



## 14. Visual and lighting impacts



## 14. Visual and lighting impacts

This chapter describes the existing environment, potential impacts and mitigation measures related to visual amenity within the proposed JRYUP. The assessment has been based on investigations of the project area to obtain an understanding of landscape features and the general character of the areas adjacent to the existing railway and maintenance facility. Investigations included:

- Description of the existing landscape and visual features
- Description of local amenity to understand its value to the local community
- Identification of potential visual and lighting impacts on local amenity

### 14.1 Methodology

On 28 November 2006 a preliminary field survey was undertaken as part of the Initial Advice Statement phase of the Project. The site was also surveyed during the day and night on the 10 and 11 May 2007 to assess potential visual and lighting issues associated with the Project.

Identification and assessment of potential visual impacts was based on the QR Environmental and Planning Processes Manual (September 2006) and DMR *Road Landscape Manual* (September 1987) methodologies with appropriate modifications to suit this Project. The methodology adopted was as follows:

- Undertaking a view shed analysis to identify where proposed infrastructure elements would be visible.
- Identifying the visual sensitivity of various infrastructure elements when viewed at a local and regional scale.
- Calculating the visual absorption capacity.
- Identifying the level of change to visual character by describing the level of contrast between the existing visual landscape and what is proposed.
- Identifying the affect on visual amenity for the local community and visitors.
- Identifying mitigation measures to minimise visual impacts.

### 14.2 Description of environmental values

#### 14.2.1 View shed analysis

It should be noted that distance has a strong influence on potential visual impact of any proposed development (as well as the scale and form of what is proposed). The further away an object is from the viewer the less visually prominent it becomes as it accounts for a smaller percentage of the total view. A view of a development can be defined as:

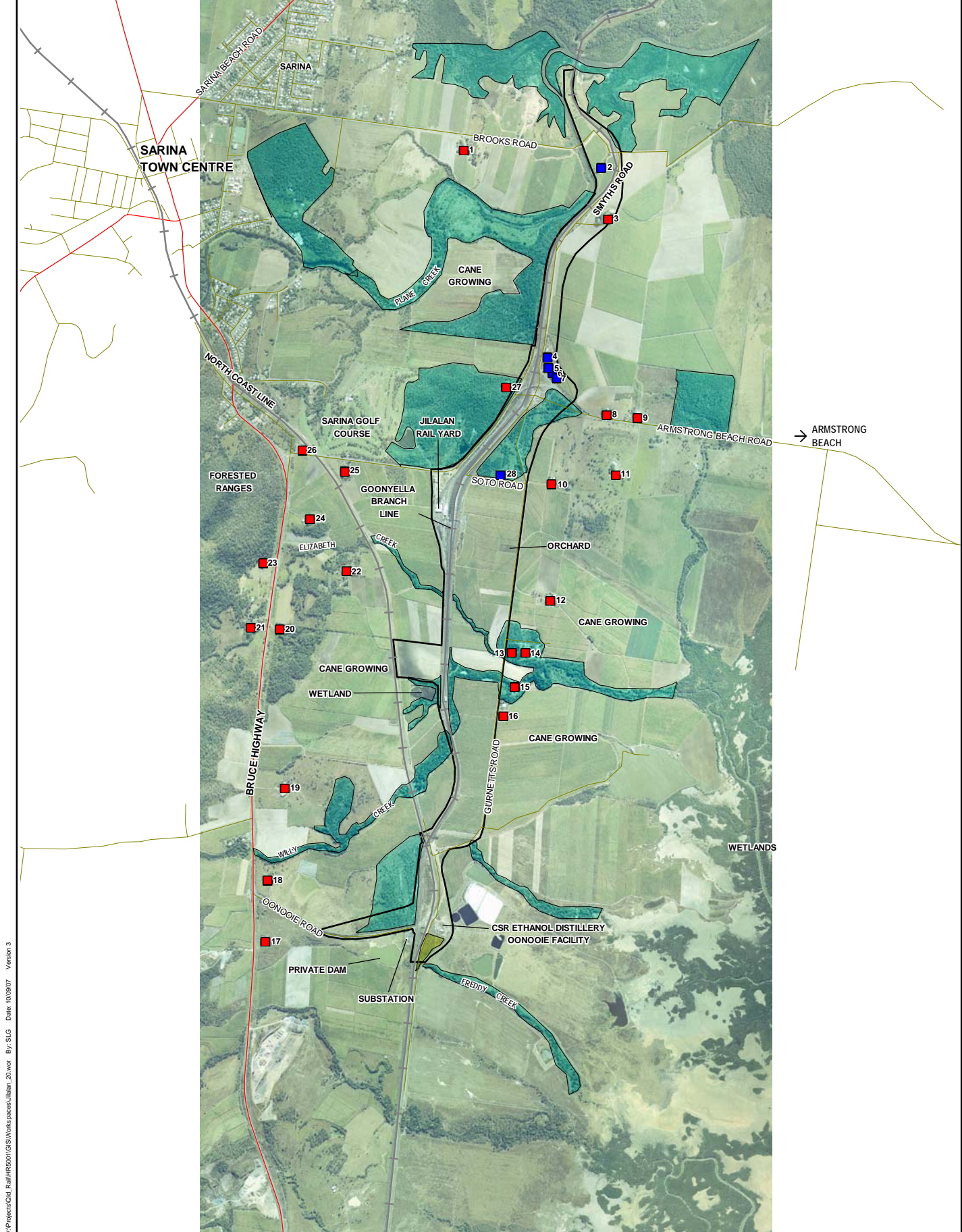
- Local if it is within 0-1 km of the viewer
- Sub-regional if it is 1-5 km of the viewer
- Regional if it is more than 5 km from the viewer

The project area lies approximately 1.5 km south of Sarina, 1.25 km east of the Bruce Highway and 0.5 km east of the North Coast Line.

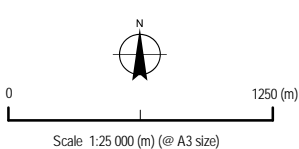
The main views of the project area are from the following viewpoints (refer Figure 14.1):

- Bruce Highway, a major tourist route (sub-regional view)
- North Coast Line used by the Tilt Train and the Sunlander that carry tourists (local view)
- The southern edge of Sarina Golf Course on Armstrong Beach Road (local view)
- A number of homesteads on the neighbouring sugar cane farms, particularly along the eastern side of Gurnetts Lane (local view)





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## LEGEND

- |              |                |  |
|--------------|----------------|--|
| Rail         | Remnant Forest | Residential Dwelling                     |
| Project Area | Young Regrowth | Residential Dwelling to be removed by QR |

## VISUAL ASSESSMENT

FIGURE 14.1

### 14.2.2 Existing landscape features

Landscape features that dominate the visual experience for residents and passers by (in order of significance):

- The forested hills to the west of the project area (Connors Range)
- Plane Creek
- The remnant/regrowth vegetation as patches and strips along Plane Creek, Elizabeth Creek, Willy Creek and Freddy Creek
- The sugar cane (seasonal)
- The existing Jilalan Rail Yards
- The Sarina Golf Course

Photomontages of the project area are shown in Photos 14.1 to 14.5 and the locations from which they were taken are shown in Figure 14.2.

Landscape features that improve the amenity of the existing area for local residents and visitors are:

- The contrast between the cane and remnant/regrowth vegetation
- The forested hills to the west of the project area (Connors Range)

### 14.2.3 Landscape character

Although there is an existing rail yard at Jilalan, the major visual landscape character is sugar cane plantation with scattered orchards, patches of remnant/regrowth forest and fringing forest along the banks of creeks and local homesteads (refer Figure 14.1).

### 14.2.4 Description of existing light sources

The main artificial light source within the project area is the lighting in and around the existing railway workshops on Armstrong Beach Road (west) (refer Photo 14.6). There are 39 light towers approximately 20 m tall and 10 light towers approximately 18 m tall. Each of the 49 towers has two 360 W sodium light fittings (total 98) (Boles pers comm.). These are switched on by sensors and run for approximately 16 hours a day seven days per week. The lights within the existing sheds run for 24 hours a day seven days per week. There are no other major artificial light sources within the project area.

There are no significant fauna habitats in close proximity to the workshops, but the lighting itself attracts insects and in turn their nocturnal predators.

Vehicular traffic at night is fairly limited given that Gurnetts Road and Armstrong Beach Road are local access roads so the light from this source is minimal and intermittent. Rail traffic is more constant but lighting is restricted to the locomotives and is an intermittent directional point source.

As this facility has been operating for a considerable amount of time it can be expected that local residents have habituated to the lights being on for such an extended period or excluded the light from entering their homes. The EIS recommends light reduction efficiency's ensuring safety of nearby residents will not be compromised.

No other permanent light sources occur within the local area.





Photo 14.1. View towards project area from Sarina Golf Course.





Photo 14.2. View towards existing Jilalan Rail Yard.



Photo 14.3. View towards project area from Armstrong Beach Road (East).





Photo 14.4. View over project area from Gurnetts Road.

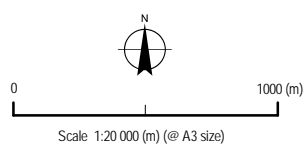


Photo 14.5. View towards project area from North Coast Rail Line.





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## LEGEND

● Visual Assessment Point  
→ Direction of Photograph

▭ Project Area  
+ Rail

PHOTO REFERENCE  
POINTS

FIGURE 14.2





Photo 14.6 Existing lighting from Armstrong Beach Road (west)

#### 14.2.5 Visual absorption capability

Visual absorption capability (VAC) is an indication of the landscape's capacity to absorb visual modification such as roads, residential and other anthropogenic activities. It is a function of existing land use, vegetation cover and type, topography, location and visibility. It is a measure of the degree of the existing visual landscape to absorb contrasting elements.

The methodology adopted for this visual assessment was developed from the following:

- Resources Inventory Committee, British Columbia, 1997
- North Shore City study, undated
- Waitakere City Study undated
- Department of Natural Resources, State of Alaska, 1978

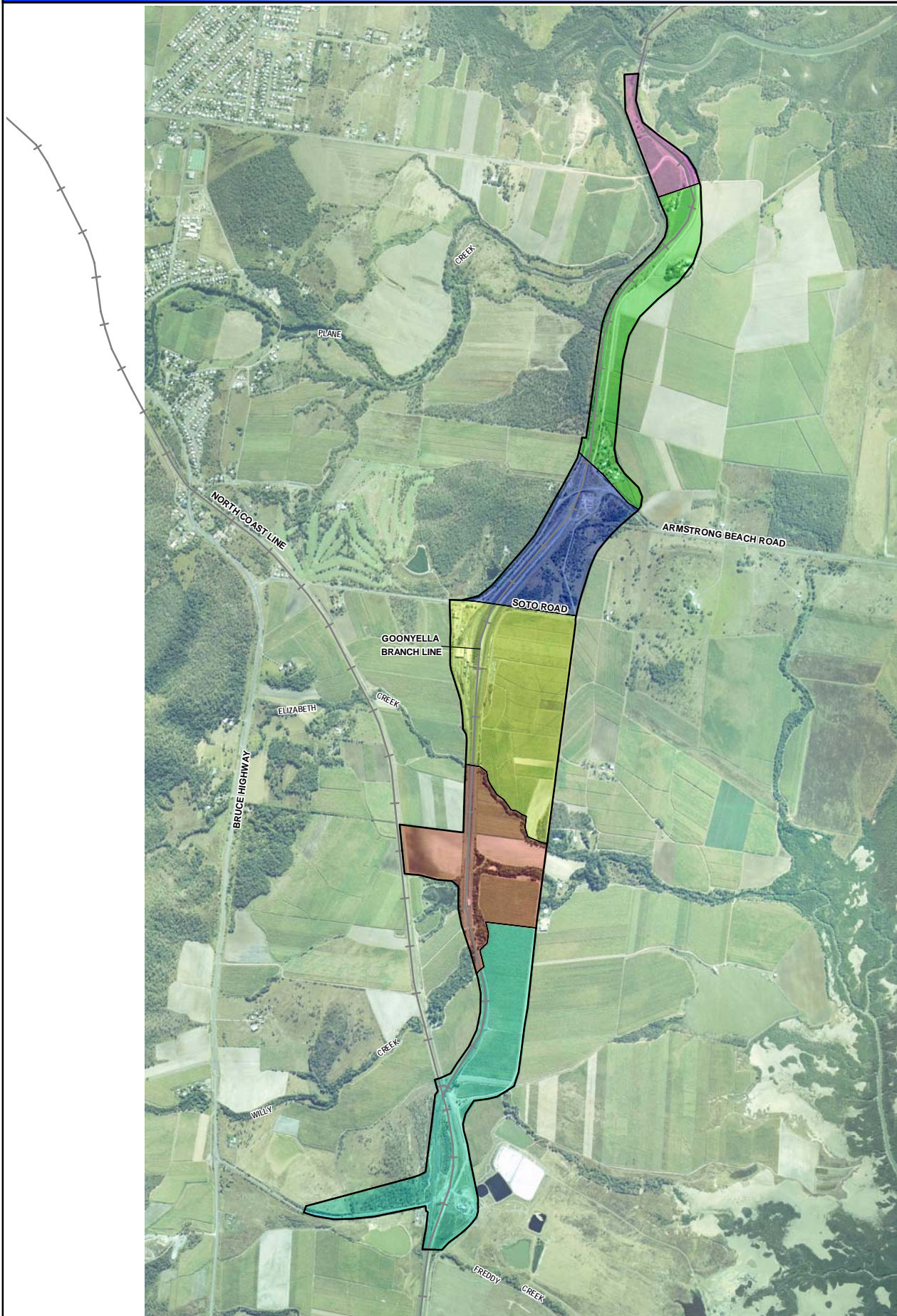
The number in brackets in the tables below indicates the score for each value of each of the contributing factors. The sum total of these scores provides a total VAC value (refer Table 14.1).

For the purposes of the VAC analysis the project area has been broken into six (6) separate precincts (refer Figure 14.3). The precincts are as follows:

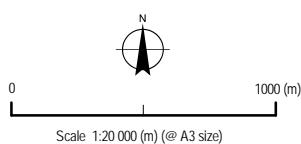
- Plane Creek Precinct
- Northern Precinct
- Armstrong Beach Road to Soto Road Precinct
- Central Precinct
- Elizabeth/Willy Creek Precinct
- South Precinct

#### Existing land use

A VAC value will be higher if the proposed development is similar in form, scale, colour and materials to existing development in the vicinity. The same development may stand out visually, and consequently score a lower VAC, if it were to be placed on a greenfield site surrounded by remnant bushland.



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## LEGEND

Visual Absorption Capacity Precinct

- |  |   |
|--|---|
| <span style="display: inline-block; width: 15px; height: 10px; background-color: pink; border: 1px solid black;"></span> Plane Creek Precinct              | <span style="display: inline-block; width: 15px; height: 10px; background-color: yellow; border: 1px solid black;"></span> Central Precinct |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: green; border: 1px solid black;"></span> Northern Precinct                | <span style="display: inline-block; width: 15px; height: 10px; background-color: red; border: 1px solid black;"></span> Creek Precinct      |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: blue; border: 1px solid black;"></span> Armstrong Beach Road to Soto Road | <span style="display: inline-block; width: 15px; height: 10px; background-color: cyan; border: 1px solid black;"></span> Southern Precinct  |

- |  |              |
|--|--------------|
| <span style="display: inline-block; width: 20px; border-bottom: 2px solid black;"></span>  | Project Area |
| <span style="display: inline-block; width: 0; height: 0; border-left: 5px solid transparent; border-right: 5px solid transparent; border-bottom: 8px solid black;"></span> | Rail         |

PRECINCTS FOR  
VISUAL ABSORPTION  
CAPACITY ANALYSIS

FIGURE 14.3



Table 14.1 outlines the values used to assess the VAC of existing land use within the project area.

**Table 14.1 VAC for existing land use**

High (3)	Moderate (2)	Low (1)
Fully developed industrial, commercial or residential areas	Development or agriculture covers 50% or more of the land surface	Little evidence of industrial, commercial or residential areas

### Vegetation cover and type

VAC values will be highest in parts of the landscape where there are visual contrasts in the vegetation such as occurs when there is a mosaic of forest and grasslands. They are lowest in areas of vegetation that is uniform in colour, form and texture or areas devoid of vegetation such as grassland, which is unable to screen the proposed new element. Table 14.2 outlines the values used to assess the VAC of existing vegetation cover and type within the project area.

**Table 14.2 VAC for vegetation cover and type**

High (3)	Moderate (2)	Low (1)	No Visually Effective Vegetation Cover (0)
Tall (>18m) closed forest (including rainforest) with a good pattern of discrete areas of vegetation across the landscape	Open forest 8-18 m tall with less discrete areas of vegetation across the landscape or dense vegetation in small patches (<10 ha) moderately spaced across the landscape	Open Woodland or widely spaced patches of closed forest or a homogeneous cover of forest across the landscape	Open Grassland, mudflats, bare soil or rock

### Topography

Visual elements are more difficult to hide in areas where the topography is steep as these slopes are visible from further away. Similarly if there are no hills or other topographical features in the landscape a bulky or tall element will be difficult to screen. Elements are easiest to screen in landscapes with a uniform cover of rolling hills providing the element is not placed at the top of one of those hills. Table 14.3 outlines the values used to assess the VAC of existing topography within the project area.

**Table 14.3 VAC for topography**

High (3)	Moderate (2)	Low (1)
Very undulating land with moderate slopes (>25% - 60%)	Moderately undulating land with moderate slopes (>25% - 60%)	Land with very steep slopes (>60%) or very flat land (0% - 25%) or areas which have an uninterrupted view across water

### Location and visibility

An element placed in an area highly visible from a long distance and by a high number of people will be harder to screen than one placed in an area that is difficult to see and is only viewed by a small number of people. Table 14.4 outlines the values used to assess the VAC of existing location and visibility within the project area.

**Table 14.4 VAC for location and visibility**

High (3)	Moderate (2)	Low (1)
An area only visible from road and rail corridors used for industrial traffic or seen by a low number of viewers or only visible to other viewers from a distance of 5 km or more	An area visible from residential areas, local road and rail networks from a distance of 1-5 km by a moderate number of viewers	An area visible from major tourist boat, road and rail corridors, or tourist lookouts and resorts at a distance of 0-1 km by a large number of viewers

### Overall VAC

An area with a high overall VAC score has the greatest capacity to absorb or hide contrasting visual elements placed within it. An area with a low VAC score has little capacity to absorb contrasting visual elements placed within it. Table 14.5 outlines the values used to assess the overall VAC.

**Table 14.5 Overall VAC**

High	Moderate	Low
Landscape has a high ability to absorb alteration and maintain its visual integrity Total value of contributing factors 10-12	Landscape has a moderate ability to absorb alteration and maintain its visual integrity. Total value of contributing factors 7-9	Landscape has a low ability to absorb alteration and maintain its visual integrity Total value of contributing factors 3-6

### Plane Creek Precinct

The Plane Creek Precinct shows little evidence of industrial, commercial or residential areas. The vegetation is mangrove forest to approximately 3-4 m tall. The topography is flat (<25%). The precinct is visible from the North Coast Line.

### Northern Precinct

Within the Northern Precinct agriculture covers 50% or more of the land surface. The vegetation is sugar cane to approximately 3 m tall when fully grown. The topography is flat (<25%). The precinct is visible from residential areas, local road and rail networks from a distance of 1-5 km by a moderate number of viewers.

### Armstrong Beach Road to Soto Road Precinct

The Armstrong Beach Road to Soto Road Precinct shows little evidence of industrial, commercial or residential areas. The vegetation is sugar cane to approximately 3 m tall when fully grown. The topography is flat (<25%). The precinct is visible from residential areas, local road and rail networks from a distance of 1-5 km by a moderate number of viewers.

### Central Precinct

Within the Central Precinct agriculture covers 50% or more of the land surface. The vegetation is sugar cane to approximately 3 m tall when fully grown. The topography is flat (<25%). The precinct is visible from the North Coast Line.



### Elizabeth/Willy Creek Precinct

The Elizabeth/Willy Creek Precinct shows little evidence of industrial, commercial or residential areas. The vegetation is sugar cane to approximately 3 m tall when fully grown. The topography is flat (<25%). The precinct is visible from the North Coast Line.

### South Precinct

The South Precinct shows little evidence of industrial, commercial or residential areas. The vegetation is sugar cane to approximately 3 m tall when fully grown. The topography is moderately undulating land with moderate slopes (>25% - 60%). The precinct is visible from the North Coast Line.

### Overall VAC for the Project Area

The overall VAC scores were calculated from the analysis of the four attributes for each precinct within the project area. Table 14.6 shows the scores given to the various attributes for each of the precincts within the project area to arrive at an overall VAC score.

**Table 14.6 Overall VAC for precincts within the Project Area**

Attribute/ Precinct	Plane Creek	Northern	Armstrong Beach Road to Soto Road	Central	Elizabeth/ Willy Creek	South
Existing Land Use	1	2	2	2	2	1
Vegetation Cover and Type	2	1/0	2	1/0	1	2
Topography	1	1	1	1	1	2
Location and Visibility	2	2	2	1	1	1
<b>Total VAC</b>	<b>6</b>	<b>5-6</b>	<b>7</b>	<b>4-5</b>	<b>5</b>	<b>6</b>

Generally the project area and surrounding areas have a low ability to absorb alteration and maintain its visual integrity. However, the Armstrong Beach Road to Soto Road Precinct has a moderate ability to absorb alteration and maintain its visual integrity. The overall VAC has been mapped in Figure 14.4.

## 14.3 Potential construction impacts

For ease of reference the residential dwellings within the study area have been numbered (refer Figure 14.1).

### 14.3.1 New locomotive maintenance facility

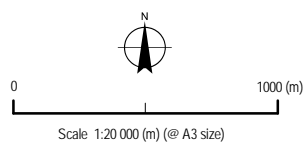
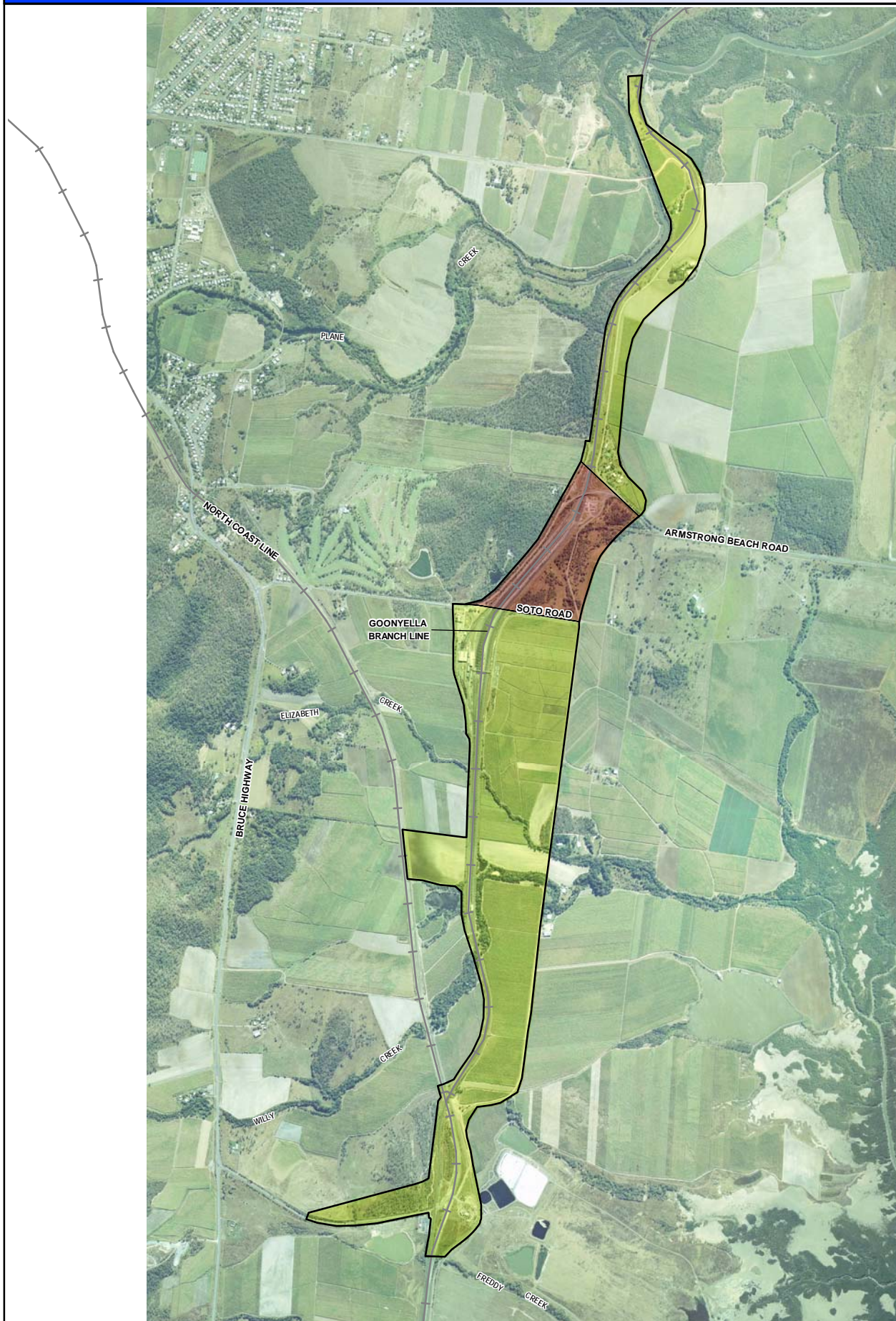
The conversion of the existing shed to a new locomotive maintenance facility and changes to the track layout within the existing layout will not result in any significant changes to the visual amenity of the area.

### 14.3.2 Northern rail yard

The residents of residential dwelling 1 will be partially shielded by the riparian vegetation along Plane Creek and by sugar cane prior to harvest time. The construction works will be visible from residential dwelling 3.

Figure 14.5 illustrates the location of residential dwellings.

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## LEGEND

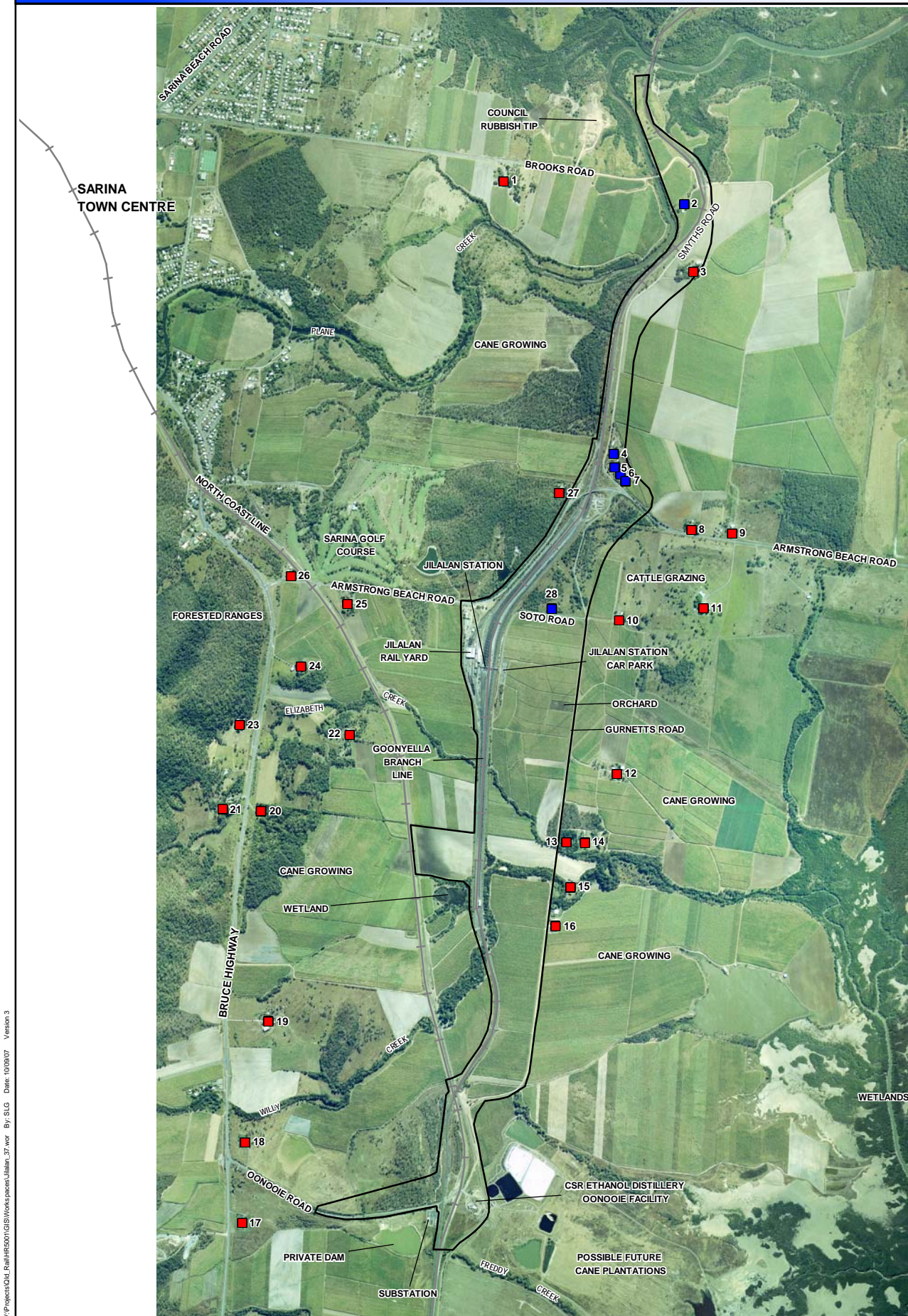
Visual Absorption Capacity  
 Low  
 Moderate

Project Area  
 Rail

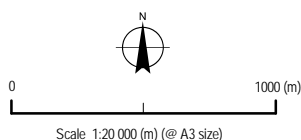
OVERALL VISUAL  
ABSORPTION CAPACITY

FIGURE 14.4





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## LEGEND

- Rail
- Project Area
- Residential Dwelling
- Residential Dwelling to be removed by QR

## VISUAL AND LIGHTING IMPACTS

FIGURE 14.5

### 14.3.3 Bypass tracks, wagon maintenance tracks and road works

Residents of residential dwellings 8 to 16 will have the potential to view the vegetation clearing, earthworks and other construction activity associated with the construction of railway infrastructure and road works. Residents of residential dwellings 17 and 18 will be screened from the construction works by the existing vegetation and topography. The remaining residents to the west of the North Coast Line should not be significantly impacted by the proposed works.

## 14.4 Potential operational impacts

### 14.4.1 New locomotive maintenance facility

The operation of the new locomotive maintenance facility and changes to the track layout within the existing layout will not result in any significant changes to the visual amenity of the area.

### 14.4.2 Northern rail yard

The proposed rail line will be up to 340 m closer to residential dwelling 1 than the existing line where it crosses Brooks Road though the existing trees on the property and along Plane Creek partially screen the additional rail traffic. As a result of operational activities the residents of residential dwelling 3 will largely be shielded from trains travelling along the new alignment by the old railway embankment which is to going to be left in situ. The train traffic that they may view will be further away.

### 14.4.3 Bypass tracks, wagon maintenance tracks and road works

Residents of residential dwellings 8 to 16 will experience a significant change of their view from that of patches of bushland and canefields to that of a major rail yard and associated infrastructure, including additional lighting during the hours of darkness. The additional lighting is likely to disrupt sleep patterns at least till residents habituate to it or unless measures are implemented to mitigate its effects.

Residents of residential dwellings 17 and 18 will be screened from the additional train traffic by the intervening topography and vegetation. The remaining residents to the west of the North Coast Line should not be significantly impacted by the additional lines and rail traffic.

### 14.4.4 Lighting effects on fauna

There has been limited specific research on the impacts of artificial lighting on fauna particularly in Australia. However, a number of potential impacts have been noted which may be relevant to this Project.

Certain species of river-navigating fish species, including salmon, herring and sand lance were found to concentrate under artificial lights exposing them to increased predation (Harder 2002).

In the United States research on a particular species of nocturnal frog has shown that sudden exposure to artificial light reduced the ability of that species to detect and thus consume prey (Buchanan 1993). The project area includes potential frog habitat at Elizabeth and Willy Creeks, the drains along Gurnetts Road between Armstrong Beach Road and Soto Road and between the CSR Sarina Distillery and Freddy Creek. Therefore frogs could be affected by artificial lighting associated with the proposed works in these areas.



Artificial outdoor lighting at night disrupts flight, navigation, vision, migration, dispersal, egg laying, mating, feeding and the ability to hide using camouflage (crypsis) in some species of moths (Frank 1988). It may also disturb circadian rhythms and photoperiodism (the response of an organism to the length of exposure to light in a 24 hour period). Some of these effects expose these moths to increased predation by birds, microbats, geckoes, spiders and other predators. Other species of moths do not appear to be effected. No extinctions of moth species have been documented as a result of these impacts. It may also confer some benefit to local populations of predators because of the increase in available food. The yellow light from low pressure sodium lamps has been shown to reduce the effect on moths and to attract less insect species overall.

A study of two species of *Eptesicus* and one species of *Vespertilio* microbats in Scandinavia found that they occurred in high densities near street lights where they hunted for moths which were attracted by the light (Rydell and Baagoe 1996). It is likely that the Project will have some positive impacts on local populations of nocturnal birds, microbats, geckoes, spiders and other predators but may lead to some reduction in local populations of some moth.

## 14.5 Mitigation measures

### 14.5.1 Design phase

#### Artificial lighting

The following measures will be implemented to minimise the adverse impacts of artificial lighting on fauna:

- Install lights that do not emit rays above the horizontal plane and spill minimal amounts of light above the area to be lit (Autonomous Government of Catalonia 1998).
- Use lighting that only emits sufficient light to achieve the purpose it is required for.
- Use light fittings which cause minimal dispersion of light outside the target area.

The following measures are recommended to minimise the adverse impacts of artificial lighting on local residents:

- Use light fittings which cause minimal dispersion of light outside the target area.
- Provide screening vegetation around the edge of the project area to filter any light spill.

#### Other infrastructure

The following measures will be implemented to minimise the adverse impacts of the design on local residents:

- Locate railway infrastructure as far away from the residential dwellings that are to remain as practical.
- Incorporate areas of soft landscaping (vegetation) into the design to soften and screen the proposed rail infrastructure and rollingstock from passing traffic (road and rail) and local residents.
- Provide a vegetated buffer zone along western side of Gurnetts Road. The design and species selection shall comply with all relevant Main Roads Department guidelines for clear zones, sight distances and clearances to other elements for the speed environment of Gurnetts Road and connecting roads. The following local native species are suggested because of their hardiness and their ability to provide visual screening:
  - Red wattle (*Acacia flavescens*)
  - River oak (*Casuarina cunninghamiana*)
  - Cottonwood (*Hibiscus tiliaceus*)
  - Creek matrush (*Lomandra hystrix*)

- Blush macaranga (*Macaranga tanarius*)
- Red kamala (*Mallotus philippensis*)
- Weeping teatree (*Melaleuca leucadendra*)
- Brown pittosporum (*Pittosporum venulosum*)
- Scrub cherry (*Syzygium australe*) including cultivated forms.

#### 14.5.2 Operational phase

The following measures will be implemented to minimise the adverse impacts of the operation of the rail infrastructure:

- Maintain areas of screening vegetation and include a programme of replanting vegetation that is senescing and no longer providing optimal screening.
- Maintain the rail infrastructure and the project area in a clean and tidy condition.

### 14.6 Conclusion

Whilst the proposed Project will cause significant changes to the existing visual landscape there are ways of mitigating these changes at least for those residents that are closest to the project area. The adverse effects of artificial lighting from the project on fauna and local residents will be minimised by implementing the recommended mitigation measures discussed above.