visually relevant within the landscape context.</td>
</tr>
<tr>
<td>2) Maximise opportunities for high quality and varied views of the coast, the rural landscape and adjacent mountain ranges.</td>
<td>The preferred route would increase the opportunities for experiencing the coast, rural landscape and adjacent mountain ranges by opening up views across the rural landscape towards the coast and mountain ranges. Views would be directed by ribbons of culturally relevant planting and reducing restrictions such as continuous planting along the road edge and continuous deep cuttings.</td>
</tr>
</tbody>
</table>
3) Provide visual connections and easy, well marked access to the towns along the route.

The preferred option locates the new south bound entrance (north of Gerringong) a further 1.2km away from town, when compared with the existing entrance. Visual connection with the town is enhanced by reiterating plantings that exist within the town, providing way-finding signage and including "gateway" design plantings at the interchange. The entrance at Belinda Street would improve the visual connection with Gerringong as the highway would no longer dip into the Crooked River Catchment as it does currently. This would keep the town in full view as one approaches from the south.

4) Use landscape treatments to soften the appearance of the road for the road user without compromising opportunities for key views.

The majority of the preferred option elevates the road user (especially across Omega Flat). The landscape treatment would be a balance between reinforcing the existing landscape character and mitigating visual impacts for Gerringong residents. Landscaping would be used particularly around new interchanges and adjacent to fill embankments, mounds and new cuttings where possible. Views across the rural landscape to the coast and towns would not be substantially or continuously compromised by embankments or plantings.

5) Consider the heritage of the highway in the upgrade so that where practicable road users may experience it.

Much of the heritage along the preferred route is able to be experienced by the user through the broader visual engagement with the landscape. Heritage values that can be experienced include the road passing in close proximity to Renfrew Park as well as the opportunities for a gateway entrance into this area with the large Ficus macrophylla specimen.

### Objective #6
Develop a simple and unified palette of elements and details that are easily maintained

<table>
<thead>
<tr>
<th>Design principles</th>
<th>Design responses</th>
</tr>
</thead>
</table>
| 1) Develop a consistent approach to the development of bridges along the highway upgrade. Urban design principles to be consistent with those outlined in the RTA’s ‘Bridge Aesthetics’ | There are four significant bridges within this section of upgrade.  
  - The Bridge over the highway at Rose Valley Road;  
  - The bridge over the existing railway line that joins to Fern Street;  
  - The bridge over at Belinda Street interchange; and  
  - The highway bridge over the Crooked River.  
  All of these bridges are designed as simple, elegant forms sympathetic to the surrounding landscape rather than as gateway elements. |
| 2) Develop a consistent approach to the design of noise walls along the highway upgrade. Urban design principles to be consistent with those outlined in the RTA’s ‘Noise Wall Design Guidelines.’ | Noise attenuation would be further addressed in the detailed design stage. |
| 3) Develop an integrated strategy for the avoidance, minimisation and improved appearance of shotcrete as outlined in the RTA’s ‘Shotcrete Design Guidelines.’ | A detailed geotechnical investigation would be undertaken during detail design to investigate actual need for shotcrete and minimise use where possible. |
| 4) Develop a consistent approach to the design of soft landscape along the highway upgrade. Planting design principles to be consistent with those outlined in the RTA’s ‘Landscape Guideline.’ | The concept design includes soft landscaping at the new interchanges, along embankments and at property boundaries and creek crossings, as well as along the upgrade route as appropriate. The route does not pass through large stands of existing vegetation but mostly pasture lands with isolated clumps of either remnant or mostly historic cultural plantings. |
5.0

Contextual and landscape character analysis
5.0 Contextual and landscape character analysis

5.1 Regional context

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

5.2 Local context

Within the study area, the Princes Highway descends from Mt Pleasant affording district views to Gerringong, Seven Mile Beach, Rose Valley and Toolijooa Ridge and the distant peak of Mt Coolangatta. The highway passes the historic Renfrew Park and then traverses the Omega Flat. The landscape is strongly influenced by the cultural influence of the dairying industry. These activities have defined the general pattern of vegetation clearance, defined rural boundaries with linear cultural plantings, and the distribution of rural houses and farm buildings.

The highway follows the alignment of the South Coast Railway Line and isolated cultural plantings to property boundaries to the west. The highway then climbs back up to the low ridge running in an east west direction from Belinda Street through to Willow Vale Road.

As the highway turns west it continues through chiefly agricultural and pastoral landscapes and gently begins to rise as it heads towards Toolijooa Ridge.

The backdrop is generally a pastoral and agricultural landscape on the flat and gently undulating slopes, punctuated by cultural row plantings and isolated specimens or clumps of cultural plantings. As the terrain becomes steeper the forested slopes of the escarpment above Rose Valley, Willow Vale and Currys Mountain become more dominant.

The township of Gerringong is located on the southern headland of Werri Beach and can be seen from Mt Pleasant and Omega Flat travelling southbound and from Willow Vale heading north. There are two access points into Gerringong; a northern access at Fern Street and a western access at Belinda Street.

5.3 Landscape Context

The natural landscape setting of the study site and the greater context of the NSW South Coast is a constant interaction of ocean and beaches, rocky headlands, narrow coastal plains, escarpments & coastal ranges. In contrast to the permanent presence of the ocean, other landscape elements vary greatly in scale and interact in many different but ultimately harmonious combinations. The existing highway offers a rich driving experience that is layered into this landscape.

The landscape context provides for many experiences and interpretations and the existing highway reveals a complex and harmonious landscape to the user. 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 casually along the route. Views also encapsulate the tree covered escarpments and meandering creeks and rivers that flow into the fertile coastal plains, lakes and wetlands. The creek lines are engaged frequently as the highway closely follows the varying topography.

The immediate study area associated with the proposal is set within the coastal hinterland between Gerringong, Mt Pleasant and Toolijooa Ridge. The topography is varying from flat to undulating graduating to relatively steep slopes further to the west as the lower slopes of the Currys and Saddleback Mountain rise to the west and north. 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 was also undertaken to assess the level of visibility of the study area.
5.3.1 Topography (slope analysis)

The main geographic feature that influences the site is the escapement which runs north south along the south coast region. The escapement drops roughly 250-300m over a 2km range and a further 50m over another 2km, creating a large flat valley floor which undulates as it extends to the ocean edge. There are a few ridge lines which extend toward the ocean creating headlands at the ocean edge. This also creates a bowl effect which surrounds Rose Valley, Omega Flat and Werri Lagoon.

The main town of Gerringong is situated on a ridge line which extends along the edge of Crooked River out to the headland at the ocean edge. The northern edge of Gerringong township slopes down towards Werri Lagoon which is contained behind the township and enters the ocean north of Gerringong between the Mt Pleasant and Gerringong Ridges. Refer to Figure 5.1 which illustrates the location of the Gerringong Upgrade (in red) in relation to the surrounding topography.

5.3.2 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 pasture with prominent cultural plantings marking farmhouse locations, and in some cases, property boundaries. Corridors of native vegetation are often retained along drainage lines within the pastureland, while isolated native trees, particularly larger specimens of figs and cabbage tree palms, also occur.

Historically, the scale and character of settlement patterns were dependent on the distribution of small dairy farms. The town of Gerringong developed as a consequence of the dairying in the area as did smaller rural settlements such as Gerroa. The settlement pattern today generally conforms to this historical pattern. Figure 5.2 illustrates the location of the Gerringong Upgrade (in red) in relation to adjacent land uses.

5.3.3 Vegetation cover

Over time the immediate area surrounding the Gerringong Upgrade has been utilised and cleared for agricultural use, resulting in vast areas of grazing land. Extensive areas of native vegetation still remain but have generally been restricted to the higher ridge lines, steeper slopes and escarpments which are unsuitable for grazing. Natural vegetation can be seen from the Gerringong upgrade, prominently on hills near Broughton Village, the Toolijooa ridge line and on some of the spurs connecting with the higher escarpment areas to the west. Vegetation strands also follow the creek lines and property/fence lines as they reach down into the valley floors. Figure 5.3 illustrates the location of the Gerringong Upgrade (in red) in relation to the overall vegetation cover.

5.3.4 Water courses

Consistent with the topography there are two main water courses within the study area. There are multiple tributaries to Oaree Creek which drains Rose Valley into Werri Lagoon. To the west and south of Gerringong the two main drainage lines form the upper catchment for Crooked River that flows to the north end of Seven Mile Beach at Gerroa. Figure 5.4 illustrates the locations of these two drainages and the associated tributaries.
The slope analysis clearly illustrates the location of the Gerringong upgrade in relation to the surrounding topography, including the Rose Valley catchment between Mt Pleasant and Gerringong.

The land use diagram illustrates that the proposed upgrade route traverses mostly farming / agricultural land.
The vegetation cover is limited and the planting closest to the upgrade is chiefly cultural, reinforcing boundaries, fence lines and drainage. Forested hills to the north and west are clearly evident.

Consistent with the slope analysis, the two key drainages are Rose Valley and Crooked River to the south, separated by a low saddle between Gerringong and Cuny’s Mountain.
5.4 Built form context

The built form and landscape elements together define the local character of the NSW South Coast. The towns that have developed in support of farming and industry (and later tourism) along the Princes Highway have evolved in harmony with the built form and surrounding landscape. The existing highway provides an integral link between the built and natural landscapes and is the main conduit by which many experience the unique character of the study area and the greater South Coast region.

5.4.1 The Princes Highway

The northern limit of the project study area is the gateway to the rural south coast. Travelling south from Sydney, the descent from Mt Pleasant presents the first opportunity for views across the landscape, taking in the mix of the ocean, coastal townships, fertile agriculture plains, escarpments, hills and broad drainages lines.

5.4.2 Gerringong township

Gerringong is a small coastal town with a population of approximately 2500, located on the southern headland of Werri Beach. It has two access points from the existing highway; a northern access at Fern Street and a western access from Belinda Street.

The character of the town reflects its rural history and unique coastal location. The landscape of the town is characterised by its strong visual connections to both the coast and Rose Valley. Impressive historical plantings of Norfolk Island Pines line the main east-west axis of Belinda Street. Figure 5.5 illustrates the key land use and structuring components of the town.

Despite recent growth, Gerringong retains the character and scale of a coastal village. The rolling topography within the town affords regular and expansive views of the coastline and hinterland. The Princes Highway bypasses Gerringong with the highway and adjacent railway line forming the western boundary of Gerringong urban development.

The current traffic split of vehicles travelling south is close to a 50:50 split between the existing Princess Highway and the ‘Sandtrack’, which passes through the town centre of Gerringong and avoids congestion sometimes experienced on the Princes Highway. During construction and in operation, the Upgrade will have a significant influence on this split of traffic and reduce through-traffic in Gerringong as a result of the closure of Fern Street during construction and increased amenity on the Princes Highway itself when the entire route from Gerringong to Bomaderry is upgraded.

The presence of the highway has little influence on the amenity of the central part of the town, with the main commercial precinct being approximately 750m from the existing access point from the highway. The proposed upgrade maintains town access points at similar locations to those currently in operation, with the northern access point around 1km further from the town centre than the existing. It is unlikely that access arrangements will have any major influence on the functioning of the road system within the town itself.
Figure 5.5 - Township of Gerringong land use and structure

- Existing Princes Highway
- Fern Street
- Belinda St - Norfolk Island Pines
- Cycleway
- Railway Line
- Physical boundary
- Main street
- Urban development
- Community open space

Prominent views to adjacent mountains
Views to Seven Mile Beach
Pacific ocean and coastal hill views
VIEWS TO SEVEN MILE BEACH
PACIFIC OCEAN AND COASTAL HILL VIEWS
PROMINENT VIEWS TO ADJACENT MOUNTAINS
5.5 Landscape character units

Four landscape character units are identified within the Gerringong Upgrade study area. These are described below and illustrated in Figure 5.6, 5.7, 5.8.

1. Mt Pleasant - At the northern end of the study area, Mt Pleasant, Saddleback Mountain and Currys Mountain separate Kiama from Gerringong. These Mountains have resulted in the Princes Highway being located in close proximity to the coast. The area is covered in a mixture of pasture land with isolated clumps of remnant south coast forest on the lower slopes, before moving into more dense forest on the upper slopes. The escarpment formed by Mt Pleasant, Saddleback and Curry’s Mountain forms both a physical and visual containment to the broader landscape. Occupying the higher more visible slopes and in close proximity to the study area the visual sensitivity of this area is considered to be high.

2. Omega Flat + Rose Valley - Rose Valley is a small catchment located below Saddleback and Currys Mountain. The Rose Valley catchment drains into Omega Flat and Werri Lagoon and a SEPP 14. The land area is dominated by dairying plots mixed with mature cultural plantings. The patterns of land ownership and land use are evident within this landscape and articulated by plantings along property boundaries, refer to figure 5.11. Travelling along the section of the Princes Highway that passes over Omega Flat is the first opportunity for motorists to truly engage with the landscape rather than participating as an observer. The northern gateway into the township of Gerringong is situated within this character unit. The close proximity to the highway, the open nature of this landscape and its cultural and rural landscape patterns confirm the visual sensitivity of this area as high to moderate.

3. Gerringong - Gerringong is a small coastal town contained to the east of the existing highway and occupying the southern headland above Werri Beach. The landscape of the town is characterised by its strong visual connection to both the coast and Rose Valley. The most distinctive landscape feature is the strong dominance are the impressive historical plantings of *Araucaria cunninghamiana* (Norfolk Island Pines) along the main east-west axis of Belinda Street and the beach front adjacent to Werri Beach. The cultural settlement patterns and arrangement of the street axis of the town relate very closely with the existing highway alignment. The township is effectively a more urban response to the pastoral landscape of Rose Valley and Willow Vale. The visual sensitivity of this landscape character unit is considered high to moderate.

4. Crooked River Catchment - The Crooked River catchment is an area south of Rose Valley and Gerringong. The Upper area of the catchment is mostly pasture land and includes the Crooked River Winery. Below the existing highway and South Coast Railway line there are extensive areas of dairying and a waste water trial treatment plant. The Crooked River then connects into the Seven Mile Beach National Park at Gerroa. The landscape grades from gently undulating in the north west grading to flat in the south east. The landscape is only sparsely vegetated with trees, the majority of these being planted around existing dwellings or on the few steep slopes adjacent to the existing highway. The visual sensitivity of this character unit is considered high to moderate due the open nature of the landscape and the strong patterns of pastoral landscape.
Figure 5.6 - Landscape character units within the Gerringong upgrade study area
5.6 Contextual and landscape character analysis:
Summary of findings

The key findings from the contextual analysis are:

> The study area can essentially be broken into four landscape character units, each of these are closely interrelated as discussed earlier these are:
> - Mt Pleasant;
> - Rose Valley and Omega Flat;
> - Gerringong; and
> - Crooked River;

> The northern end of the project site is the gateway to the rural south coast, this landscape is an intimate scale of escarpment hills, rolling valleys, small creek lines, wetlands, townships and rural plots that are contained to the east by the Pacific Ocean. The arrangement of this landscape forms an attractive and harmonious composition where any intervention would require careful integration.

> 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 highway upgrade corridor as can been seen in Figure 5.11.

> The study area is divided between two catchments, Rose Valley to the north and the Crooked River to the South. These two catchments are separated by a saddle that runs in an easterly direction from Currys Mountain to the south headland of Werri Beach in the town of Gerringong.

> 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. The dominant species are:

> - *Araucaria heterophylla* (Norfolk Island Pines) arranged mostly in avenue or row plantings;
> - *Ficus macrophylla* (Moreton Bay Figs) either as isolated specimens or small groups;
> - *Livistona australis* (Cabbage Tree Palm) arranged in clumped plantings; and
> - *Casuarina cunninghamiana* (Swamp She Oak) – in row and or avenue plantings. See Figure 5.10.

> The township of Gerringong is contained to the west by the existing highway and South Coast Railway line and future growth is planned to be south of the existing town.

> The township has developed and functions based on the two main routes through town. The junction of Fern Street corridor (running north-south) and the Belinda Street corridor (running east-west) forms the commercial centre of town. The proposed upgrade would have little impact on the functioning of these routes within the town.

> While there are distinct landscape character units within the study area the open nature of varying topography ensure that they are visually well connected. The experience of the landscape character varies in scale from the broad expanse of the whole of Rose Valley, Gerringong and the ocean to the more intimate, including the crossing of Omega Flat and the entrance into the township of Gerringong where the view is contained by the avenue of Casuarina trees.
Figure 5.7 - Landscape context - illustrating the character units looking south
Figure 5.8 - Landscape context - illustrating the character units looking north east
Figure 5.9 - Cultural tree planting in the study area and region

Figure 5.10 - Geometric cultural patterns in the landscape are clearly evident across Rose Valley and Omega Flat
Landscape character and visual impact assessment
6.0 Landscape character and visual impact assessment

6.1 Methodology

The methodology for the landscape character and visual impact assessment is based on the RTA’s Environmental Impact Assessment Guidance Note – Guidelines for Landscape Character and Visual Impact Assessment (RTA, 2009b).

The visual catchment of the proposal has been divided in two parts, the first is an overall assessment of the proposal and the second is an assessment of the four key landscape character units within the overall proposal. The four landscape character units as described in section 5.0, assessed are:

- Mt Pleasant;
- Rose Valley and Omega Flat;
- Gerringong; and
- Crooked River

The following method was used in assessing landscape character and visual impact for each of those units:

- A detailed description of the proposal;
- Assessment of existing landscape character;
- Descriptions 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; and
- The mitigation strategy.

These are supported by figures that illustrate the following:

- An artist’s impression from a series of selected viewpoints illustrating the likely final built outcome including the suggested mitigation measures. The artist’s impressions are represented with before and after images.

Assumed view groups include road users and local residents. All of the visual assessments in the field were taken from publicly accessible land.

The visibility analysis was undertaken using a GIS based viewshed analysis. Viewpoints were selected on the basis that they are vantage points or represent concentrations of people and visual envelope maps were produced illustrating the area of likely visual impact associated with the proposal to represent the range of views to the study area, including points both within and outside of the study area. Viewsheds for each of the selected viewpoints were mapped using GIS to illustrate the overall visual catchment.
6.2 Landscape character and visual assessment: Overall proposal

General
While each landscape character unit is assessed in detail in sections 6.3 through section 6.6 an overall assessment is provided for the whole of the Gerringong Upgrade. The overall ratings for sensitivity to change and magnitude of 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 Gerringong Upgrade is set within what is widely recognised as a harmonious coastal / pastoral landscape. The landscape is a rich mosaic that balances cultural and natural landscape patterns in a landscape that has an intimate and engaging scale. The topography is varying from flat to undulating graduating to relatively steep slopes further to the west as the lower slopes of the Currys and Saddleback Mountain rise to the west and north that are covered in remnant forest vegetation. In the flatter valley’s and adjacent to the highway are strong cultural patterns in the landscape associated with ownership and the agricultural and pastoral land use.

Detailed project description
The upgrade can be summarised by four key components;

- A widening of the road from 2 lanes to separated dual carriageway between Mt Pleasant and Toolijooa Road;
- A new interchange at Rose Valley Road;
- A new bridge over the South Coast Railways at Fern Street;
- A new interchange at Belinda Street;

Impacts
Interventions associated with the upgrade that would have a landscape character and visual impact on the Mt Pleasant landscape character unit would include:

- The relative scale of the proposed upgrade this includes both in footprint (width), structure (bridges and overpasses) and in general elevation (flood mitigation);
- The introduction of large fill embankments and cut slopes;
- The amount of infrastructure required for the new town access points;
- The potential loss of existing roadside vegetation;

Visibility
Based on the open nature of the landscape and the localised topography the proposed upgrade works are generally all within areas that are highly visible. Visibility and viewer sensitivity to the upgrade and modifications by the proposed works was analysed from the perspective of assumed viewer groups. These are expected to be primarily adjacent residents and users of the corridor itself.

Sensitivity to proposed change
Viewer sensitivity of adjacent residents and road users within the area is expected to be medium to high based on;

- The relatively open nature of the landscape which the upgrade passes through; and
- The long evolved and well established cultural patterns the landscape exhibits;

Magnitude to proposed change
The magnitude of change to local residents and road users is expected to be high based on;

- The relatively open nature of the landscape which the upgrade passes through;
- The scale of the interventions required;
- The potential time frames for construction;
Assessment of impact
The overall impact assessment was based on the average assessments completed for each of the four landscape character units;
> Mt Pleasant
> Rose Valley and Omega Flat
> Gerringong and
> Crooked River
For the detailed assessment of each of these refer to sections 6.3 through 6.6).
The impacts are summarised below in figure 6.1 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 - High to Moderate.

Mitigation strategy
The recommended mitigation strategy to minimise impacts to the landscape and visual character of the Mt Pleasant character unit include;
> The minimisation of the apparent width of the corridor and reinforcement of the existing landscape patterns would be paramount in integrating the highway upgrade into the existing landscape context
> Integrate new vegetation with the existing landscape character;
> To ensure that the appropriate footprint is developed as part of the upgrade;
> Design retaining wall structures in accordance with the Urban design strategy;
> Design bridges and associated elements in accordance with the Urban design strategy;
> The requirement for integration of large fill embankments and cut slopes; and
> Engage adjacent land owners in assessing if early works (landscape plantings) mitigation can be achieved to help lessen any likely impacts of the upgrade.

Gerringong upgrade - Potential Landscape and Visual Impact Summary Table

<table>
<thead>
<tr>
<th>Category</th>
<th>Mt Pleasant</th>
<th>Rose Valley + Omega Flat</th>
<th>Gerringong</th>
<th>Crooked River</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>Moderate impact</td>
<td>High impact</td>
<td>High to moderate impact</td>
<td>Moderate impact</td>
</tr>
<tr>
<td>Magnitude</td>
<td>Moderate impact</td>
<td>High to moderate impact</td>
<td>High to moderate impact</td>
<td>Moderate impact</td>
</tr>
<tr>
<td>Overall</td>
<td>Moderate impact</td>
<td>High impact</td>
<td>High to moderate impact</td>
<td>Moderate impact</td>
</tr>
<tr>
<td>Overall (All units)</td>
<td>Moderate impact</td>
<td>High to moderate impact</td>
<td>Moderate impact</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6.1 Landscape and visual impact summary table
6.3 Landscape character + visual impact analysis - Mt Pleasant

Existing landscape character
The landscape character on the southern slopes of Mt Pleasant is a harmonious and intimate balance of forested hills, rolling pasture land, cultural tree plantings, majestic *Ficus macrophylla* specimens (fig trees). The upper slopes are heavily forested transitioning to pasture lands as the land flattens to form Rose Valley. There is very little built form in this area, the landscape is mostly experienced by the road user. **Figure 6.3** illustrates the existing landscape context.

Detailed project description
The upgrade would include the continuation of the existing two lane dual carriageway that follow the Kiama Bends. This requires increasing the width of the existing corridor. This widening would require:

> A widening of the road from 3 lanes to separated dual carriageway;
> New cut batters to southern facing slopes;
> New concrete barriers to the centre median; and
> North bound climbing lane up Mt Pleasant.

Impacts
Interventions associated with the upgrade that would have a landscape character and visual impact on the Mt Pleasant landscape character unit would include:

> Increased footprint width of the upgrade;
> Increased cut batters to the south and south eastern facing slopes; and
> Loss of some vegetation associated with the widening of the corridor.

Visibility
The southern slopes of Mt Pleasant enclose Rose Valley to the north and are clearly visible from the majority of the town of Gerringong and from the residents on the southern side of Rose Valley. For north bound highway users the southern slopes of Mt Pleasant are highly visible all the way from Sims Road through to Rose Valley Road.

**Figure 6.2** illustrates the visibility of the Mt Pleasant landscape unit proposal, while **Figures 6.4 through 6.6** illustrate the upgrade proposal.

Sensitivity to proposed change
The views to Mt Pleasant are chiefly from the town of Gerringong, which is some distance away. Currently the Kiama bends are the most noticeable element in the viewshed. The increased size of the new cuttings would have an impact but based on the distance away for the majority of people experiencing the Mt Pleasant landscape the sensitivity to change would be moderate. **Rating - Moderate.**

Magnitude of proposed change
The experience of the Mt Pleasant landscape is broad and the changes are chiefly related to the widening of the road corridor and the increased footprint of the existing cut slope. The magnitude of this change would only have a moderate impact. **Rating - Moderate.**

Assessment of impact
Based on the overall scale of the proposed intervention and the relative distance that the majority of users while experience these interventions from, the overall impact is rated as medium. **Overall rating - Moderate.** Refer **figure 6.7** for the assessment table.

Mitigation strategy
The recommended mitigation strategy to minimise impacts to the landscape and visual character of the Mt Pleasant character unit include:

> Replace any trees / shrub vegetation lost as part of the upgrade;
> Establishment of vegetation to the lower part of the cuttings, where possible to stabilise cutting and improve visual amenity.
Figure 6.2 Visual catchment and key viewpoints of the Mt Pleasant landscape character unit

Key viewing locations
1. Gerrignong north to Mt Pleasant
2. Travelling north along highway
3. Travelling south after Kiama bends
4. Residents of Rose Valley to the north east

Figure 6.3 Looking north east at the descent from Mt Pleasant into Rose Valley along the existing highway.
Figure 6.4 Aerial view looking south west toward Rose Valley, illustrating proposed cut embankments on the south east facing slopes.

Figure 6.5 Drivers view, heading north east up to the Kiama Bends, illustrating proposed concrete median and cut embankments.

Figure 6.6 Driver’s view, heading north from proposed highway, furthest right the cut in the ridge at the Kiama Bends can be seen, below and to the left the two proposed cut embankments to the south facing slopes of Mt Pleasant are also evident.

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Figure 6.7 Impact assessment table for the Mt Pleasant landscape character unit.
6.4 Landscape character + visual impact analysis - Rose Valley & Omega Flat

Existing landscape character
The lower slopes of Rose Valley beneath Mt Pleasant are dominated by the large Fig trees, pasture and cultural row plantings. The pastoral landscape is dotted with small estates and isolated farm houses. To the east the historic Renfrew Park Estate lies immediately adjacent to the existing highway. Rose Valley flattens out and transitions into the Omega Flat through which the current highway passes. Omega Flat forms the floodplain between Rose Valley and the Werri Lagoon. The northern end of Fern Street is characterised in the immediate context by the vertical dominance of the formal she oaks (*Casuarina cunninghamiana*) and the strong horizontal plane of Omega Flat. The formalised channels and broad areas of grass and reeds are also evident. The broader backdrop is of the open and structured fields of the upper Rose Valley and the more extensively vegetated slopes of Currys Mountain, Saddleback Mountain and Mt Pleasant. The landscape is also dissected by the South Coast Railway Line.

Figure 6.9 illustrates the existing landscape character of the Rose Valley landscape character unit.

Detailed project description
The upgrade involves the following components within the Rose Valley and Omega Flat landscape unit;

> A new interchange at Rose Valley Road including;
> A bridge over the highway, the proposed bridge would include throw screens and lighting for safety;
> North and sound bound off ramps and north and north bound on ramp;
> A concrete reinforced earth wall between the main highway and the south bound off ramp;
> A bus turn around on Rose Valley Road

> A new bridge at Fern Street over the South Coast Railway Line, with a total length of 180m. The proposed bridge would include throw screens and be constructed on concrete piers.

Impacts
Interventions associated with the upgrade that would have a landscape character and visual impact on the Rose Valley and Omega Flat landscape unit include;

> Increased footprint width at the interchange with the addition of the south bound and north bound entry and exit ramps to access Rose Valley Road;
> New bridge over the highway that is elevated in the landscape and a new visible element;
> The widened road corridor would have impacts to the western edge of Renfrew Park Estate, requiring the removal of some existing vegetation, including a Moreton Bay Fig Tree;
> Extensive earthworks including embankments to accommodate new roads and bridges as the proposed interchange is on a small ridge line;
> Impacts to mature *Ficus macrophylla* specimens on the south western side of the upgrade. The smaller of the two trees would be removed to accommodate the new ramp to exit from the Princes Highway to Rose Valley Road.
> The addition of the two lane bridge over the South Coast Railway Line would be the highest impact within Rose valley and Omega Flat and would introduce an elevated element into the flat landscape. The likely structure would be visually imposing with an overall length of approximately 180m; and
> Prominence of the elevated embankment across Omega Flat that gives the main highway 1:100 year flood immunity.
Visibility
Rose Valley and Omega Flat are generally visible from the north and north west facing slopes of the township of Gerringong. From Mt Pleasant Rose Valley and Omega Flat compose the foreground of what is a regionally significant viewsheet. The outlook (turn out off the existing highway at the Kiama Bends) provides a view over Rose Valley, Gerringong, Seven Mile Beach, Mt Coolangatta and Shoalhaven Heads in the distance. The proposed bridge at Fern Street would introduce a large new element into this significant view. Within Rose Valley itself, there are a small number of residents that view across Rose Valley toward the highway, these views would also be impacted by the introduction of the proposed bridge over the railway line, refer figure 6.8.

Figure 6.8 illustrates the visibility of the overall proposal and the key viewpoints while figures 6.10 through 6.17 illustrate the upgrade proposal.

Sensitivity to proposed changes
In the vicinity of Rose Valley Road the road corridor is highly constrained by significant cultural elements including the significant fig trees to the west and the historic Renfrew Estate to the East.

The existing road crosses the railway at grade and is part of the fabric of the area and the addition of the elevated bridge would have an impact. This would be tempered by the proposed bridge alignment matching the existing road configurations. There are no residences in the immediate area. To the west the existing highway is generally unseen presently from Rose Valley. While some distance from the roadway the open nature of the existing landscape would be impacted on by the introduction of new infrastructure into the viewsheet. Rating - High.

The proposed bridge at Fern Street is approximately 180m in length. The introduction of this element into a broad, flat and highly visible landscape would have a high magnitude of change. Rating - High to Moderate

Assessment of impact
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 - High to Moderate. Refer figure 6.18 for the assessment table.

Mitigation strategy
The rhythmic pattern of the rural landscape needs to be reinforced in the broader context. With the adjusted entry to Gerringong there is the opportunity for the inclusion of cultural plantings at the new interchange that reinforce the existing patterns within the landscape and also provide connection and way showing for the town.

The existing Fig trees removed at Rose Valley Road should be replaced by new planting as they have such strong local significance and compliment the retention of the main specimen.

The abutment structures of the proposed bridge over the Railway connecting to Fern Street would be screened with appropriate plantings to reduce the apparent visual mass of the structure. The bridge deck and parapet would be designed to be slim and simple utilising a rail barrier.

For the application of these mitigation strategies and the concept design illustrated in Section 03 refer to figures 6.14 through 6.17.
Figure 6.9  Looking south over Rose Valley and Omega Flat, the strong grid pattern of the landscape is clearly evident.

Figure 6.8 Visual catchment and key viewpoints of the Rose Valley and Omega Flat landscape character unit.

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<tr>
<th>Key viewing locations</th>
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<tr>
<td>1 Mt Pleasant south to Rose Valley</td>
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<td>2 Travelling north and south after Kiama bends to Sims Road</td>
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<td>3 Gerringong north to Rose Valley</td>
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<td>4 Residents of Rose Valley</td>
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1.5 km 1.25 km 1 km

1 2 3 4

Visual catchment of Rose Valley + Omega Flat

Intensity of visibility, dark high + light low

Figure 6.9 Looking south over Rose Valley and Omega Flat, the strong grid pattern of the landscape is clearly evident.

South Coast Railway Line

Omega Flat

Renfrew Park Estate

Rose Valley Road
Figure 6.10 Aerial view, looking east toward Renfrew Park, foreground includes the bus turnaround and on and off ramps

Figure 6.11 Aerial view, looking south illustrating the Rose Valley Road bridge and south bound off ramp to Gerringong

Figure 6.12 Aerial view, illustrating the retaining wall and slot south of the bridge that allows for the retention of the large fig tree (shown left)

Figure 6.13 Driver’s view, heading south from proposed highway, access ramp to Gerringong on the left.

Figure 6.14 Aerial view looking south east to Gerringong illustrating the elevated highway over Omega Flat and the bridge over the railway line

Figure 6.15 Aerial view looking south illustrating the skewed nature of the bridge over the railway and the length and scale of the bridge

Figure 6.16 Drivers view, heading north east across Omega Flat, illustrating the bridge form and columns

Figure 6.17 Driver’s view, heading south from proposed highway, illustrates the curved form of the bridge

Figure 6.18 Impact assessment table for the Rose Valley and Omega Flat landscape character unit
6.4.1 Artist’s impression #01 - Rose Valley + Gerringong from Mt Pleasant

Figure 6.19 Artist’s impression location #01 showing viewshed coverage
Location 1: The viewpoint has been taken overlooking the proposed alignment from the Mt Pleasant lookout at the end of Kiama Bends, looking South over Gerringong township taking in Omega Flat and Werri Lagoon in the foreground and Gerringong in the mid and back ground. Mt Coolangatta can be seen in the distance. Princes Highway (and proposed alignment) can be seen entering the view from the right foreground, descending down the slope on the edge of Rose Valley, continuing across Omega Flat in the centre of the view, before reaching the background and disappearing behind the ridge line at Willow Vale. This view holds particular cultural significance as it introduces people to the rural landscape of the south coast.

Location Lat: -34.711959° Long: 150.841049° Elev: 120m (asl) Facing: South South-west
6.4.2 Artist’s impression #02 - Rose Valley Road interchange

Figure 6.21 Artist’s impression location #02 showing viewedshed coverage
Location 2. The viewpoint has been taken from the proposed road be seen by a motorist. In the immediate view a ridge line descends down the centre line towards Omega Flat and encapsulates Rose Valley floor to the right. To the left of the centre line of the view are the headlands and higher areas of Gerringong Township. The views are concentrated towards Rose Valley which is populated with sparsely placed rural farms and wide open dairying areas. The view right extends all the way to the Willow Vale ridge line which has a mixture of open areas and vegetated areas along the skyline. There are some significant sized fig trees in the mid ground which provide sculptural elements in the landscape. The Princes Highway (and proposed alignment) is visible as it follows the leading edge of the ridge as it descends towards the valley floor.

Location Lat: -34.715963° Long: 150.832671° Elev: 50m (asl) Facing: South South-west

Figure 6.22 Artists impression from viewpoint #02 - Gerringong Upgrade
6.4.3 Artist's impression #03 - Fern Street Bridge and Highway from Rose Valley Road

Figure 6.23 Artist's impression location #03 showing viewshed coverage.
Location 3: The viewpoint has been taken from Rose Valley Road looking back across the valley over Omega Flats, Werri Lagoon and the northern end of the Gerringong township. The immediate foreground is open pasture and farmland. Vegetation cover is a lot more apparent due to the low elevation of the viewpoint and the distance to the horizon. In the mid ground is the vegetation cover of Werri Lagoon and Omega Flat, hiding the northern end of Gerringong. To the right mid ground hiding views over the ocean is the headland to the north of Werri beach and the hills that lead up toward Mt. Pleasant which is out of view to the left. The Princes Highway (and proposed alignment) is visible in the mid-ground, descending along the ridge line towards Omega Flat. It is also visible in patches as it crosses the Omega Flats before disappearing out of view behind some small ridges. This view is significant as it demonstrates a typical view experienced by many existing property owners see. The bridge over the railway line is clearly visible.

Location Lat: -34.721469° Long: 150.819081° Elev: 20m (as) Facing: South East
6.5 Landscape character + visual impact analysis - Gerringong

Existing landscape character

The landscape of the town is characterised by its strong visual connection to both the coast and Rose Valley. There are impressive historical plantings of Norfolk Island Pines along the main east-west axis of Belinda Street. The cultural settlement patterns and arrangement of the street axis of the town relate very closely with the existing highway alignment. The township is effectively a more urban response to the pastoral landscape of Rose Valley, Crooked River and Willow Vale. Figures 6.25 and 6.27 illustrate the existing landscape character at the interface of the town with the broader landscape.

Detailed project description

The upgrade involves the following components within the Gerringong landscape unit;

- New access arrangement at Fern Street Valley Road with a 2 lane bridge over the South Coast Rail line;
- New access arrangement at Belinda Street with four way access movements and a 4 lane bridge over Belinda Street;
- New cut embankments in the vicinity of Sims Road, cut embankments to be in the order of 6 - 8 m in height;

Impacts

Interventions associated with the upgrade that would have a landscape character and visual impact on the Gerringong landscape unit include;

- The introduction of a large bridge into the broad and visible Omega Flat landscape at the north entrance to town;
- A reconfiguration of the south bound entrance to town that takes the entrance further away from Gerringong than the existing arrangement;
- Loss of roadside vegetation to the western side of the existing highway north of Sims Road;
- The elevation of the proposed highway by up to 4m above the existing level as it traverses the southern area of Omega Flat just north of Gerringong;
- An extended section of raised highway associated with an overpass of Belinda Street, large embankment slopes and significantly increased footprint width in this area.

The new access arrangements to Gerringong do not alter the existing hierarchy and functions of the two main streets, Fern Street and Belinda Street.

Visibility

As Gerringong has the majority of aspect facing north and north east the visibility of the residents to the new bridge at Fern Street is somewhat restricted. The bridge would also be approximately 500m away from the nearest residences in northern Gerringong and Werri Beach. The additional widened footprint of the upgrade would be visible to the north from Gerringong. As discussed previously the Fern Street Bridge would be visible from residents within Rose Valley.

The Belinda Street interchange is located adjacent to the industrial estate within Gerringong and with localised terrain would only be partially visible for residents of Gerringong on the generally west and south west facing slopes. To the east the railway line serves as a buffer and the highway is generally depressed into the landscape in this vicinity.

Figure 6.26 illustrates the visibility of the Gerringong landscape unit and the key viewpoints in relationship to the upgrade proposal, while Figures 6.28 through 6.30 illustrate the upgrade proposal.
Sensitivity to proposed changes
Considering that the proposed access points to Gerringong connect into the current local road hierarchy and structure the impacts within Gerringong would be minimal. The changes, while large in scale are also occurring some distance from the township and are likely to be visible to only a few residences. Within the broader landscape context of Gerringong and Rose Valley the existing landscape can be considered sensitive to change. **Rating: Moderate**

Magnitude of proposed changes
The two proposed access points at Fern Street and Belinda Street are significant in scale and while not impacting the functioning of the internal local road network would have large changes in the broader landscape and alter the entrance and exit experiences for the township of Gerringong. The south bound exit to Gerringong would occur some 500m + further away from town. **Rating High to Moderate**.

Assessment
Based on the overall scale of the proposed intervention interfacing with the Gerringong landscape unit, the overall impact is rated as high to moderate. **Overall rating - High to Moderate.** Refer figure 6.31 for the assessment table.

Mitigation strategy
Reducing the visual impacts of the bridge structure at Fern Street would require the establishment of screening vegetation consistent with the landscape character of the immediate context. Extending the avenue planting along Fern Street reinforces the existing character and patterns within the landscape. The amount of bridge on earth embankment would be minimised to make the bridge as lightweight in appearance as possible. Additional cultural plantings characteristic of Rose Valley would be included to help provide visual impact and mitigation.

The embankment slopes associated with the raised highway should utilise slopes that are less than 1:2 and that are more sympathetic with the adjacent flat landscape. Any vegetation removed as part of the upgrade north of Sims Road should be replaced.

The intervention at Belinda Street is large in scale and complex in its components. The slopes that are associated with the embankments should be less than 1:2 to allow for the successful establishment of vegetation. The opportunity exists for the establishment of cultural plantings that link the entrance with the township of Gerringong. The bridge detailing and lighting works would need to be carefully integrated to provide a simple and legible outcome.

The landscape and urban design interventions would be consistent with the recommendations of the landscape and urban design strategy in **Section 4.0** of this report.

For the application of these mitigation strategies and the concept design illustrated in **Section 3.0**.
Figure 6.27 Current configuration and landscape at Belinda Street

Figure 6.26 Visual catchment and key viewpoints of the Gerringong landscape character unit

Key viewing locations
1. Mt Pleasant south to Gerringong
2. Travelling north along highway
3. Gerringong residents viewing Fern Street and Belinda Street Valley
4. Residents of Rose Valley
5. Residents of Crooked River

Visual catchment of Gerringong
Intensity of visibility: dark high + light low

1km Boundary from highway

Figure 6.27 Current configuration and landscape at Belinda Street
Figure 6.28 Aerial view looking west from Gerringong, illustrating the 4 lane bridge over Belinda Street and large embankments.

Figure 6.29 Aerial view looking east toward Gerringong illustrating proposed ramp arrangement and height of proposed road above existing grade.

Figure 6.30 Detail aerial of the Belinda Street underpass, illustrating the open abutments.

### Table: Gerringong Landscape Unit - Potential Landscape Character and Visual Impact vs Magnitude of Change

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6.5.1 Artist’s impression #04 - Fern Street Bridge from Fern Street

Figure 6.32 Artist's impression location #04 showing viewshed coverage

Figure 6.32 Artist's impression location #04 showing viewshed coverage
Location 4. The viewpoint has been taken on Fern Street, looking back towards the Princes Highway as it descends down the ridge line to the Rose Valley floor. In the foreground are the Omega Flats leading towards the higher ground with a dominant ridge line which can be seen sweeping up left to right as it climbs up the mountain edge. In the background is a prominent ridge line which extends out towards Mt. Pleasant. The Princes Highway (and proposed alignment) can be seen in the mid-ground as it follows the ridge line climbing up towards Mt. Pleasant. Fern street can be seen in the immediate foreground as it continues across the flats and connects to the highway. This view is significant as it is the exit (and entry) point into the Gerringong Township and has been the recognisable gateway for many years. The proposed bridge over the railway as part of the bypass will change the entry and gateway to the town.

Location Lat: -34.735129° Long: 150.827525° Elev: 12m (asl) Facing: Between North & North North-east
6.5.2 Artist’s impression #05 - Belinda Street interchange

Figure 6.34 Artist’s impression location #05 showing viewed area coverage
Location 5: This viewpoint is looking towards the township of Gerringong and the headland from the Willow Vale Ridge line at the existing highway. In the foreground is the creek line and low lying areas for Crooked River. In the mid-ground the green rural pasture areas give way to the expanding outskirts of Gerringong. The background is composed of the Gerringong headland to the centre and right, and distant views beyond Gerringong to the ocean to the left. The Princes Highway (and proposed alignment) are visible in the immediate foreground, as it winds right down towards the Crooked River valley, then turns left disappearing behind a cutting and re-appearing in the distant view before disappearing again as it exits in the background left. In the mid ground is the second primary road entrance to Gerringong township and where the proposed grade separated interchange will occur. This view is significant as it illustrates the elevation of the proposed highway in this area.

Location Lat: -34.745951° Long: 150.805784° Elev: 55m (asl) Facing: East
6.6 Landscape character + visual impact analysis - Crooked River

Existing Landscape Character
South of the ridge line near Sims Road, south and west of Gerringong and east of Toolijooa Ridge, the Crooked River catchment is an open pastoral and agricultural landscape. North of the highway lies the Crooked River Winery and rolling undulating hills. South of the highway is the flat rich agricultural land. The landscape is generally open with views to the south and south east. There are isolated clumps of cultural plantings but it is the open agricultural plots that are the dominant landscape feature.

Figures 6.36 and 6.38 illustrate the existing landscape character of the Crooked River landscape character unit.

Detailed project description
The upgrade would involve the following components within the Crooked River landscape unit;

> The upgraded highway follows the existing alignment through to the end of the project at Toolijooa Road.
> West of Gerringong the access ramps connect with Willowvale Road and Bailey’s Road;
> New bridges to both the highway and associated ramps cross over Crooked River;
> New cut embankments and fill embankments west of Bailey’s Road to allow for the widening of the road.

Impacts
Interventions associated with the upgrade that would have landscape character and visual impacts to the Crooked River landscape unit include:

> Prominence of the interchange infrastructure at Belinda Street which starts approximately 800-900m west of Belinda Street;
> The requirement for three bridges over the Crooked River;
> The large cut and fill embankments required as part of the upgrade; and
> The loss of vegetation due to the road widening, there is very little vegetation along this section of existing highway but what it there would be impacted on significantly by the widening.

Visibility
The existing highway travels along a small ridge line as it moves west. The current two and or three lane configuration is nestled into the terrain. The higher and more concentrated level of visibility is from the residents of the southern side of Gerringong on the west facing slope. While some distance from the roadway the open nature of the existing landscape would be impacted on by the introduction of new infrastructure into the viewshed.

Figure 6.37 illustrates the visibility of the Gerringong landscape unit and the key viewpoints in relationship to the upgrade proposal, while figures 6.39 through 6.44 illustrate the upgrade proposal.

Sensitivity to proposed changes
The landscape is very open in this area so changes would be very visible. By utilising the existing highway and existing cuttings some of that impact would be mitigated. Rating - Moderate.

Magnitude of proposed changes
The proposed upgrade follows the alignment of the existing highway in this area. The increased scale of the cuttings would be integrated with the existing formations to minimise impact. Rating - Moderate.

Assessment
Based on the overall scale of the proposed intervention interfacing with the Crooked River landscape unit, the overall impact is rated as moderate. Overall rating - Moderate. Refer figure 6.45 for the assessment table.

Suggested mitigation
The recommended mitigation strategy to minimise impacts to the landscape and visual character of the Crooked River landscape character unit include;
> Replacing any trees / shrub vegetation lost as part of the upgrade;
> Establishment of vegetation to the lower part of the cuttings and where cuttings are completed to a width that has allowed for future widening; Ensuring that the slopes that are associated with the embankments around Belinda Street would be less than 1:2 to allow for the successful establishment of vegetation.
> The establishment of cultural plantings that link the entrance with the township of Gerringong.
> Ensuring that the bridge detailing and lighting works are carefully integrated to provide a simple and legible outcome.

The landscape and urban design interventions would be consistent with the recommendations of the urban design strategy in Section 4.0.
proposed road alignment

Key viewing locations
1 Road users travelling north and south
2 Residents of Crooked River
3 Gerringong residents viewing west

Figure 6.37 Visual catchment and key viewpoints of the Crooked River landscape character unit

Figure 6.38 Looking south over the existing highway and the Crooked River floodplain
Figure 6.44 Driver view travelling north, illustrating large cutting west of Gerringong, the start of the exit lane for Gerringong can be seen on the right.

Figure 6.42 Aerial view looking west from Gerringong, illustrating the transition from the elevated section of highway into the cutting.

Figure 6.43 Aerial view looking south west illustrating the large cutting through the knoll.

Figure 6.41 Aerial view looking north at the configuration of bridge, underpass and river crossing.

Figure 6.40 Aerial view looking south at the bridge arrangements at Crooked River and Willowvale Road.

Figure 6.39 Aerial view looking east over the Crooked River winery, illustrating the length of raised embankment.

Figure 6.45 Impact assessment table for the Crooked River landscape character unit.

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<td>Moderate to low impact</td>
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</table>
Mitigation and management measures
7.0 Mitigation and management measures

Landscape character impacts and visual impacts from the Gerringong upgrade are described in Section 6.0 with suggested mitigation measures outlined. In this section, actual mitigation and management measures to be applied to the Gerringong Upgrade are identified in response to the impacts that arise from the project. In general, the mitigation measures would seek to:

> Reduce the physical impacts of the upgrade works to the minimum required to achieve the proposal objectives;
> Replace at a minimum any tree and or large shrub plantings lost as part of the upgrade works;
> Integrate new vegetation with the existing landscape character by using culturally relevant species;
> Ensure that long term integration of the upgrade into the existing landscape character is successful by selecting the appropriate footprint, blending the infrastructure with the surrounding landscape and ensuring the restoration of usable around the infrastructure;
> Design retaining wall structures, cut embankments and fill slopes and bridges and associated elements in accordance with the Urban Design Strategy (refer to Section 4.0);
> Engage adjacent land owners in assessing if early works mitigation (eg. landscape plantings) can be achieved to help reduce impacts of the upgrade.

Table 7.1 sets out the specific mitigation and management measures that would be implemented in response to the impacts identified in each of the landscape character units and relates these to the five viewpoints illustrated in the artist’s impression in Section 6.0. These mitigation measures are also implemented in the Concept Urban Design plans and section which are illustrated in Section 3.0.
**Potential impacts identified in landscape character and visual impact assessment**

**Viewpoint #01 - Mt Pleasant to Rose Valley, Omega Flat and Gerringong Landscape Units:**
- Increased footprint width of proposed upgrade
- Visual impact from new overpass/bridge structures and associated earthworks at Rose Valley Road interchange.
- Removal of one of the two established *Ficus macrophylla* specimens to the west of the existing highway to allow for construction of a ramp.
- Removal of one established *Ficus macrophylla* to the east of the existing highway in the south-west corner of the existing Renfrew Park grounds.
- Visual impact from the new bridge spanning 200m in length over the existing South Coast Railway line to connect Fern Street with the upgraded highway.

**Design responses mitigation and management measures**
- Visual impacts from the new infrastructure would be managed and reduced using landscaping techniques as identified in the Urban Design Concept Sketches.
- The existing rhythmic pattern of the rural landscape would be reinforced in the broader context by including cultural plantings to articulate property boundaries and waterways. Roadside plantings would not line the roadside but be planted casually along the route to allow views to the wider rural area and the ocean.
- Cultural plantings would be included at the new interchange and entry to Gerringong to reinforce the existing landscaping strategies within the town (such as boulevards of trees along main avenues) to provide connection and way showing.
- Screening abutment structures of the proposed bridge over the Railway connecting Fern street with appropriate additional plantings to reduce the apparent visual mass of the structure.
- Prominent engineering elements would be designed as simple, elegant structures in the landscape and planting strategies should screen prominent design elements where possible. For example, the bridge deck and parapet of the bridge over the railway line linking Fern Street with the Princes Highway at Rose Valley Interchange would comprise a slim and simple design with plantings screening the abutments.
- The most established *Ficus macrophylla* specimen would be retained due to its strong cultural significance to both indigenous heritage and European Heritage through its association with the symmetrical plantings in the Renfrew Park grounds.

**Viewpoint # 02  - Rose Valley Road Interchange Landscape Units - Rose Valley + Omega Flat**
- Increased footprint width of proposed upgrade
- Visual impact from new bridge over the highway at the proposed Rose Valley Interchange. The new bridge would be more than 3m higher than the existing road and serves as an extension of Rose Valley Road as it comes up from the west and connects over the highway cutting to the eastern side of the highway.
- The proposed interchange would be occurring on a small ridge line requiring some extensive earthworks including fills and embankments resulting in visual impacts at this viewpoint.
- The widened corridor would have impacts to the western edge of Renfrew Estate, requiring strip acquisition and removal of some existing vegetation including one established *Ficus macrophylla* specimen in the south-west corner of the grounds.
- Removal of one of two significant *Ficus macrophylla* specimens to the west of the existing highway to allow for construction of a ramp.

**The bridge structure over the highway at Rose Valley Road and associated walls would be integrated as far as practicable with adjacent infrastructure and fill slopes and embankments blended with surrounding topography and planted with appropriate species including Fig and Norfolk Pine trees.**

**The Urban Design Strategy would support retention of one of the existing Fig trees, which would be incorporated into a gateway planting strategy to introduce travellers to the northern entrance to Gerringong. The most established *Ficus macrophylla* specimen with the strongest cultural significance to both Aboriginal heritage and European Heritage though its association with the symmetrical plantings in the Renfrew Estate grounds would be removed.**

**Additional cultural planting on embankments would provide stabilisation and contribute to way showing and visual connectivity with Gerringong township.**
<table>
<thead>
<tr>
<th>Viewpoint + Landscape Unit</th>
<th>Potential impacts identified in landscape character and visual impact assessment</th>
<th>Design responses mitigation and management measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>VP #03 Looking across Rose Valley and Omega Flat from Rose Valley Road</td>
<td>Significant visual impacts from this distance include:</td>
<td>• Major infrastructure items would be integrated into the landscape by responding to the natural topography</td>
</tr>
<tr>
<td>Landscape Units: Rose Valley + Omega Flat and Gerringong</td>
<td>- Interchange at Rose Valley Road as it is on the elevated ridge line adjacent to Renfrew Park Estate</td>
<td>• Major infrastructure items would be integrated by screening prominent structures, particularly the bridge abutment structures at Fern Street Bridge and Rose Valley Road Interchange, with culturally relevant plant species.</td>
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<td>- Large bridge over the railway line at Fern Street</td>
<td>• Infrastructure would be integrated with the landscape and maximise useful pasture land by varying embankment slopes to blend with the edge of infrastructure across Omega Flat and at Rose Valley Road and Interchange.</td>
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<td>- Elevated embankment across Omega Flat</td>
<td>• Culturally significant plantings would be introduced to embankments to blend with the surrounding landscape and provide stabilisation to earthworks.</td>
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<td>VP #04 Fern Street looking north-west Gerringong + Rose Valley</td>
<td>Addition of a two-lane bridge spanning 200m over the existing South Coast Railway line to connect Fern Street with the upgraded highway would add an elevated element to the flat landscape. A series of skewed columns would be required to overcome technical and physical requirements of the rail corridor and local ground conditions resulting in a visually imposing structure.</td>
<td>• Cultural and specimen plantings would be introduced at the Rose Valley Interchange to provide a gateway and way showing for Gerringong.</td>
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<tr>
<td>Landscape Units: Rose Valley + Omega Flat and Gerringong</td>
<td>• Visual impacts from the elevation of the overall highway above the Omega Flat floodplain by between 3 - 4m above the existing highway and associated earthworks</td>
<td>• Retention of the large Fig tree and associated cultural/specimen plantings at the Rose Valley interchange would assist with integration and reduce visual impacts</td>
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<tr>
<td>VP #05 - West to Belinda Street Interchange Gerringong + Crooked River</td>
<td>• Visual impact from the highway being elevated by up to 5m in the vicinity of the Belinda Street and Willow Vale Road</td>
<td>• Screening vegetation comprising culturally relevant species would be used to reduce visual impacts from prominent engineering structures such as the Fern Street bridge over the railway line.</td>
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<tr>
<td>Landscape Units: Gerringong and Crooked River</td>
<td>• Visual impact from the access ramps connecting Willow Vale Road and Belinda Street back with the highway, associated batter slopes and requirement for bridges at Belinda Street, Crooked River and s</td>
<td>• Embankment slopes associated with the raised highway would not exceed 1: 2 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>
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<td>• Culturally relevant plantings along embankments would further reduce visual impacts and provide stabilisation for the earthworks.</td>
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<td></td>
<td>• The interchange at Belinda Street would be large in scale and complex in its components. Embankment slopes associated with the raised highway would not exceed 1: 2 and should 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>
<td>• Culturally relevant plantings along embankments would provide stabilisation and mitigate visual amenity impacts, while providing opportunities for way showing and visual connectivity with Gerringong township.</td>
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<td>• The bridge structure and associated walls would be integrated as far as practicable with adjacent infrastructure and fill slopes and embankments blended with surrounding topography and planted with appropriate species including Fig and Norfolk Pine trees.</td>
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