



Tintenbar to Ewingsdale

Environmental assessment

Working paper 11 – Urban design,
landscape and visual assessment





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Urban Design, Landscape and Visual Assessment

Prepared for the

NSW Roads and Traffic Authority

Pacific Highway Upgrade
Tintenbar to Ewingsdale

By

SPACKMAN ✦ **MOSSOP**

Rev 07

10 June 2008

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Rev 07

10 June 2008

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REPORT STRUCTURE AND EXECUTIVE SUMMARY

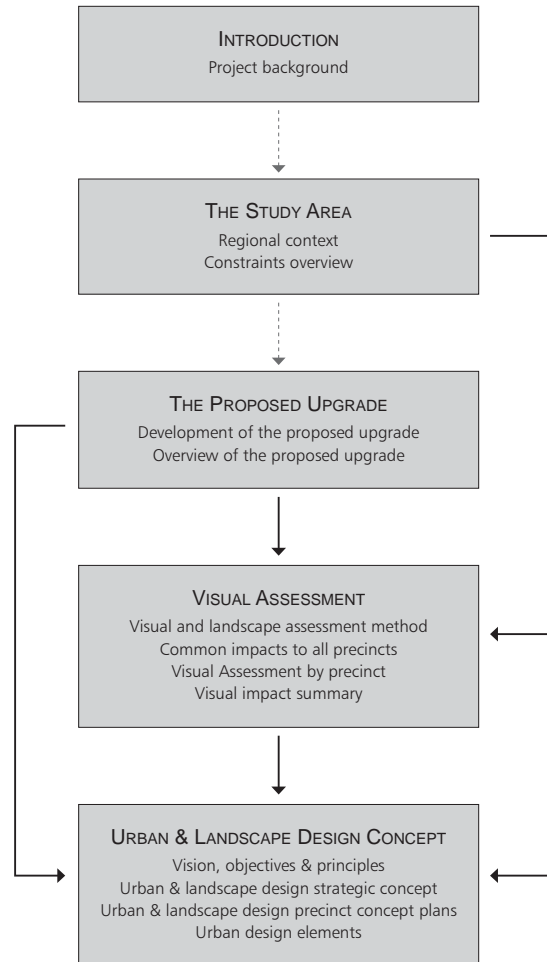
This "Urban Design, Landscape and Visual Assessment" working paper has been prepared by Spackman & Mossop, as part of the environmental assessment of the proposed upgrade of the Pacific Highway between Tintenbar and Ewingsdale. Spackman & Mossop were commissioned by ARUP on behalf of the RTA and are one of a range of subconsultants contributing to the environmental assessment of the proposed upgrade.

This working paper specifically addresses the visual and landscape issues associated with the proposed upgrade, by undertaking a visual assessment of the proposed upgrade and providing urban and landscape design directions for future stages of the proposed upgrade. In doing so, it has incorporated the Director General's requirements for the visual assessment component of the environmental assessment, as well as feedback received from the RTA's urban design section.

This working paper has been divided into the following sections (refer to flow chart "Report Structure"):

1. Introduction
2. The Study Area
3. The Proposed Upgrade
4. Landscape and Visual Impact Assessment
5. Urban and Landscape Design Concept

More detail on these sections and respective key findings is provided on the following pages.



*Flow Chart 1:
Structure of the "Urban Design, Landscape
and Visual Assessment" working paper*

1. Introduction

The "Introduction" gives a brief overview of the background to this working paper and the proposed upgrade of the Pacific Highway between Tintenbar and Ewingsdale. It further defines the study area for this working paper.

Key Findings

The decision to upgrade the Pacific Highway between Tintenbar and Ewingsdale dates back to 1996, when the NSW and Federal Government made a joint commitment to upgrade the remaining sections of the Pacific Highway to a four lane, dual carriageway road.

The detailed planning for the project commenced in 2004, and Spackman & Mossop were engaged by ARUP on behalf of the NSW Roads and Traffic Authority (RTA) to undertake urban and regional landscape design and visual assessment services. The design for the proposed upgrade was developed since then, through an iterative planning process involving a wide range of specialist consultants, government agencies and community stakeholders.

2. The Study Area

This section places the study area in its regional context and provides an overview of the study area, by describing existing conditions including the area's landform, vegetation and settlement patterns. This is followed by an overview of constraints to the proposed upgrade of the Pacific Highway. These include statutory constraints provided by the policy and legislative framework and the landscape and visual constraints arising out of the existing conditions of the study area.

Key Findings

The study area is located in the Northern Rivers region of New South Wales. It is an area widely appreciated for its high scenic quality and visual diversity, including by locals and visitors to the area. Set against a backdrop of coastal plains, local coastal ranges such as the elevated plateau that dominates much of the study area provide the dominant visual feature in the landscape. The dramatic landform of the study area combines with its long agricultural history and limited levels of urban development to create a varied scenic landscape of high lifestyle and (eco) tourism value which continues to attract growing numbers of people to live and visit.

The highly scenic character of the study area, its relaxed lifestyle and the importance of tourism to the local economy result in a high level of sensitivity with regard to any proposed changes to the landscape.

The landform, vegetation and settlement patterns of the area further combine to define the visual and landscape constraints to the proposed upgrade. These include the land use, settlement and circulation patterns which influence the perception of viewers likely to see the proposed upgrade, and the interplay between the landform and vegetation cover which determines the degree to which the proposed upgrade will be able to be seen, based on its elevation relative to other parts of the study area and the degree to which it would be concealed by vegetation.

Statutory constraints to the proposed upgrade are provided in the recognition of the importance of the scenic escarpment through its inclusion in a scenic protection zone in both the Byron Bay and Ballina Local Environmental Plan.

3. The Proposed Upgrade

This section provides an overview of the major features of the proposed upgrade of the Pacific Highway between Tintenbar and Ewingsdale. They are the proposed alignment, proposed interchanges or changes to existing interchanges and changes to local vehicular access and circulation. The section further includes a brief overview of the process of developing the design.

Key Findings

The proposed upgrade would replace the existing two-lane highway and provide a new alignment for the Pacific Highway between Tintenbar and Ewingsdale that is completely independent from the existing highway. The existing highway would be retained as a local access route.

Commencing at the Ross Lane interchange (proposed to be constructed as part of the Ballina bypass project), the proposed upgrade would follow a gently meandering alignment through the undulating agricultural plateau, remaining in relatively close vicinity to the existing highway for much of its route. The exception would be the section between the existing Bangalow bypass and St Helena Road, where the proposed highway would run through the Tinderbox Valley significantly to the east of the existing highway. The proposed upgrade would pass under a tunnel in the St Helena ridge before emerging alongside the existing highway on the

Ewingsdale spur. It would join the existing dual carriageway at the Ewingsdale interchange.

The proposed upgrade would involve the construction of one new interchange at Ivy Lane, as well as modifications to existing interchanges at Ross Lane, Bangalow and Ewingsdale. A number of local access roads would be required to re-connect properties with the existing highway, where current direct access to the highway would be lost. Generally speaking this would affect properties on the western side of the existing highway between Ross Lane and Emigrant Creek and north of St Helena Road, and properties on the eastern side of the existing highway between Emigrant Creek and the Bangalow interchange. Properties along the existing highway north of the Bangalow interchange would not be affected.

4. Landscape and Visual Impact Assessment

This section is dedicated to the assessment of the likely visual impact of the proposed upgrade on the visual environment of the study area. A detailed visual assessment method was developed for the project, based on common visual assessment practice and adapted for the particular conditions of the study area. Adaptations specifically related to the development of a method which would permit assessment in a quantitative manner, in order to provide a frame of reference to the highly individualistic nature of visual perception which often leads to differing opinions with regard to the degree of visual impact.

The description of the visual assessment method is followed by an assessment of the likely visual impact of the proposed upgrade. The study area was divided into five precincts which roughly correspond to visual catchments along the proposed upgrade. The precincts are Knockrow, Emigrant Creek, Bangalow, Tinderbox Creek Valley and Ewingsdale. Following a brief discussion of common impacts across the study area (including temporary visual impacts), the visual assessment is presented on the basis of these largely visually contained precincts. This has enabled the working paper to focus on local issues and discuss the proposed upgrade at a greater level of detail than would otherwise be possible.

The assessment includes a description of the existing character of each precinct, a detailed description of the works associated with the proposed upgrade of the Pacific Highway and the visual assessment of these works consisting of a discussion of the visual effect of the proposed works, the visual sensitivity of viewers and the resulting likely visual impact.

The detailed discussion of the precincts is followed by a summary of the visual impact which gives consideration to the cumulative effects of the proposed upgrade across all precincts and in terms of the scenic and landscape qualities of the study area.

Key Findings

Based on the outcomes of the quantitative assessment, the visual impact of the proposed upgrade on the various precincts in the study area ranges between 'moderate' (Knockrow, Emigrant Creek and Ewingsdale precincts) and 'moderate to high' (Bangalow and Tinderbox Creek Valley precinct). These ratings reflect the corresponding local conditions, the scale of the proposed road infrastructure and the extent of visibility from surrounding viewpoints within each precinct's setting. They further provide a good indication of the physical magnitude of the proposed upgrade and of the number and kinds of viewers.

However, the quantitative focus of the assessment does not fully reflect the likely visual impact on the existing highly scenic and intricate landscape pattern. Further, it does not address the cumulative impact of the proposed upgrade on the study area as a whole.

Considering the overall visual effect of the proposed upgrade on the nature of the landscape in the study area, it is likely that the proposed upgrade will remain a dominant feature in the landscape, with mitigation measures only partially able to mitigate its large scale. Combined with the area's acknowledged scenic qualities, its growing popularity as a place to live and visit and the resulting high visual sensitivity of viewers, the cumulative visual impact of the proposed upgrade is likely to be in the high to moderate range.

5. Urban and Landscape Design Concept

The urban and landscape design concept outlines a series of measures to integrate the proposed upgrade into the visual and landscape setting of the study area, with the aim of making a positive contribution to the landscape through which the proposed upgrade passes. A key feature of this is the identification of urban and landscape design measure that will assist in the reduction of the identified visual impacts associated with the proposed upgrade. In order to achieve this, an overall urban design vision and urban and landscape design principles and objectives are developed for the proposed upgrade, based on the RTA's *Pacific Highway Urban Design Framework*, and the existing conditions of the study area.

These are followed by the urban and landscape design concept which consists of several components:

- > **the urban and landscape design strategic concept**, addressing issues of landmarks (both natural and constructed features), corridor landscaping and the location and degree of importance, from an urban design and visual point of view, of major road infrastructure elements such as bridges, overbridges, tunnel portals and noise walls.
- > **an urban and landscape design concept plan for each visual assessment precinct**, outlining key issues for consideration in future design stages as well as specific design recommendations for various points along the route. These are informed by the findings of the visual impact assessment.
- > a discussion of **urban design elements**, providing design principles for the further development and detailed design of elements including bridges, overbridges, tunnel portals and noise barriers.

All components of the urban and landscape design concept address the experience of the motorist on the proposed upgrade as well as the experience of viewers in the study area.

Key Findings

The urban design vision for the proposed upgrade is provided by the RTA's *Pacific Highway Urban Design Framework*:

"A sweeping, vegetated highway, providing panoramic views to the Great Dividing Range and the rivers, forests, farmlands, and coastline of the Pacific Ocean. Sensitively designed to fit into the landscape and be unobtrusive. Characterised by simple, attractive road infrastructure."

The strategic concept identifies the following features as major landmarks along the proposed upgrade: the coastal plains, the St Helena ridge, the Byron Creek floodplain, 'Arundel', the Emigrant Creek crossing, the Knockrow escarpment and the Ross Lane escarpment.

Major road infrastructure elements identified by the strategic concept include interchanges and new intersections, major cuttings, bridges, overbridges, tunnel portals and noise barriers. They represent the most visible components of the proposed upgrade, as far as viewers in surrounding areas are concerned. Their detailed design will therefore make an important contribution to the way in which the proposed upgrade will be perceived by viewers in the study area. Further, a number of these elements are also situated in identified landmark locations along the route, rendering their design

resolution even more important from an urban design and visual point of view.

This is reflected by a 'design hierarchy' developed for road infrastructure elements. The most important elements from an urban and visual point of view are the bridges across Emigrant and Byron Creeks, the tunnel portals in the scenic escarpment, the noise barriers near Bangalow and on the exposed Ewingsdale spur and the major cutting through 'Arundel'.

The corridor landscape strategy outlined in the strategic concept builds on the existing pattern of planting, natural vegetation and open landscapes in the study area, to create a rhythm of open and enclosed landscapes along the proposed upgrade that provide an interesting experience for the motorist and respect prevailing landscape patterns, thereby reducing the level of visual contrast between the road corridor and the surrounding landscape.

In terms of the detailed urban and landscape design concept plans prepared for each visual assessment precinct, each precinct presents a number of individual challenges and associated specific design recommendations. However, there are a number of key infrastructure items as well as a number of recurring issues which, from an urban design and visual point of view, would justify a design review and/ or require careful design consideration during the next design stages:

Key Infrastructure Items

> Tunnel (and portal) design

The tunnel under the St Helena ridge is prominently located in the side of the scenic escarpment and represents a major landmark. The current proposal involves major excavation of the natural hillside and is likely to require major engineering works to stabilise cutting faces. This outcome is not sympathetic to the identified visual significance of the scenic escarpment and its landmark status along the proposed upgrade. Consideration should therefore be given to reviewing the tunnel design with the aim of increasing the length of the tunnel. This would reduce the scale of excavation works and associated hard engineering measures which in turn would significantly reduce the visual impact of the tunnel portals.

> Bridge design

The bridges along the proposed upgrade will be large and important structural elements with the potential to significantly influence the perception of the visual impact of the proposed upgrade as a whole. Developing detailed designs (including construction methods) that result in refined, transparent and elegant structures reflective of the highly scenic nature of the study area will therefore be of great importance. The most desirable outcome would be

one of a consistent approach to bridge design and construction along the route, ideally featuring a haunched design with a minimal number of spans. This may also result in less environmental disturbance due to longer spans and fewer piers, and may prove economically competitive and justifiable due to continuity advantages.

If this approach is not considered to be feasible, it will be important for bridge design and construction to correspond to the degree of visual and urban design importance identified in the strategic concept. The visually most important bridges are those at Emigrant Creek and Byron Creek, followed by 'Yarrenbool Place' and then at Skinners Creek and Tinderbox Creek. Prioritising design and expenditure in this way would ensure that the more prominent bridges and those in major landmark locations reflect the importance of their setting.

> **Noise barrier design**

Limited information on the design details of noise barriers was available at the time of this working paper, in particular with regards to the exact length, height and location relative to the proposed upgrade. However, as noise barriers in a predominantly rural environment and one as scenic as the elevated plateau are likely to be perceived as highly unusual, the design of noise barriers should aim to reduce their visibility as much as possible, in order for the landscape to remain the dominant visual feature. This could be achieved through densely landscaped earth mounds or hard engineering structure such as a vertical noise walls, provided the later would be accompanied by dense planting on both sides.

Recurring Design Issues

> **Reduce the visual impact of parallel areas of hard pavement**

Several locations along the proposed upgrade feature a large number of parallel roadways, including around the Ross Lane, Bangalow and Ewingsdale interchange. The large amount of parallel hard pavement areas would create a high level of contrast with the rural nature of the study area. Planting, including planting of trees and shrubs, between the separate roadways should be maximised, in order to visually break up the area of hard pavement visible from any one area or viewpoint and thereby reduce its visual impact.

Further, road design development should seek to minimise hard paved areas as much as possible, in particular where pavement would only be required in the case of future road widening or the potential provision of additional traffic movements at intersections in the future. In shoulders, consideration should also be given to the use of alternative materials and/ or textures that reduce the width of the uniform driving surface.

> **Vertically independent carriageways**

The north and southbound carriageway of the proposed upgrade in its current form are designed to be parallel, in terms of both their vertical and horizontal alignment. The urban and landscape design concept plans identify a number of locations with the potential to provide vertically independent carriageways. Generally, these are sections of the proposed upgrade between major infrastructure elements such as bridges which would require the carriageways to be at the same elevation.

Vertical separation of carriageways offers the potential to reduce the motorway character of the proposed upgrade, reducing the potential visual effect of the proposed upgrade and providing a more diverse and interesting driving experience. It further has the potential to reduce the need for cut and fill along the route, by matching individual carriageway levels more closely to the natural landform.

> **Shaping of cuttings and embankments**

The proposed upgrade involves a large amount of earthworks along much of the route and which contribute to the identified visual effect and visual impact. In particular cuttings have a potentially great visual impact, as their shape is frequently observed silhouetted against the skyline. A sharply defined edge would contrast strongly with the gently rolling character of the natural landscape, and cuttings should therefore be shaped in a way that reduces this contrast and allows cuttings to tie with the natural shape of the landscape.

Similarly, embankments should be 'graded out' at the bottom, to reduce the visual impact of an obvious junction between fill embankments and the natural landform.

Combined with the establishment of vegetation over time, this will assist in reducing the 'artificial' character of cuttings and embankments.

> **Cutting and embankment stabilisation/ revegetation**

In addition to the shape of cuttings and embankments, their successful long term stabilisation and revegetation will be a critical factor influencing the character of the proposed upgrade and the degree of contrast between the road corridor and the surrounding landscape.

Consideration should be given to the angle of cutting and embankment slopes with regard to short and long term soil stability, the potential for plants to successfully establish and long term maintenance (issues include mulch or small rocks being washed onto the road pavement). Close liaison with geotechnical specialists is recommended in order to identify the need for and best means of soil stabilisation to ensure good long-term vegetation cover.

> **Protect the character of the existing highway**

There are a number of locations along the proposed upgrade where the proposed road reservation abuts the existing highway alignment and where construction activities may impact on existing established roadside vegetation, including boundary hedges, avenues and other stands of trees. Retaining and protecting roadside vegetation along the existing highway is important from the point of view of minimising the degree of visual change associated with the proposed upgrade and in maintaining the attractive driving experience along the existing highway, for both locals and visitors to the area. Detail design and construction works should therefore aim to maximise the retention of this vegetation and, where this is not possible, reinstate vegetation following completion of the works. Reinstated vegetation should be of sufficiently established size to compensate for the loss of roadside vegetation in the short term.

> **Severed plantations**

Plantations and in particular macadamia plantations, are a defining feature of the study area's visual and landscape character. The retention of stands of macadamia trees should therefore be maximised as much as possible. The issue arises where existing plantations are being severed by the proposed upgrade, leaving isolated stands of established trees that are nevertheless not directly affected by the construction of the proposed upgrade. Retaining such stands of trees is especially important within a context of aiming to reduce the degree of visual change in parts of the landscape not directly affected by the construction of the proposed upgrade.

While the issue of residual lands and their future uses is addressed in a separate working paper, continuing discussions with affected and neighbouring land business owners would be important from a visual point of view, in order to maximise the degree to which the existing visual landscape character can be retained.

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1. introduction

PROJECT BACKGROUND

2

In 2004, Spackman & Mossop were commissioned by ARUP on behalf of the RTA to provide Urban and Regional Landscape Design and Visual Assessment services for the Pacific Highway Tintenbar to Ewingsdale upgrade Project.

The project involved the identification of constraints to upgrading the Pacific Highway in the study area, the identification and preliminary assessment of a number of route options, and the selection of a preferred route. This working paper represents the final stage in the route selection phase which is the environmental assessment of the proposed upgrade.

This working paper contains the visual impact assessment of the proposed upgrade and includes an urban and landscape design concept to integrate the proposed upgrade with the landscape of the study area.

The Pacific Highway provides the major component of the principal national highway link between Sydney and Brisbane and the many coastal communities in between. From its beginning at Hexham near Newcastle and its end at Tweed Heads on the Queensland border, it consists of some 700 kilometres of road which traverse a highly varied and scenic landscape, characterised by its location between the eastern seaboard and the Great Dividing Range. It passes a large number of coastal communities many of which provide popular holiday destinations, as well as passing through natural bushland areas, floodplains and varied agricultural landscapes which include pastures and many different crop plantations. Occasionally, spectacular glimpses to the Pacific Ocean open up along the route.

In 1996, the NSW and Federal Government announced their joint commitment to upgrade the Pacific Highway to provide a double-lane divided road. The upgraded Pacific Highway will reduce travel times, meet increasing traffic demand and provide for safer travel along the route. Investigations into upgrading the Pacific Highway between Tintenbar and Ewingsdale commenced in 2004. Since then, a preferred route for the proposed Highway upgrade was developed through an iterative planning process involving a range of specialist consultants, government agencies, communities, community groups and individuals. The urban design and visual assessment advice provided throughout this process project has contributed to the selection of the preferred route for the proposed Pacific Highway upgrade in the study area (the proposed upgrade).

This "Urban Design, Landscape And Visual Assessment" working paper has been prepared by Spackman & Mossop as part of the Environmental Assessment of the proposed upgrade of the Pacific Highway between Tintenbar and Ewingsdale. It addresses the Director-General's requirements for the environmental assessment of the proposed upgrade, prepared under Section 75F of the *Environmental Planning and Assessment Act 1979*.

The working paper presents an overview of the general visual and landscape issues and constraints which were identified in the process of developing the proposed upgrade. This is followed by a detailed urban design, landscape and visual assessment of the proposed upgrade, based on a number of site visits and field investigations and complemented by a review of relevant literature and the analysis of 2004 aerial photographs and topographic maps.

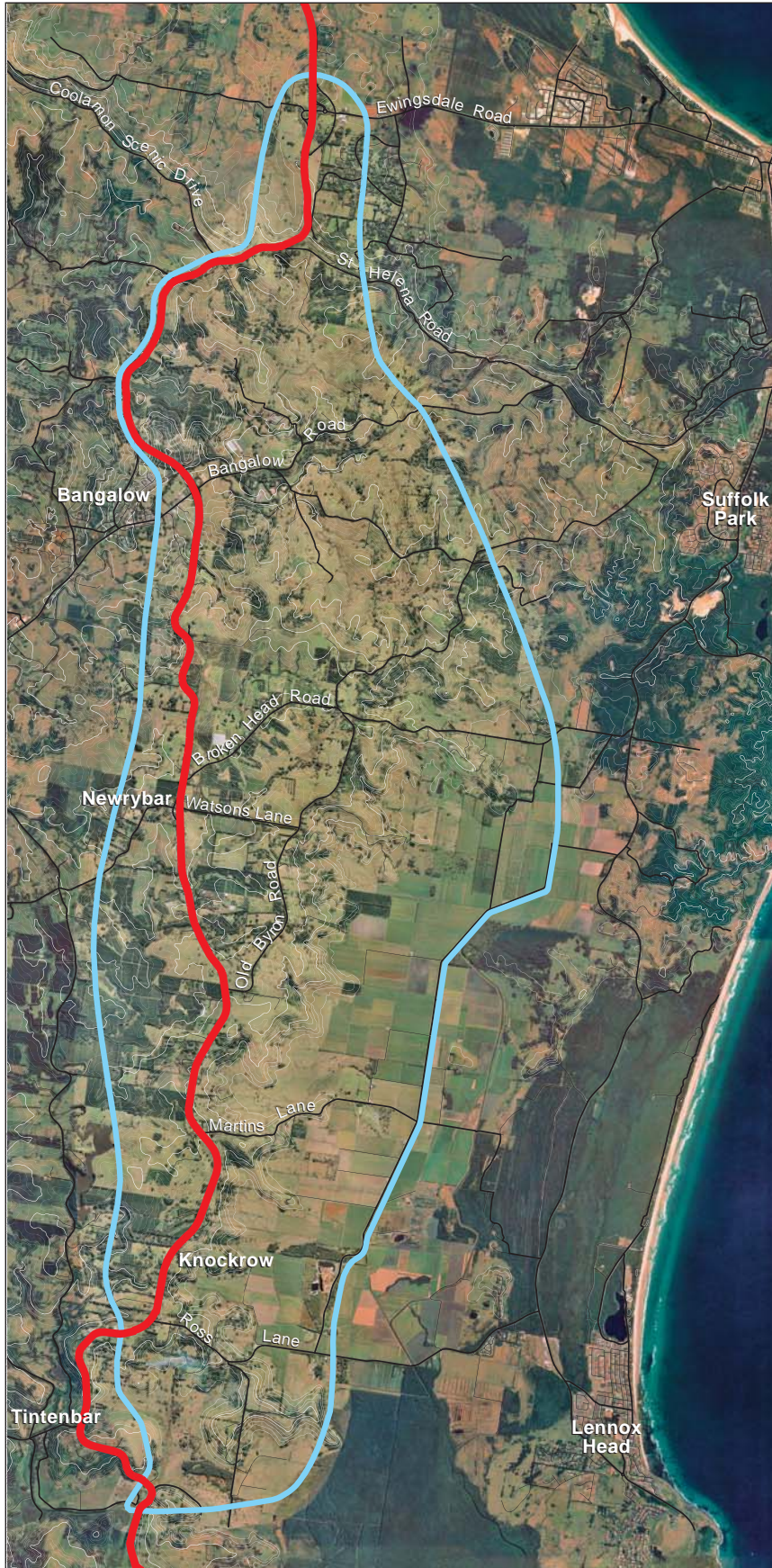


Illustration 1:
Study Area for the proposed upgrade of the Pacific Highway between Tintenbar and Ewingsdale

2. the study area

REGIONAL CONTEXT

6

The study area for the Pacific Highway upgrade, Tintenbar and Ewingsdale is located on the NSW North Coast, in the region centred around Lismore and commonly known as the Northern Rivers. The Northern Rivers Region stretches from the Clarence River to the Queensland border, and from the coastline to the foothills of the Great Dividing Range (refer Illustration 2). The study area is contained in the northern half of the Region, between Ballina in the south and Byron Bay in the north, both of which are important regional centres, in terms of population numbers as well as in terms of the range of services and facilities they offer.



Illustration 2
The Northern Rivers Region of NSW

The Northern Rivers Region contains a wide array of natural features which contribute to the high scenic qualities and diversity for which it is appreciated by locals and visitors alike. They include the coastal landscapes of beaches and rocky headlands, the broad meandering coastal rivers for which the region is named, and rugged rainforest mountain ranges such as the Night Cap Ranges, Mt Warning and the Border

Ranges, which have been included on the World Heritage List since 1986.

Of these features, Mt Warning (refer Illustration 3), named by James Cook in 1770, as a warning to seafarers of the numerous treacherous reefs along the coast, provides the major scenic landmark feature in the region around the study area. It can be widely seen from within the study area as well as from the surrounding hills and coastline.



Illustration 3
Ewingsdale, the Coastal Flats and Mt Warning in the Background

South of Murwillumbah and in the study area, the Great Dividing Range recedes from the coast, relative to other parts of Eastern Australia (refer to Illustration 4). Because of this, local coastal ranges and headlands become the prominent elevations in the area, acting as major landscape features. Examples of these include ranges and coastal headlands such as Brunswick Heads, Cape Byron, Broken Head and the escarpment within the study area which forms the edge of a plateau elevated above the coastal plains in the hinterland of Byron Bay.



Illustration 4
Regional Topographic Map of north-eastern NSW

The escarpment dominates much of the study area, both physically, by providing a relatively sudden drop in elevation, and visually, by providing visual containment to the coastal landscape. Views from these prominent land forms are as important as views of them.

While the image of the Lighthouse on Cape Byron is the landscape icon for the area (refer Illustration 5), the views from Cape Byron and the escarpment over the coastal hinterland, the mountain ranges including Mt Warning and the sweeping curve of the coastline of Byron Bay are memorable images of this scenic area (refer to Illustrations 6 and 7 respectively).

From its earliest settlement associated with timber getting, dairying and whaling, to farming for sugar cane, tropical fruits and nuts, coffee and tea, and the more recent development of an eco-tourism industry, the region's development owes much to its varied natural landscape features and scenic character. Together with the area's relaxed country lifestyle, the scenic nature and recreational potential of the natural environment continue to attract large numbers of people to the area, both in terms of visitors and new residents.



Illustration 5
Cape Byron Lighthouse

This has created a rich and diverse culture which manifests itself in the many local artists such as film makers, poets, musicians and writers, as well as a variety of festivals and performances. It is further complemented by the recent establishment of a knowledge-based industry focusing on education, science and research.

The new establishment of this kind of industry is typically successful in areas characterised by high lifestyle values, drawing on them to continue to attract people away from bigger centres. It is for these values, including environmental, and community values, that the area is well known and appreciated.



Illustration 6
The Bay as seen from Bangalow Road on the Escarpment



Illustration 7
The Bay and Hinterland as seen from Cape Byron

DESCRIPTION OF THE STUDY AREA

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The highly scenic character of the Byron Bay hinterland combined with the importance of tourism in this section of the North Coast, makes the proposed upgrade of the Pacific Highway between Tintenbar and Ewingsdale sensitive from both an urban design and visual perspective.

Before attempting to identify the potential visual impact of the proposed upgrade, it is necessary to understand the current visual and landscape character of the study area, as well as the sensitivity of people with regard to changes in this character. As outlined in the visual assessment method later in this working paper, these will have a direct bearing on the potential visual impact of identified highway upgrade options. Apart from the nature of the development itself, the landform and vegetation cover of the area will be important in determining the potential visual effect of an upgraded highway, whereas land use and settlement patterns will determine how sensitive people in the area will be to changes in the landscape and visual environment.

LANDFORM

The majority of the study area is located on an elevated plateau which is defined by a steep escarpment on its northern and eastern edges (refer to Illustration 8), falling to a relatively flat coastal plain.

The escarpment that separates the plateau areas and the coastal flats is aligned roughly parallel to the coast, running in a north-easterly to south-westerly direction. The escarpment rises above the coastal plain, generally increasing in height from about 70m above sea level in the south of the study area to over 190m above sea level at Granuaille Hill, above McLeods Shoot Lookout in the north of the study area. It provides a dominant landform feature in the locality, accounting for much of the area's scenic quality.

The coastal plain or coastal flats (refer to Illustration 9) are located between the coastal dunes and headlands and the escarpment. The coastal flats vary in width from a 4-5km wide plain near Ross Lane to a series of relatively narrow valley floors north of Midgen Flat Road, where the escarpment draws to within 2km of the coast and rises to more than 130m above sea level. A similar coastal plain is located north-east of the study area, extending north from the foot of the escarpment near Byron Bay.

On their eastern side the coastal flats are contained by a series of low coastal ridges and headlands such as Broken Head and Lennox Head, all of which offer views back to the escarpment. While the escarpment is the dominant landscape

feature defining the western edge of the coastal landscape, the distance to it and the remainder of the study area when viewed from the coast is too great to provide the viewer with the kind of detail that would make it possible to identify individual elements or smaller-scale changes to the landscape (refer to Illustration 10). Much of the study area is concealed behind the escarpment when seen from the coast. Where local high points can be seen above the escarpment, the distance from the coast is too great to permit a detailed reading of the landscape.



Illustration 8
The Escarpment rising above Cane Fields in the Coastal Flats



Illustration 9
The Landscape of the Coastal Flats

The landscape of the elevated plateau is characterised by a steeply undulating landform dissected by numerous watercourses (refer to Illustration 11). As a result of this, the escarpment itself as well as the ridges and higher slopes on the plateau are exposed to many viewpoints. Conversely, the lower slopes and valleys of the plateau are often concealed from many viewpoints in the locality. The elevated areas within the study area also provide expansive regional views towards the Pacific Ocean and inland. Many properties situated on the upper slopes of the escarpment in particular, enjoy spectacular and uninterrupted views towards the Pacific Ocean and across the coastal flats, headlands and ridges (refer to Illustration 12).

VEGETATION

On the elevated plateau, the combination of a subtropical climate and highly rich and productive soils produces a lush cover of both indigenous and exotic vegetation, interspersed by more open areas of paddocks or plantations. A recurring feature along the current highway is the significant number of macadamia tree plantations whose grid arrangements provide a unique character to the local agricultural landscape (refer to Illustration 13). The types and degree of vegetation cover combined with the steeply undulating landform results in a highly diverse and scenic landscape.

The escarpment slopes are generally steeper and less suitable for agriculture, resulting in a combination of open grassed paddocks with clumps of exotic and native trees, the latter primarily on the steeper slopes. The coastal flats, by contrast, are characterised by geometric patterns of crops of mostly sugar cane. In recent years a number of macadamia plantations have also been planted at the foot of the escarpment as well as in the coastal flats and local elevated areas within the coastal flats.

These are interspersed with stands of trees often associated with remnant swamps or wetlands, and the geometric arrangements of reed-lined trenches and drains that enable the cultivation of these low-lying lands. The height of crop and tree stands in this flat landscape commonly obscures any views from the flats to the surrounding landscape, including the escarpment, until such times when crops are harvested (refer to Illustration 14).

SETTLEMENT PATTERNS

The settlement pattern within and adjacent to the study area is a mixture of small towns and villages with relatively closely settled rural properties in the surrounding areas. Bangalow is the largest town in the study area and located on its western edge. It is situated on the intersection of the Old Pacific Highway alignment and the North Coast rail line. Newrybar is a small village on the Pacific Highway which services the local area. Ewingsdale in the north is a relatively recent subdivision on the lower escarpment slopes overlooking Byron Bay.

Residential properties outside of these towns concentrate along the local roads through the study area, creating small hamlets close to the roads' edges which often follow the ridge lines of the high plateau (refer to Illustration 15).



Illustration 10
View towards the Escarpment from Lennox Head



Illustration 11
Exposed Hills and Ridges of the Elevated Plateau



Illustration 12
View of the Coastal Flats from the top of the Escarpment



Illustration 13
Macadamia Plantations on the Elevated Plateau



Illustration 14
Cane Fields in the Coastal Flats

A number of recent residential subdivisions are evident in the area, complementing more traditional rural housing and taking advantage of the spectacular rural and coastal views (refer to Illustration 16). With the exception of towns like Suffolk Park and Lennox Head (which are outside of the study area), the densities of residences on the coastal flats and the escarpment's slopes are substantially lower than on the ridge lines of the elevated plateau area.

This is due primarily to the steep slopes and soil instability on the escarpment, and flooding and "soft soils" on the flats. The attraction of panoramic views of the surrounding landscape and in some cases the ocean, also explain the higher settlement densities on the elevated plateau areas.



Illustration 15
Cluster of Rural Residential Housing along Broken Head Road



Illustration 16
Recent Subdivision in Wood Crescent, off Coopers Shoot Road

CONSTRAINTS OVERVIEW

The analysis comprises two sets of constraints. Firstly, constraints imposed by the legislative framework with regard to land use and scenic or landscape protection, and secondly, constraints as a result of the existing visual landscape character in the area, which will determine the degree of visual effect and visual sensitivity of the proposed upgrade. Both sets of constraints are discussed in more detail in the following sections.

POLICY CONTEXT AND LEGISLATIVE FRAMEWORK

The local Councils of Byron and Ballina have Scenic Protection Zones that cover a number of landscape features, including the escarpment areas in and adjacent to the study area (refer to Illustration 17 “Scenic Escarpment – Protection Through Land Use Zoning). Areas contained within the Environmental Protection (Scenic/ Escarpment) Zone (Zone 7(d)) of the Ballina Local Government Area would not be affected by the proposed upgrade.

The objectives for the Scenic/ Escarpment Zone (Zone 7(d)) within the Byron Local Government Area are:

- a) to protect and enhance the scenic qualities of the Shire of Byron which enhance the visual amenity by controlling the choice and colour of building materials, position and bulk of buildings, access roads and landscaping,
- b) to prohibit development within the zone that is likely to have a visually disruptive effect on the scenic quality and visual amenity of the Shire,
- c) to enable development for certain purposes where such development would not have a detrimental effect on the scenic quality and visual amenity of the Shire,
- d) to minimise soil erosion from escarpment areas and prevent development in geologically hazardous zones, and
- e) to enable the careful control of noxious plants and weeds by means not likely to be significantly detrimental to the native ecosystem.

Although much of the prominent escarpment is covered by the Scenic Escarpment Zones, there are some sections of the escarpment which are not covered by this zoning but are of equally high scenic value (refer to Illustration 17 “Scenic Escarpment – Protection Through Land Use Zoning).

Despite this gap, however, the inclusion of the much of the escarpment under the Scenic Protection Zone should be interpreted as a sign that the prominence of the escarpment and its importance as a landscape feature in the area is recognised in and appreciated by the local community. The visual prominence of the escarpment means that the extent and nature of development occurring along it will be particularly influential in determining the overall visual character of the area. The escarpment provides the backdrop to the coastal landscape and therefore significantly shapes the way the whole area is perceived. In contrast, other areas, such as those in the coastal flats or on the elevated plateau are much less exposed and consequently have greater capacity to absorb development without affecting the overall landscape character.

In this context, areas not included in the Scenic Escarpment zone should not be regarded as having lesser scenic qualities, and zoning boundaries should not be interpreted as providing the only measure to guide the appropriate location of developments with potentially significant visual and landscape impacts. Instead, the zoning reflects the local desire to maintain a perception of the area as a rural dominated landscape with strong scenic and lifestyle values, rather than of a landscape dominated by residential housing.

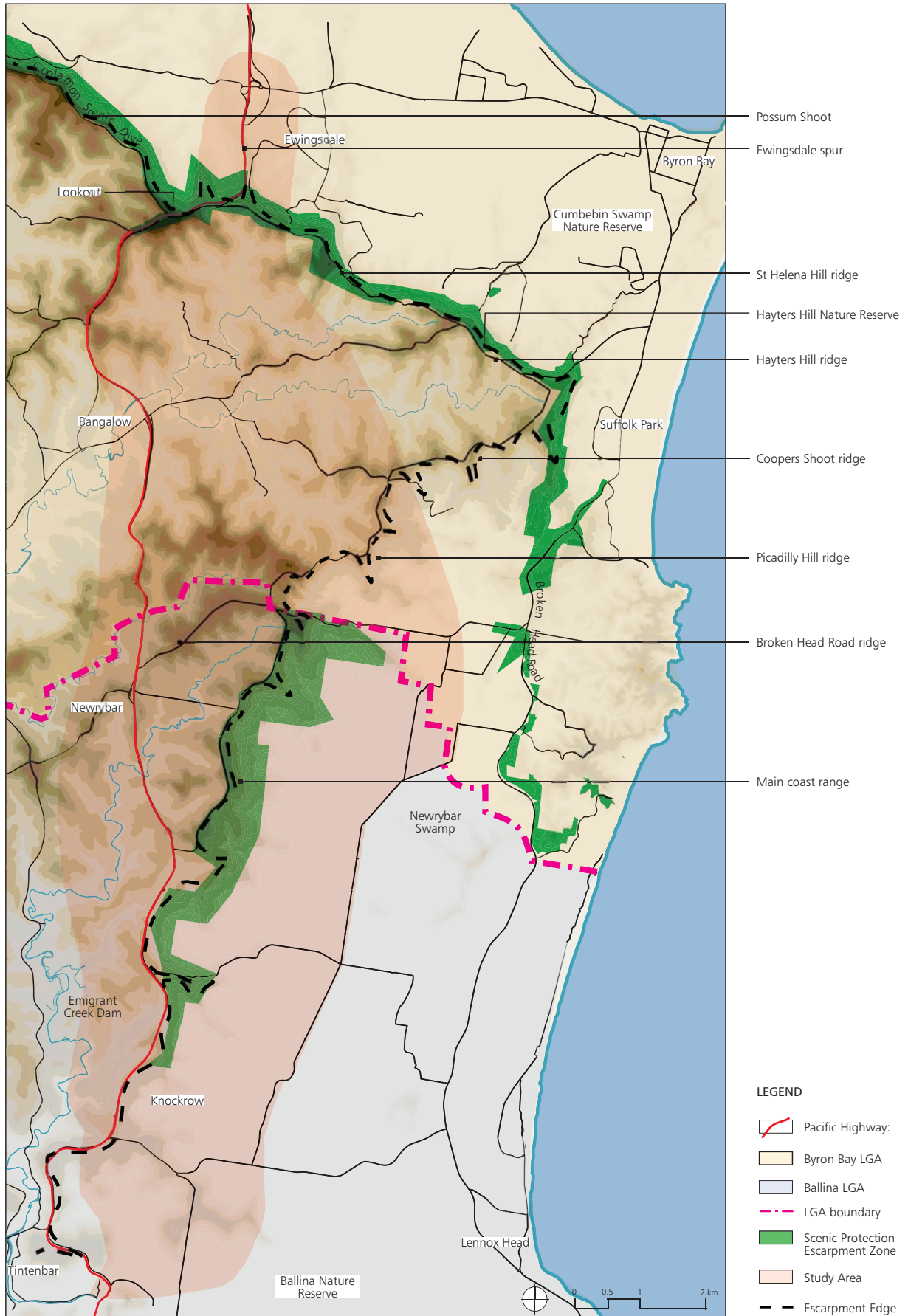


Illustration 17:
Scenic Escarpment - Protection Through Land Use Zoning

VISUAL AND LANDSCAPE CONSTRAINTS CLASSIFICATIONS

As discussed in previous sections, the whole region including the study area is considered to have high scenic (visual) and landscape values. While certain landscape features are more prominent than others, it is the diversity of landscape types and characters and the relationships between them that contribute to the overall landscape and visual experience of the area.

The visual and landscape constraints below are presented and described with regard to assessing the potential visual impact of the proposed upgrade (refer to section "Visual Impact Assessment"). As the visual impact will be a measure of the visual effect of the proposal and the visual sensitivity of viewers, the constraints take into consideration the relationship between the physical features of the landscape and the degree to which people in different areas are likely to be sensitive to changes in the landscape and visual environment.

As will be discussed in the visual assessment method later in this working paper, the visual effect will be partly determined by the characteristics of the visual and landscape setting, while the sensitivity of viewers will be determined by the land use, settlement and circulation patterns of the study area.

The constraints categories and their relationship to the visual assessment method are:

Constraints Category	Visual Assessment Parameter
Landform and Visual Exposure	Define the Visual Effect
Land Cover and Visual Absorption Capacity	
Land Use, Settlement and Circulation Patterns	Define the Sensitivity of Viewers to Changes in the Visual Environment

These categories are illustrated by the accompanying maps and described in the following sections.

Landform and Visual Exposure

The 'Landform and Visual Exposure' map (Illustration 18) defines areas of exposed hills and ridges that are visually sensitive to road construction. These include ridge lines, spurs and hills located on the elevated plateau, as well as the visually exposed face of the escarpment, which is one of the major scenic landmarks of the area as discussed earlier on.

Road construction through these hills and ridges would potentially require large cuttings and embankments that would create a strong visual effect and may be widely visible to both local residents and tourists travelling through the area. The visual impact of large cuttings in ridge lines would be particularly difficult to ameliorate.

The lower slopes and valley floors below the ridges offer lesser constraints. Cut and fill embankments would still be required and might be substantial in some areas. However, from the point of view of visual exposure of the route, the undulating landform of the lower slopes and valley floors offers some opportunities to create a road alignment which would be less visible across large sections of the study area. An alignment winding around the lower slopes would be more readily concealed by intervening landform, resulting in a road which would be less exposed to viewers in the area, especially when seen from a distance. Overall, such an alignment would be more readily absorbed into the landscape.

In contrast, earthworks associated with road construction in the coastal flats would primarily consist of elevated fill embankments to avoid flood-prone areas. However, the flat and open landform would result in the road being exposed to elevated viewpoints, particularly from roads and properties along the edge of the escarpment.

As can be seen on the map (Illustration 18), the study area features a complex landform pattern across the central and western parts. This illustrates the difficulty in selecting a route that will not cut through a number of these exposed hills and ridges. The map also illustrates the relative ease of following the edge of the coastal flats near the foot slopes of the escarpment. However, connecting with the existing highway alignment at Ewingsdale, would require the route to cut through the exposed escarpment in the vicinity of either the Picadilly Hill ridge or Coopers Shoot as well as at the St Helena ridge.

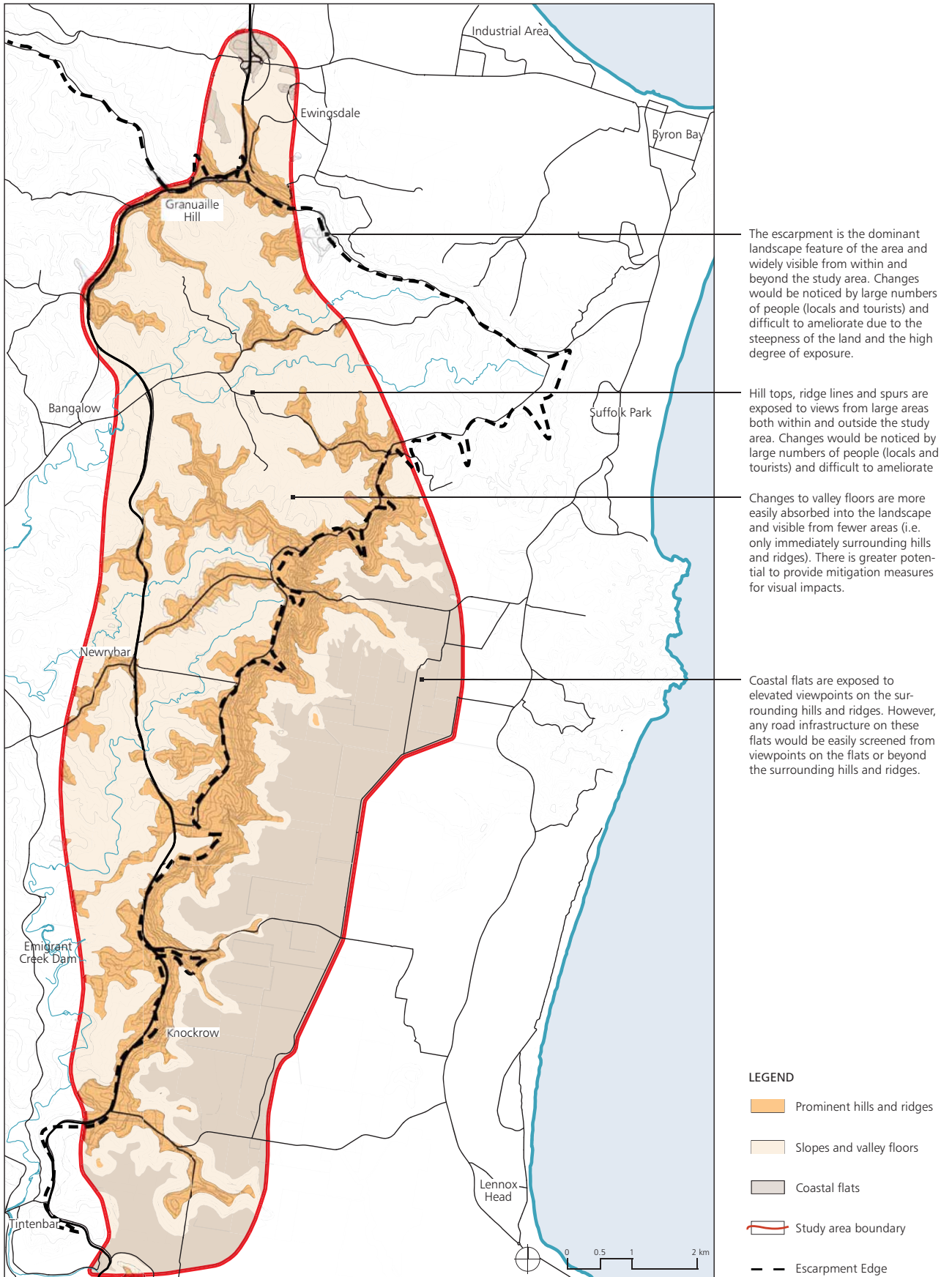


Illustration 18:
Landform and Visual Exposure

Land Cover and Visual Absorption Capacity

The “Land Cover and Visual Absorption Capacity” map (Illustration 19) illustrates the varied and strongly patterned landscape of the study area, which influences the visual impact of a potential road. This complex pattern is a result of the contrast between the open landscape of grazing paddocks and cane fields, and a variety of vegetated areas. The latter include clusters or rows of indigenous trees located predominantly along creek and road corridors, and exotic trees associated with private properties or macadamia plantations and fruit farms.

Generally, any road alignment bisecting areas of dense tree cover would create a strong contrast and corresponding high visual impact, particularly when viewed from areas elevated above the road. The highest impact would result from bisecting more structured patterns such as macadamia tree plantations, whereas irregular patterns of indigenous trees create a more complex landscape pattern that can generally visually absorb the road better.

An alignment in cleared paddocks and cane fields will have less visual contrast and impact than in a densely treed area, however the openness of these areas will expose the new alignment to a wide range of viewpoints.

An alignment that follows the edge between plantations and cane fields or open paddocks would greatly reduce the visual effect on the overall landscape setting, especially when seen from elevated areas.

Finally, the areas of tree cover between the viewer and the road alignment can reduce the visual effect of a new road alignment, particularly when viewed from the lower slopes, valley floors and coastal flats due to the screening effect of the intervening trees.

Land Use, Settlement and Circulation Patterns

Land use, settlement and circulation patterns are important in the visual assessment, as they provide an indication of a number of different viewing areas as well as activities people may be engaged in. This in turn influences the way in which people view the landscape and how they would respond to changes in it, determining the degree of visual sensitivity towards any highway upgrade option.

The primary viewing areas across the landscape are illustrated on the ‘Land Use, Settlement and Circulation Patterns’ map (Illustration 20). They include the various roads occurring in and adjacent to the study area, towns and villages, clusters of semi rural housing and recent residential subdivisions of rural land, as well as isolated homesteads. The most sensitive areas to visual change are those with the greatest number of potential viewers and those viewers who are either engaged in recreational activities (tourists) or are local residents. Workers on rural properties or in urban settings are likely to be less sensitive to changes in their visual environment.

Of the roads in the area, the existing highway is a primary tourist route that would be most sensitive, grading down to the minor roads and local access roads as the least sensitive to changes in outlook. The larger population centres of Byron Bay, Lennox Head, Suffolk Park, Bangalow, Ewingsdale and Newrybar would be the areas of greatest sensitivity whilst the isolated rural homesteads would be the lowest sensitivity to change.

There are less residences and connecting through roads on the coastal flats and this reduces the visual sensitivity of these areas in comparison to the plateau areas. However the escarpment areas that overlook the coastal flats, have numerous residences situated along the ridges and upper slopes and these would be highly sensitive to the alignment of the highway in an area which currently has limited road infrastructure and features prominently in their outlook.

As previously discussed, the zoning of substantial areas of the escarpment as Scenic Protection highlights the importance of the escarpment area to the community as well as the corresponding high levels of sensitivity to a change in the appearance of these areas. The areas of escarpment not zoned Scenic Protection are also of high scenic value and are likely to be equally highly valued by the community.

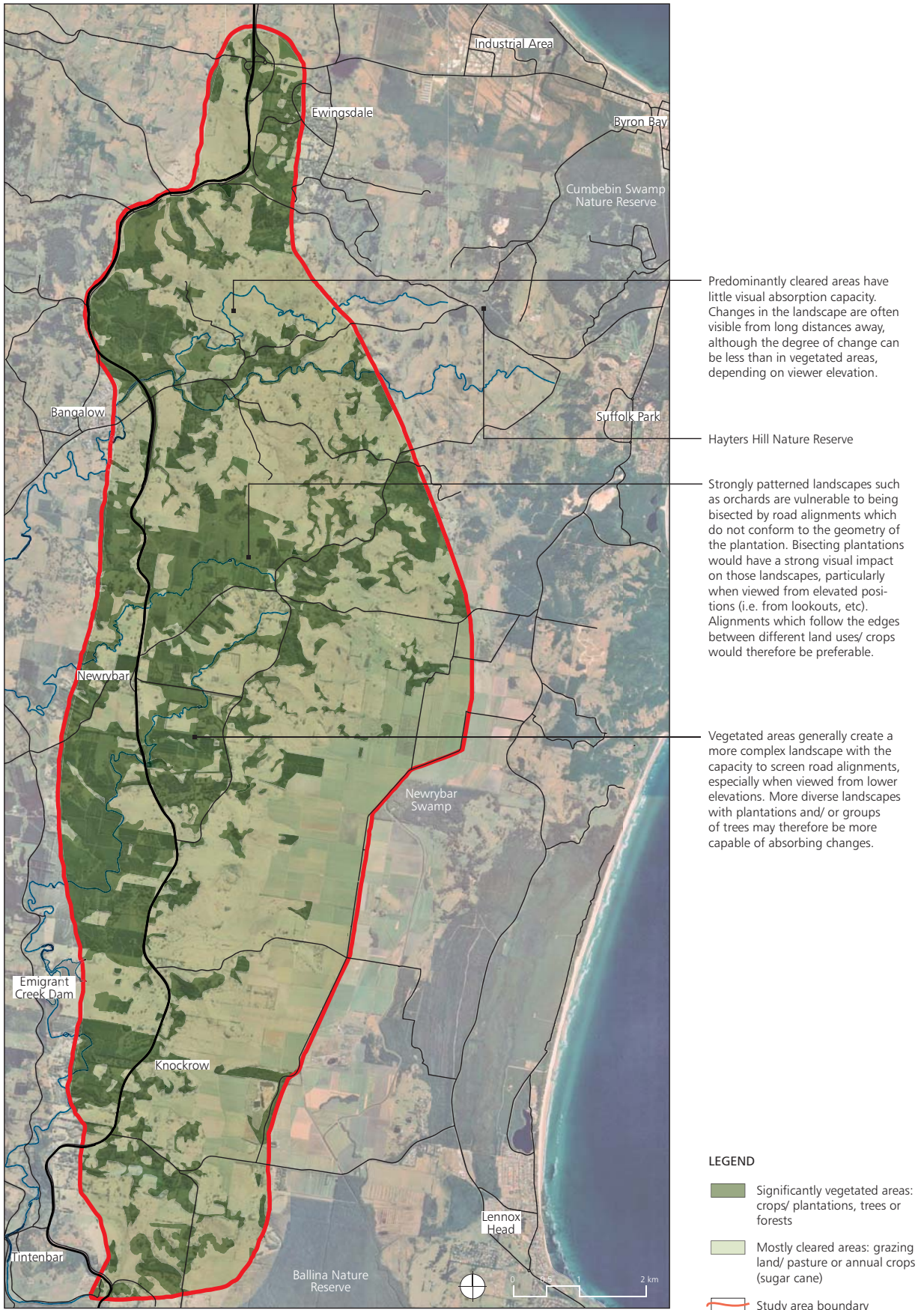
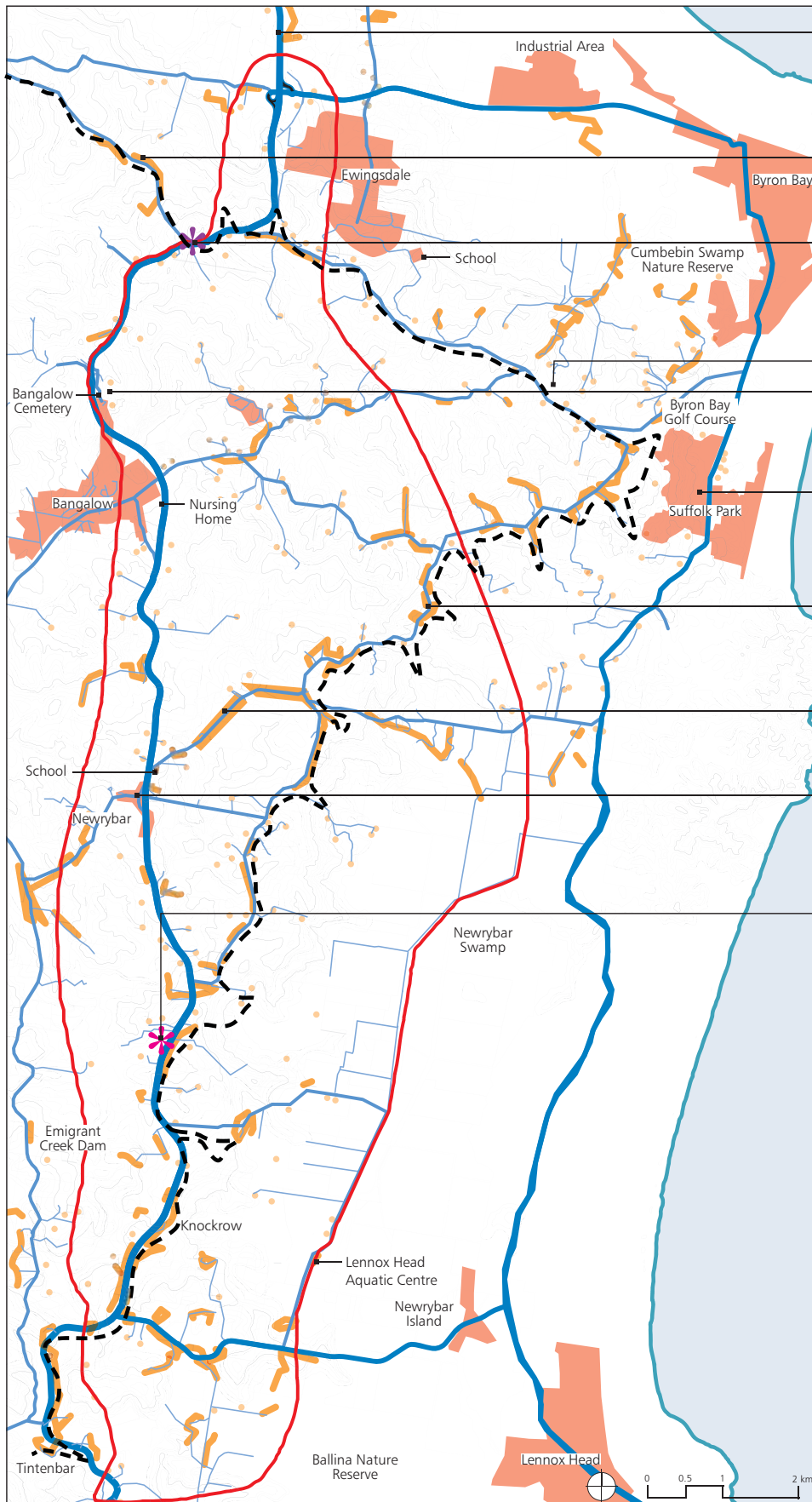


Illustration 19:
Land Cover and Visual Absorption Capacity



- Large numbers of motorists along the Pacific Highway and other major routes would be highly sensitive to changes in the open outlook into the surrounding scenic rural landscape.
- Clusters of housing along the escarpment will be sensitive to changes in medium to foreground views.
- McLeods Shoot Lookout is a major scenic lookout providing views over the coastal plains, to the ocean and along the adjoining escarpment. Locals and tourists would be highly sensitive to changes in the outlook.
- Hayters Hill Nature Reserve
- Locals will be sensitive to changes in the outlook from Bangalow Cemetery.
- Local towns and employment centres are key vantage points. Locals and tourists would be highly sensitive to changes affecting the visual/scenic quality of their environment.
- Tourists and local motorists along local ridge line roads would be sensitive to changes in the open outlook into the surrounding scenic rural landscape.
- Clusters of housing along ridge line roads have elevated viewing positions and would be sensitive to changes in their scenic outlook.
- Increasing tourist facilities such as restaurants/cafés in small villages like Newrybar increase the number of potential viewers who would be highly sensitive to changes in the quality of their environment.
- Tourist facilities including farms, guest houses and other rural attractions would be highly sensitive to changes.

LEGEND

- Pacific Highway: highly sensitive local, regional and tourist traffic route
- Major roads: highly sensitive local and tourist traffic routes
- Local roads: moderately sensitive local and tourist traffic routes
- Minor roads/ access drive-ways: low sensitivity
- Highly sensitive areas: look-outs and tourist attractions
- Highly sensitive areas: towns and villages
- Moderately sensitive areas: rural housing clusters
- Sensitive areas: isolated rural homes
- Study area boundary
- Escarpment Edge

Illustration 20:
Land use, Circulation and Settlement Patterns