

Executive Summary

1. Completing the upgrade of the Pacific Highway

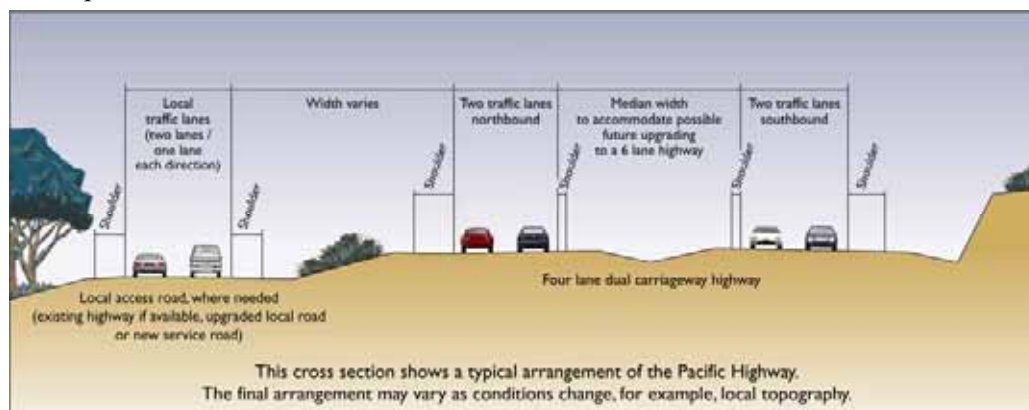
In January 1996 the NSW and Australian governments announced their joint commitment to a 10 year program to upgrade the Pacific Highway between Hexham and the Queensland border. As of September 2006, a total of 233 kilometres are now double-lane divided road. A further 480 kilometres of highway are under construction, have been approved for construction or have had a preferred route identified. This will provide planning certainty for local communities and pave the way for a construction program to complete the upgrade of the Pacific Highway.

The Pacific Highway is an AusLink National Network road. For the 10 years to June 2006, \$2.3 billion has been invested by the NSW and Australian governments. Over the past 10 years, the NSW Government has committed \$1.66 billion and the Australian Government \$660 million.

In December 2005, the NSW and Australian governments announced a jointly funded program of \$960 million for the three years to 2009. In May 2006, the Federal Budget announced an additional \$160 million, matched by NSW, for the period to the end of 2009. This increased the total value of the joint investment for the Pacific Highway Upgrade Program from \$960 million to \$1.3 billion.

Both governments are jointly examining how the entire length of the highway can be upgraded to dual carriageway in the next 10 years.

This report summarises the outcomes of the route options development and preferred route selection phases of the highway upgrade between Wells Crossing and Iluka Road. It describes the options that have been developed, and provides information on the process used and the factors considered in the assessment of the options. It describes the route that has been selected as the preferred route for this section, and the reasons for its selection.



■ **Figure 1: The Pacific Highway Upgrade Program**



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Wells Crossing to Iluka Road

This project involves the proposed upgrade of approximately 80 kilometres of the Pacific Highway on the north coast of NSW. The project commences just north of Wells Crossing, approximately 23 kilometres south of Grafton. It extends to Iluka Road, approximately 56 kilometres north of Grafton, and includes a crossing of the Clarence River. The upgrading of this section of road forms an essential part of the overall upgrade of the highway between Hexham and the Queensland border.

Road safety is a primary objective of the Pacific Highway Upgrade Program. In many locations the alignment of the existing highway within the study area does not meet the design standards established for the Pacific Highway Upgrade Program. The current accident rate between Wells Crossing and Iluka Road is high, compared to the RTA's target for the Pacific Highway. The bus crash in 1989 at Cowper, north of Grafton, was a major incident within the study area, which elevated public concern about the safety of the Pacific Highway.

The upgrade of the Pacific Highway between Wells Crossing and Iluka Road is needed to improve road safety and to reduce travel times. The upgrade will benefit all road users including local and long distance travellers, and freight transport operators.

2. Short and long term planning for the NSW north coast

The north coast is one of the fastest growing areas in NSW. The volume of traffic using the highway varies from area to area. The highway design may change to meet the needs of each area and to achieve an appropriate level of safety and accessibility. Motorway and arterial styles of road are described here.

An arterial style highway

An arterial style highway is suitable for areas where there are fewer vehicles turning onto the upgraded highway. It includes four lanes (two in each direction) in separated carriageways. The speed limit generally will be posted at 100km/h but may be increased to 110km/h where it is safe to do so.

Access to the highway is by:

- Surface level (or at-grade) intersections with local roads.
- Some grade-separated interchanges may be warranted.
- Left in and left out turning movements to and from local roads and properties.
- U-turn facilities for vehicles to turn around at appropriate, safe locations.

A motorway style roadway

The RTA is planning for the long term in all cases. However in some areas the long term motorway standard is required now. This is because there are more people living nearby, requiring frequent and safe access to the highway. Providing a motorway style highway provides motorists with a choice of:

- Being able to use a local traffic route for slower speeds (80km/h) and local access.
- Using the motorway for longer distance travel at higher speeds (110km/h).

This motorway will have four lanes (two in each direction) in separate carriageways. The speed limit will be posted at 110km/h. Access to the motorway will be controlled by:

- Interchanges with ramps to access the highway for frequently used areas.
- Local roads to cross above or below the highway.
- A reduced number of left in/left out arrangements for local roads and properties, if these cannot be eliminated entirely.

The preferred route selected for the highway upgrade between Wells Crossing and Harwood Bridge provides the opportunity to complete the upgrading of the highway on a staged basis. Between Harwood and Iluka Road upgrading to an arterial style highway may be followed by a subsequent upgrade to a motorway style roadway. The preferred route could be developed, in some sections, to be built to an arterial standard road as part of a staged approach to the overall construction of the upgrade to a motorway standard. The highway between Wells Crossing and Harwood Bridge is proposed to be upgraded, in sections, to a motorway standard road.

Preliminary traffic investigations indicate that grade separated interchanges would be required where the upgrade deviates from the existing highway at Glenugie, at Tyndale and south of Harwood Bridge (Yamba Road). North of Harwood there would be a grade separated interchange at Iluka Road. The final location of the interchanges would be determined as part of detailed investigations to be undertaken during the highway design phase.

3. Route option development and preferred route selection process

The route option development process involved the following steps:

- Review of existing data.
- Site visits – field and aerial inspections of the study area.
- Preliminary traffic, hydrological, ecological, heritage, geotechnical and other investigations.
- A variety of community involvement activities to identify community interests, issues and concerns.

- Opportunities and constraints workshops.
- Options workshop to consider possible options.
- Identification and refinement of the feasible route options.
- Preparation of the route options development report.

The route options development process concluded with the public display of the route options and the release of the *Route Options Development Report*, in October 2005. The public display of the route options provided the community with an opportunity to make review and make comment on the route options.

The public display also marked the beginning of the preferred route selection process.

The selection of the preferred route involved the following steps:

- Public display of the route options and receipt of submissions from the community.
- Review of submissions from the community.
- The value management workshop.
- Additional investigations resulting from the community submissions and the value management workshop.
- A route selection workshop which considered the outputs of the value management workshop, the community submissions and the results of additional investigations carried out.
- Consideration of adjustments to alignments to further minimise property, business, environmental and other impacts; and
- Preparation of the Preferred Route Report.

4. The study area characteristics

Overview of the local area

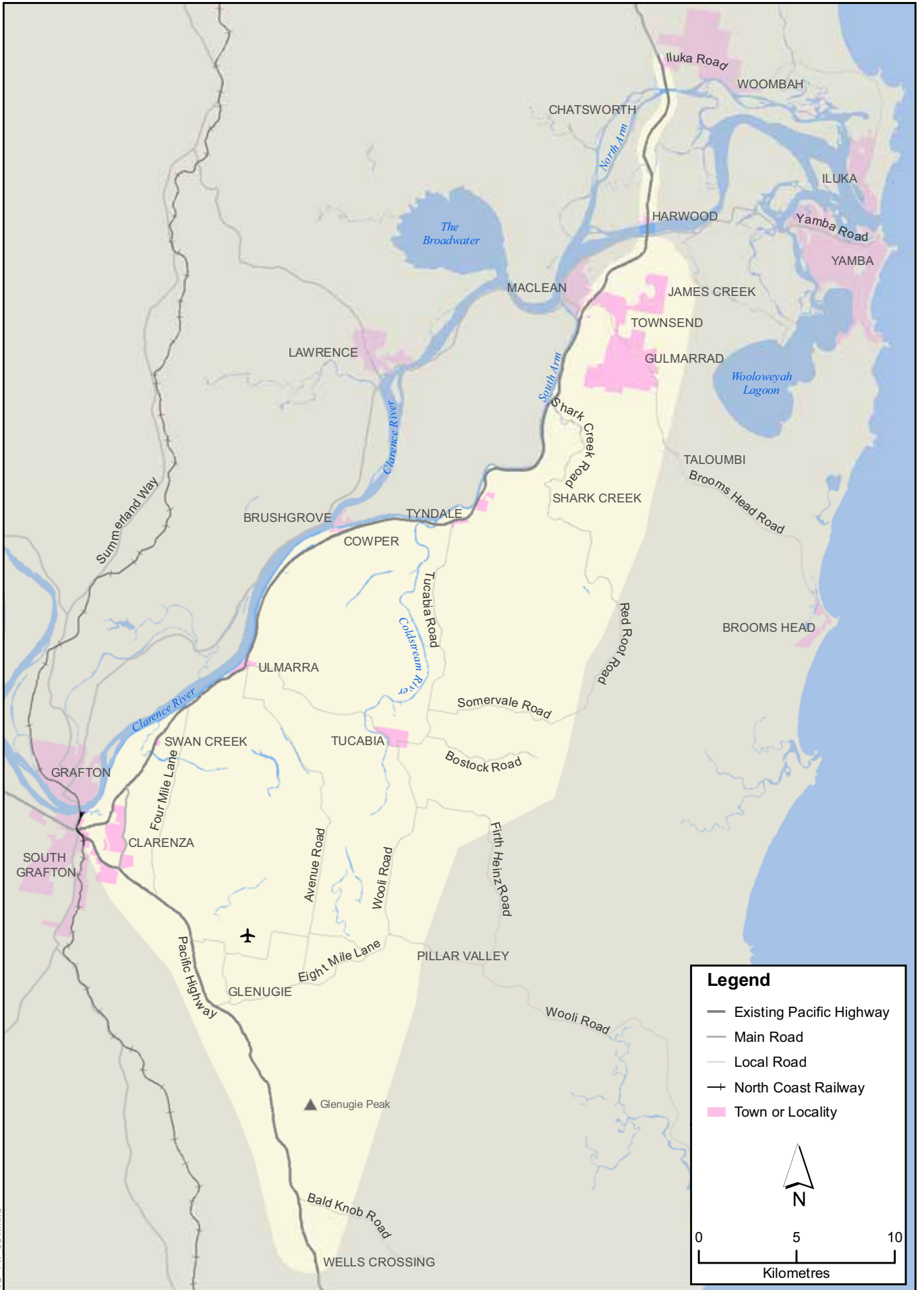
The study area is generally triangular in shape and covers an area of approximately 64,500 hectares, as shown in **Figure 2**.

It extends from Wells Crossing in the south to Iluka Road in the north, and from South Grafton in the west to Pillar Valley and Taloumbi in the east. South of Harwood Bridge the existing Pacific Highway alignment forms the general western boundary. The eastern boundary is largely defined by topographic and ecological constraints. The Clarence River and South Arm of the Clarence River are major constraints to the development of route options. North of the river the study area is approximately 800 metres wide and follows the corridor of the existing highway.

The existing Pacific Highway is the main route for residents and visitors to reach major local destinations including Grafton. The Pacific Highway connects and serves the major centres in the Clarence Valley of Grafton, Maclean, Yamba and Iluka and other smaller villages in between. Grafton is the administrative and economic centre with a population close to 17,000 (in 2001). Grafton is also at the crossroads of the Summerland Way, Gwydir Highway and the Pacific Highway and is an important rail and freight centre serving the region. Access to Grafton via the existing highway, or an upgraded route, is considered by the local community to be a very important issue. Local/regional traffic and through traffic generate demand for a range of services and facilities including petrol, meals, accommodation and repairs. Many businesses along the highway rely on passing trade.

Existing land use in the study area is predominantly rural. The range of productive uses reflects the diverse topography, geology and soils, and ecology of the area. Farming in the south-west and east of the study area has traditionally centred on timber felling, broad scale cropping (such as soya beans), dairy and grazing activities. Diversification into niche production such as orchards, organic farming and small scale crops is occurring and has potential for growth. North of about Cowper, cane farming predominates in the low lying areas. Harwood mill is the main sugar mill in the area and all cane from the district is processed there.

Many of the issues for the project that are important to the community relate to land use and settlement patterns and potential impacts on livelihoods and lifestyle. The western part of the study area is more densely settled than the eastern area. Settlement has historically been concentrated in towns and villages along the Pacific Highway and Clarence River and many residents have strong family ties to these rural areas over generations. In more recent years, population growth has occurred in rural residential areas and rural small holdings, resulting in growth in semi-urban areas at the fringes of larger towns, and other more scattered rural communities.



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Wells Crossing to Iluka Road
Upgrading the Pacific Highway

Figure 2: The study area

The eastern part of the study area remains sparsely populated, but those who do live there value its isolation and bushland character.

State forests occupy large areas within the south and east of the study area and include Glenugie State Forest, Bom Bom State Forest, Pine Brush State Forest and a small area of Newfoundland State Forest.

Three areas of land reserved under the *National Parks and Wildlife Act, 1974* are located totally or partly within the study area. They are Yuraygir State Conservation Area near Wells Crossing, Yaegl Nature Reserve near Maclean, and Mororo Creek Nature Reserve to the west of the Pacific Highway in the vicinity of the Iluka Road intersection.

Traffic and transport issues

The Wells Crossing to Iluka Road section of the Pacific Highway has one of the lowest traffic volumes of any section of the highway, with AADT flows between 7500 to 8000 vehicles per day. While current volumes are relatively low, trends in growth of long distance traffic are similar to other sections of the highway with higher volumes.

Approximately 30-35 per cent of the total volume of traffic on the Pacific Highway is through traffic (traffic that starts and finishes its journey outside the study area on the Pacific Highway). Local traffic (traffic that starts and ends its journey inside the study area) makes up about 40-45 per cent of total traffic on the highway. Regional traffic (traffic that either starts or ends its journey in the study area including Gwydir Highway) makes up the remaining 25-30 per cent. This demonstrates the importance of the existing highway as a route to reach local destinations either within or near the study area.

The mix of heavy vehicles and light vehicles, and the proportion of through, local and regional traffic, also change depending on the time of day. Approximately 95 per cent of light vehicles travel on the highway during daylight hours. Approximately 50 per cent of heavy vehicles travel on the highway at night. This means that the proportion of heavy vehicles to light vehicles on the road at the night is much greater than during the day.

Ongoing improvements to other sections of the highway have reduced travel times and increased heavy vehicle growth on the Pacific Highway. Heavy vehicles are a significant component of the overall traffic profile of the highway (approximately 20 per cent). Freight growth is projected to increase since it is related to economic development, particularly growth in consumer demand. In addition to long distance heavy vehicles that use the highway as a route between capital cities, increased demand for heavy vehicle movements to and from local destinations will be driven by population growth along the north coast. The Pacific Highway is therefore important for freight movement at an interstate level and to service population centres along the highway.

Continued growth in all traffic (local and long distance) is projected in the study area over the next 20-40 years. The AADT for all vehicles is forecast to nearly double over the period from 2004 to 2041. Numbers of freight vehicles are forecast to more than double in number to over 3500 trucks per average day, which would represent 25 per cent of the daily traffic volumes in 2041, south of Grafton.

The highway currently passes through numerous towns, villages and other settlements within the study area. Conflicts between highway traffic (in particular heavy vehicles) and the amenity of these settlements are expected to increase with the growth in vehicle volumes and the number of heavy vehicles.

There is a need to provide a higher and consistent standard of road through this area to better serve existing and future road users.

Aboriginal heritage

The study area falls within the boundaries of the Grafton-Ngerrie and Yaegl Local Aboriginal Land Councils. Also, several tribal and elders groups have an interest in the study area. Recorded sites, areas of cultural significance and areas with high archaeological potential have been considered in the development and assessment of the route options and the preferred route.

From the findings of previous archaeological studies, consultations with Aboriginal groups and general knowledge of Aboriginal settlement patterns on the north coast, a model for the likely occurrence of indigenous heritage sites was determined. Field surveys identified 17 sites within the study area, in addition to the nine sites already recorded. A further four sites are known in the study area from previous studies. The majority of sites are recorded from the lower lying floodplain sections of the study area, although some sites have also been identified in the foothills and hill slopes. Despite the relatively low number of records for the study area, the study area is generally considered to have high archaeological potential. There are several areas and features, identified through consultation with local Aboriginal groups, that are known to have important cultural values to the Aboriginal people of the area.

Non-indigenous heritage

The area has a long history of European settlement, with the first official exploration by settlers was in 1839. Settlement was originally linked to timber getting, with later expansion into agriculture and mining. Settlement along the river reflects its crucial role as the main link to other centres and for people and cargo.

There are 14 heritage listed sites within or immediately adjacent to the study area. A further 16 historical sites, with potential heritage significance, were identified during the study. These sites have been considered in the development and assessment of the route options and the preferred route.

Visual amenity

The topography of the study area is dominated by the extensive floodplain of the Clarence River. The study area is located primarily on the eastern side of the flood plain which typically varies in width from 1km up to 10km. The flatter areas of the Clarence floodplain permit extensive views of the vastness of the northern river floodplains.

The eastern extent of the study area is delineated by the Coast, Shark Creek, and Somervale Ranges and Pillar Ridge. The hills for the greater part of the study area define the visual edge of the floodplain and separate it from the coast. Within these steeper areas there are a number of visual features or high points of which Glenugie Peak (also known as Mount Elaine) at a height of 316m is the most dominant.

There is a broad vegetation pattern in the study area that reflects the topography and the soils of the area. The floodplains have for the greater part been cleared for agriculture, while the steeper terrain of the hills is still mostly covered in forest.

There is a strong presence of water within the landscape of the study area and a number of differing views of water can be gained. The rivers, creeks, dams, and wetlands all have distinct characters and presence that influence our visual response. Within the study area water is both a permanent and ephemeral element within the landscape.

Noise

The study area has a large number of residences both in towns and villages, and throughout the rural areas. The majority of residences are located in Grafton and districts, Glenugie, Ulmarra, Tyndale, Tucabia, Pillar Valley, Townsend, Gulmarrad and James Creek. A large number of dwellings are located along the existing Pacific Highway.

Residential development adjacent to the existing Pacific Highway is subject to the highest levels of road traffic noise in the study area. Residents along the highway have experienced increases in noise as overall traffic volumes and numbers of heavy vehicles have increased. Other areas, particularly in the east of the study area, are subject to only low volumes of traffic on local roads, and the existing noise environment is typical of relatively isolated rural location.

Terrestrial and aquatic ecology

Much of the floodplain area of the Clarence River would have comprised lowland rainforest, swamp forests, wetlands and wet floodplain eucalypt forests prior to European settlement. The vast majority of the vegetation was cleared from the floodplain due to clearing from early timber industries, the presence of fertile soil types suitable for agriculture, and proximity to the river and coast for transport and settlement. As a result of past clearing and modification, several vegetation communities of the NSW North Coast Bioregion have been scheduled as endangered ecological communities under the *Threatened Species Conservation Act, 1995*.

Within the study area there are numerous small and isolated remnant fragments of these ecological communities scattered throughout the floodplain. Additionally, there are some large intact and undisturbed remnant stands of high ecological importance. Generally, the condition of Endangered Ecological Communities in the study area is moderate to poor due to influences of other land use such as grazing and land clearing, or changes to hydrological regimes. However, some areas of relatively intact, high quality vegetation communities exist, particularly in the eastern parts of the study area.

Nine ecologically significant wetlands listed under SEPP 14 occur within the study area. These wetlands are primarily located in the central and eastern parts of the study area near Pillar Valley, Tucabia and Shark Creek.

The area is rich in ecological resources, with approximately 100 threatened fauna species known from the study area and immediate surrounds. This diversity and quality of fauna habitats within the study area is a key consideration for the project as is the importance of links to other areas of high value habitat such as the Yuraygir National Park. In a broader regional perspective, the containment of the study area by the Clarence River and the presence of Yuraygir National Park contribute to making the Clarence Valley and adjacent coastal areas a sink for high biodiversity, particularly fauna.

All parts of the study area provide some habitat value; however, the forested eastern parts of the study area and the large freshwater wetlands through the central parts of the study area are of greatest importance. The presence of large areas of contiguous and high quality remnant bushland, and linkages from bushland to wetland and floodplain habitats, are very important to the native fauna of the area and are significant at a regional level.

Several wildlife corridor linkages are located within the study area. These are important in providing access to the diverse habitats of the floodplain and ranges, and assist in supporting a high diversity of fauna species. Main corridors link the Coast Range to Shark Creek Range, and the Coast Range over the Pillar Ridge and across to Crows Nest Swamp. Many smaller local wildlife corridors and links also occur throughout the study area.

The waterways of the lower Clarence region are variable in terms of environmental condition and form. While waterways in the study area exhibit relatively good aquatic habitat values, key issues include predation or competition by exotic species such as *Gambusia* (Mosquito Fish), poor quality riparian zones impacted by grazing and clearing, and degradation of freshwater and estuarine wetland habitats.

Coastal Emu endangered population

The coastal Emu population in the NSW North Coast Bioregion and Port Stephens Local Government Area has been listed as endangered on the NSW *Threatened Species Conservation*

Act, 1995. The largest remaining sub-population of coastal Emu occurs within and near the study area. Survival of this sub-population is probably due to the historic conservation of Yuraygir National Park, the largest extent of undeveloped coastline in NSW, adjacent to large expanses of agricultural land. The presence of breeding pairs and chicks is an indication that the size of the Emu population appears to be sufficient for maintaining long-term viability. The long term survival of the population is, however, dependent on controlling habitat loss or degradation and other threats such as road kill, development and predation.

Access to a diversity of habitats is considered critical to the survival of this population, which is known to travel between the forested areas of the coast range and the open grassland and wetlands of the floodplain.

Topography, geology and soils

The study area is located in a geological basin underlain by sedimentary rocks, mainly sandstones of varying hardness. Two key sandstone formations occur as a prominent chain of hills in the centre of the study area (Shark Creek Range, Pillar Range and Bondi Hill), and further east within the Coast Range. Glenugie Peak, a volcanic plug, is a significant geological feature in the south of the study area.

The western and northern sections of the study area are dominated by the flat to undulating Clarence Valley floodplain including Coldstream Basin and Shark Creek Basin. Soft soils and potentially acidic soils occur in low lying areas and present substantial constraints (mainly construction cost and time) due to impact on excavation, foundation stability and embankment settlements.

The south and east of the study area are characterised by low but in some cases steep ranges, generally with ridges running in a north-south direction. These are the most favourable geotechnical conditions for highway construction.

There are several areas where quarrying operations are concentrated within the study area. These are generally in the more elevated topography, although there is some evidence of quarrying on the floodplain, possibly for sand. There are no known mining operations in the study area.

Flooding and drainage

The Clarence is the largest river system on the east coast of NSW, and the size of the catchment and floodplain present significant risks for the development of an upgraded highway. The Clarence River floodplain is subject to frequent and extensive flood inundation. The project study area encompasses much of the extensive floodplains of the Clarence River and its tributaries including Swan Creek, Glenugie Creek, Shark Creek, and the Coldstream River.

The numerous sub-catchments within the Clarence River system vary in size and flooding characteristics. This variability, along with the influence of the ocean (through storm surges) means that the study area experiences different types of flooding. Inundation as a result of flows from upstream in the catchment can combine with storm surges to create major floods. In addition, the contribution of smaller catchments to local flooding is important, particularly for smaller floods. Flow velocities and depths can be high in some of the tributaries of the Clarence River such as the Coldstream River and Shark Creek. In the upper catchment areas, away from the Clarence River and its main tributaries, the issues are related to the rapid rise of fast flowing waters along creek lines, rather than longer flood events. Typically, storms in these areas can cause waters to rise by metres within hours, resulting in flows strong enough to damage infrastructure and property and cut local access.

There are two very important issues in relation to flooding for the project. The first is the potential for a new road in the floodplain to result in changes to flooding behaviour and potentially increase flooding risks to towns and properties. The second issue relates to flood risks associated with the functionality of the upgraded highway, such as structural stability of the road, traffic delays and damage to the road pavement.

5. Route options

Development of route options

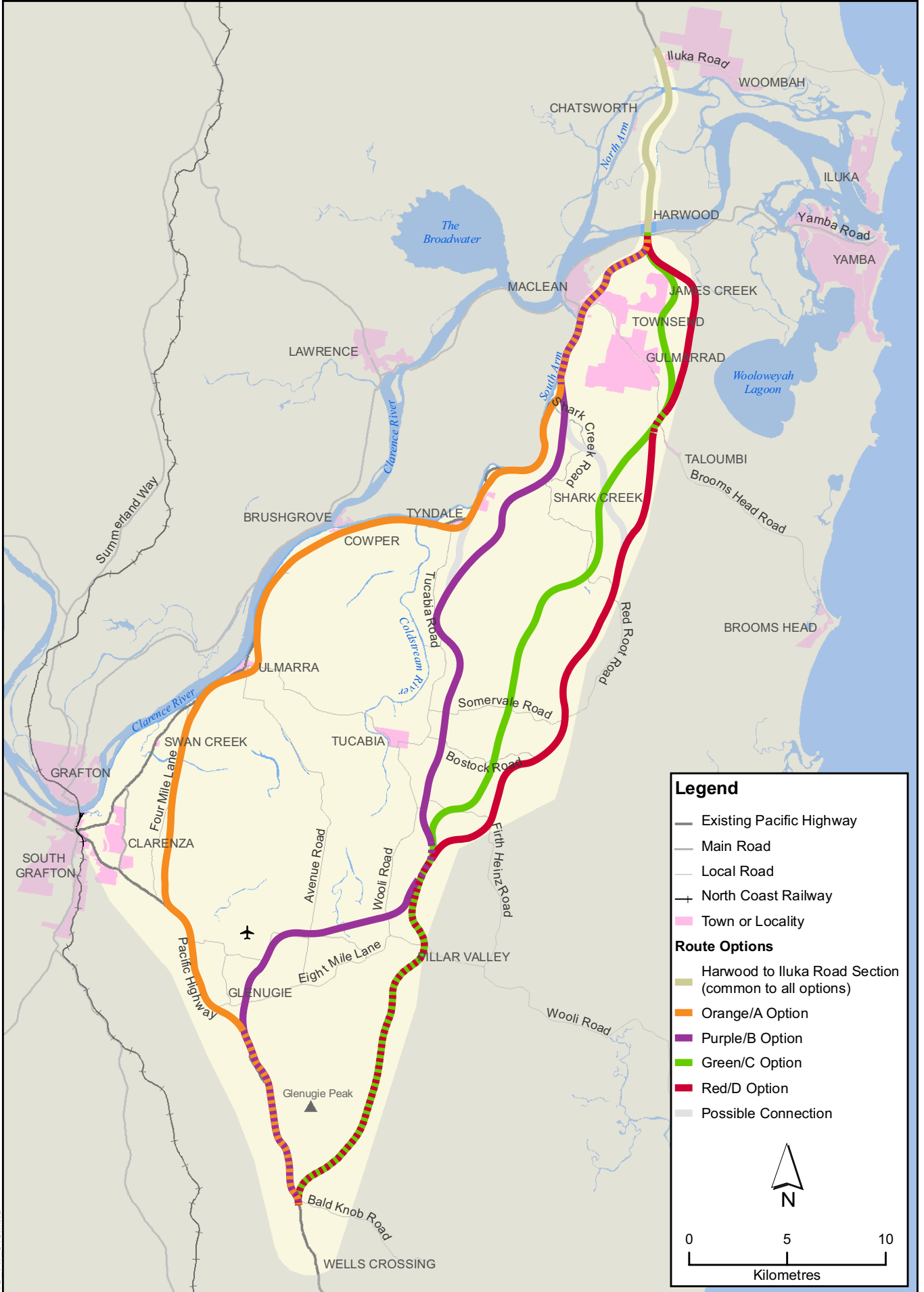
Four options and two possible connections were developed for the section between Wells Crossing and Harwood Bridge. One corridor was developed initially for the section between Harwood and Iluka Road and consideration was also given to two additional options developed following the route options display. The options are shown in **Figure 3** and **Figure 4**. A summary of these options, as assessed in the *Route Options Development Report* (RTA, 2005), is provided in **Table 1**. The assessment of the route options has been refined since the release of the *Route Options Development Report*, and the impacts of the route options as reported in some working papers may differ from that reported in **Table 1**. The working papers should be referred to for the most up to date assessment of the route options.

■ **Table 1: Summary of route options**

Option	Description
Options between Wells Crossing and Harwood Bridge	
Orange/A	<ul style="list-style-type: none"> ■ The most westerly of the options considered. ■ Largely follows the corridor of the existing Pacific Highway. Would deviate from highway between Bom Bom State Forest and Swan Creek. ■ Includes a bypass of Ulmarra and a deviation at Tyndale. ■ 69 kilometres long and crosses 38 kilometres of flood plain. ■ Interchanges at Wells Crossing, Four Mile Lane, Swan Creek and Yamba Road ■ Presents the greatest risk in relation to flooding of the Swan Creek area and potential impacts on Grafton. ■ Would also result in the highest number of houses being (approximately 175). ■ Impacts on approximately 465 ha of prime agricultural land. ■ Presents the least risk from an ecological perspective. ■ Highest potential for impacts on items of non-indigenous heritage. ■ Impacts would be associated with intensification of transport infrastructure and activity within the existing road corridor. ■ Upgrading in the vicinity of the existing road corridor would provide the most advantages which contribute to achieving the safety and transport efficiency objectives of the Pacific Highway Upgrade Program. ■ This option would achieve the most significant decrease in the overall number of accidents on the road network, as a result of the higher volume of traffic that would be attracted and highest overall travel time saving for all vehicles. ■ Offers opportunities for staged development.
Purple/B	<ul style="list-style-type: none"> ■ The most central of options considered. ■ Uses approximately 19 kilometres of the existing highway corridor between Wells Crossing and Glenugie and north of Shark Creek to Harwood Bridge. ■ 66 kilometres long and crosses 13 kilometres of floodplain. ■ Interchanges at Glenugie and Yamba Road. ■ Would impact on approximately 90 houses. ■ Flooding issues associated with Shark Creek and north, although presents less risk than the Orange/A option. ■ Impacts on approximately 265 ha of prime agricultural land. ■ Impacts on areas of high habitat quality, Endangered Ecological Communities and wetlands. ■ Some impact on items of Aboriginal heritage. ■ Potential for staged construction. ■ Would provide some advantages in terms of achieving the safety and transport efficiency objectives of the Pacific Highway Upgrade Program.

Option	Description
Green/C	<ul style="list-style-type: none"> ■ Generally traverses the eastern side of the study area. ■ Does not utilise the existing highway, Deviates from the existing highway between Bald Knob Road and Harwood Bridge. ■ 60 kilometres long and crosses five kilometres of floodplain. ■ Interchanges at Bald Knob Road and Yamba Road. ■ Does not affect Coldstream flood basin. Issues associated with high velocity local catchment flooding. ■ Travels through Pine Brush State Forest and Shark Creek SEPP 14 wetland. ■ Would result in a small number of houses being affected (approximately five). ■ Would have high impacts on residential amenity. ■ Would have high impacts on rural residential amenity. ■ Would impact on approximately 115 ha of prime agricultural land. ■ Would result in very high ecological impacts. ■ Impacts on an item of non-indigenous heritage. ■ Impacts on items of Aboriginal heritage. ■ Would achieve significant travel time and transport cost savings for through traffic. ■ Limited potential for staged construction.
Red/D	<ul style="list-style-type: none"> ■ The most easterly of options considered. ■ Does not utilise the existing highway. Deviates from the existing highway between Bald Knob Road and Harwood Bridge, ■ 60 kilometres long and crosses nine kilometres of floodplain. ■ Interchanges at Bald Knob Road and Yamba Road, ■ Would result in a small number of houses being affected (approximately 10). ■ Would have high impacts on rural residential amenity. ■ Would impact on approximately 220 ha of prime agricultural land. ■ Does not affect Coldstream flood basin. Issues associated with high velocity local catchment flooding and the floodplain associated with Wooloweyah Lagoon. ■ Would result in very high ecological impacts. ■ Impacts on an item of non-indigenous heritage. ■ Impacts on items of Aboriginal heritage. ■ Would achieve significant travel time and transport cost savings for through traffic. ■ Limited potential for staged construction.

Possible connections	
Connection south of Tyndale (between the Purple/B and Orange/A options).	<ul style="list-style-type: none"> ■ The connection is approximately five kilometres long, has a generally north-south alignment and passes to the east of the village of Tyndale. ■ Travels along a long length with very soft soils. ■ Low risk in relation to flooding. ■ Low risk in relation to ecological impacts.
Connection from Shark Creek Road to Red Root Road (between the Green/C or Red/D options and the Purple/B option).	<ul style="list-style-type: none"> ■ Up to 9.5 kilometres long, depending on whether it connects from the Red/D or Green/C options. ■ Allows the easterly options to connect with the existing highway corridor west of Gulmarrad and Townsend. ■ Traverses the Shark Creek Range before crossing the floodplain around Shark Creek closer to the existing highway. ■ Western section of the connection would require high embankments to achieve flood immunity. ■ Moderate ecological impacts and in close proximity to a SEPP 14 wetland.
Options between Harwood and Iluka Road	
Option 1, along existing road corridor	<ul style="list-style-type: none"> ■ 10 kilometres, across the floodplain. ■ Provides good connections south of the Harwood Bridge ■ Potential for staged construction. ■ Low ecological impacts. ■ Would impact on a higher number of houses located close to the existing highway (approximately nine houses). ■ High impact on prime agricultural land, although impacts would be at the edges of farms. ■ Impacts on Harwood Conservation Area. ■ High impact on visual amenity in relation to Harwood Bridge. ■ Would provide flexibility for staging with use of existing highway.
Option 2, to the east of Harwood village	<ul style="list-style-type: none"> ■ 10.5 kilometres, across the floodplain. ■ Less community severance than option 1 as it would be to the east of the mill and the village. ■ Would impact on least number of houses (approximately six houses). ■ Would have high impacts on cane farms through creation of new corridor, north and south of the river. ■ Highest ecological impacts. ■ Bridge east of the mill would impact on maritime uses of the river by restricting the turning circle.
Option 3, to the west of Harwood village	<ul style="list-style-type: none"> ■ 10.5 kilometres, across the floodplain. ■ Less community severance than option 1 as it would be to the west of the mill and the village. ■ Would impact on the highest number of houses and hence has higher community impact. ■ Would impact on most houses (approximately 11 houses). ■ Would have high impacts on cane farms through creation of new corridor, north and south of the river. ■ Moderate ecological impacts.



Legend

- Existing Pacific Highway
- Main Road
- Local Road
- + North Coast Railway
- Town or Locality

Route Options

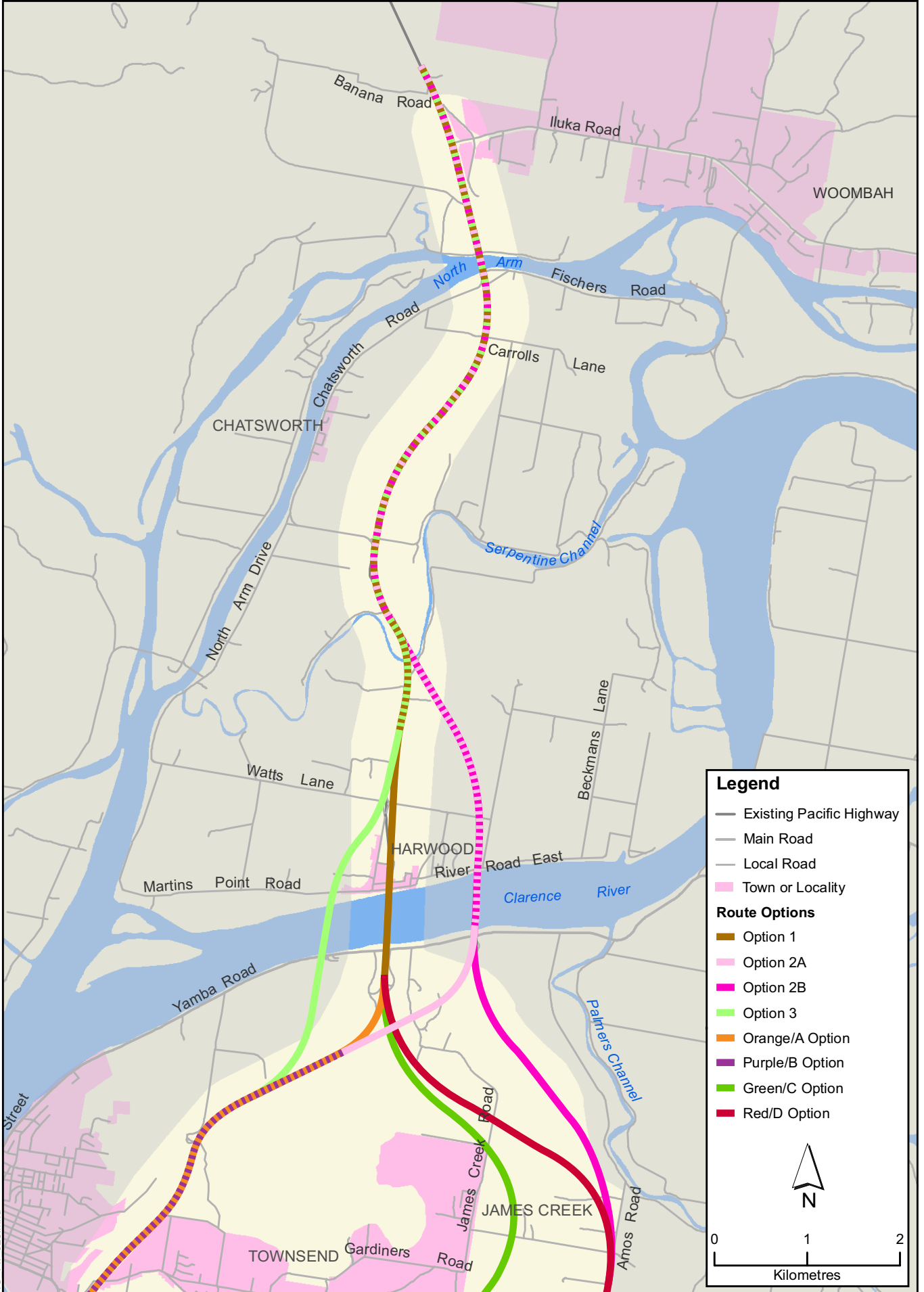
- Harwood to Iluka Road Section (common to all options)
- Orange/A Option
- Purple/B Option
- Green/C Option
- Red/D Option
- Possible Connection

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Wells Crossing to Iluka Road
Upgrading the Pacific Highway

Figure 3: Route options between Wells Crossing and Harwood Bridge



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Wells Crossing to Iluka Road
Upgrading the Pacific Highway

Figure 4: Route options between Harwood Bridge and Iluka Road

6. Outcomes of the public display

The Wells Crossing to Iluka Road project route options were on public display from 21 October 2005 to 2 December 2005. A number of consultation activities took place during the display period to publicise the display, inform the community and other stakeholders about the options under consideration and invite feedback. The public display of route options was one input into the process for determining the preferred option for the project.

A number of issues, comments and concerns were raised. The critical issues, considered most important by the community when deciding the preferred route were:

- Safety conditions on any new section of highway as well as on the existing highway.
- Flood risk, including the depth or duration of flooding, inundation of new areas or otherwise adversely change current flooding patterns.
- Habitat and environmental conditions for threatened species including the endangered coastal Emu population.
- Acquisition of houses, including the property acquisition process and concern about compensation for both directly affected properties and those indirectly affected.
- Amenity of the places where people have chosen to live, including increased noise.
- Highly productive agricultural areas.
- Potential impacts on businesses and economic development in the area, including existing businesses on the existing highway and the potential for emerging businesses including ecotourism.
- Access from the new road to areas within the study area and maintaining access for local roads and for properties and houses.
- The location and height of a new bridge, or bridges, over the Clarence River.
- The potential adverse impacts of an upgraded highway upgrade through the village of Harwood.
- Sensitive aboriginal heritage and sites.
- Timing of construction.

The submissions from the public contributed to the assessment criteria and performance measures that have provided the framework to assess the options and establish the need for further investigations and potential route refinements.

7. Value management workshop – assessment of route options between Wells Crossing and Harwood Bridge

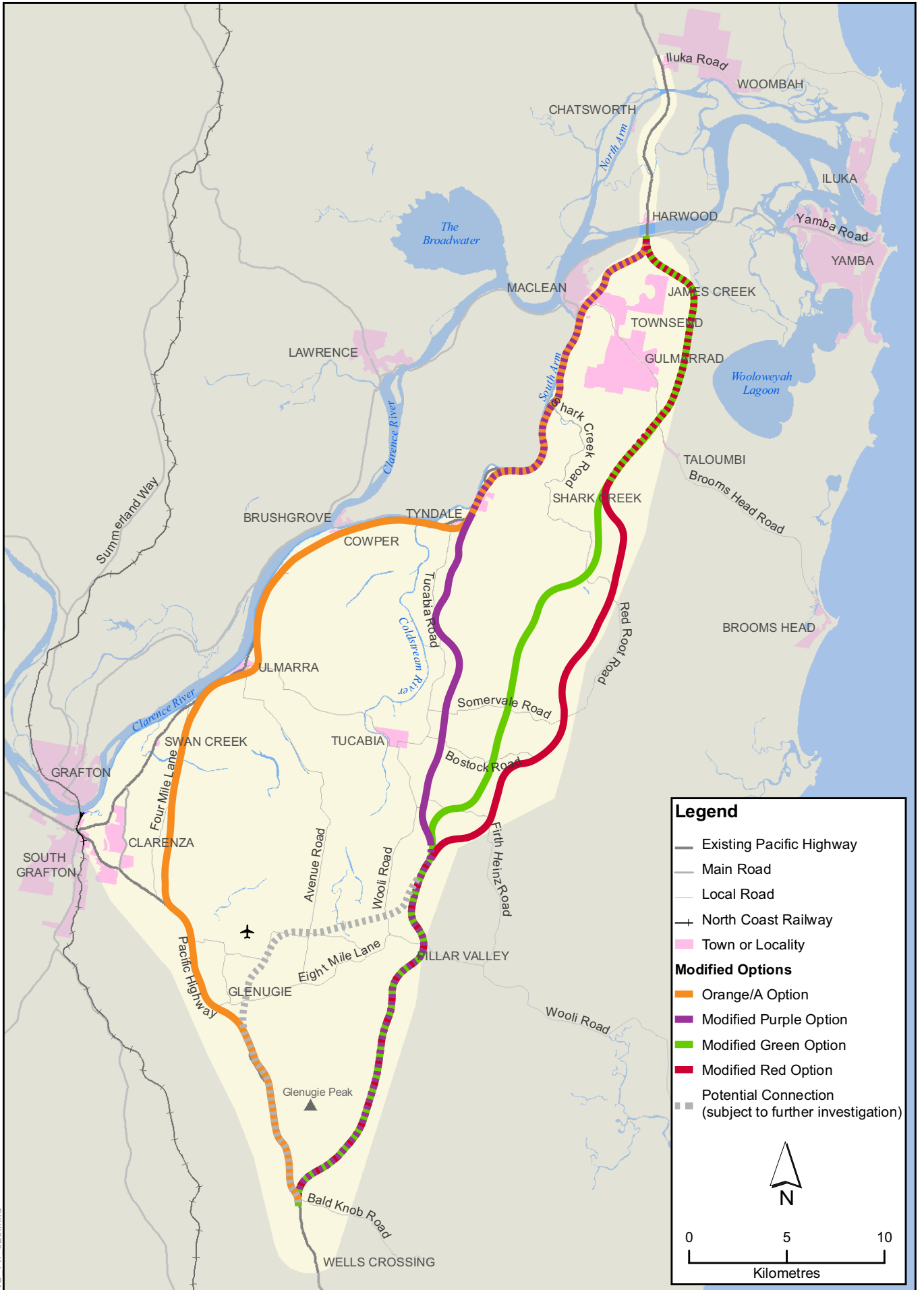
A three-day Value Management Workshop for the section between Wells Crossing and Harwood Bridge was held in March 2006, following the public display of the route options. A Value Management Workshop was seen as an appropriate tool to bring together a wide range of stakeholder interests and expertise to review the investigations undertaken to date, and on the balance of issues, to assess the options against agreed assessment criteria and recommend a preferred direction to progress the project.

The Value Management Workshop did not provide clear direction to the RTA in terms of a recommendation on a preferred route. It did, however, provide a clear direction for further investigation to progress the project.

During the workshop the participants considered the options, connections and combinations of these. The group developed “Modified” Purple, Green and Red options that were combinations of sections of route options, along with the Orange/A option, which was not able to be modified. The remaining sections were not carried forward for consideration. These are shown on **Figure 5**.

The general conclusions from the Value Management Workshop were as follows:

- A Modified Green option performs overall and on balance better than the other options (if strategic cost estimates are included in the comparison). The Modified Green option ranked first from a social and local economic perspective, equal first from a functional perspective and third from a natural environment perspective.
- The Modified Green option included at its south the common Green/Red alignment rather than the alignment of the Purple/B option. There was no consensus reached in the workshop as to which offered the better line combination at the southern end. It was agreed by the participants that further investigation would be undertaken by the project team to resolve the issues raised before a recommendation as to the preferred line in this area could be reached.
- There are a number of issues associated with possible alignments at the southern end. The Red/Green line between Wells Crossing and Pillar Valley has social and environmental impacts, whereas the Purple line from Glenugie to Pillar Valley has a number of social and local economic benefits, but impacts on the ecology of the Coldstream wetlands.
- If strategic cost estimates are excluded from the comparison, a Modified Green option and the Orange/A option are closely ranked. Orange/A ranked first from a natural environment perspective, equal first from a functional perspective and third from a social and economic perspective. The Orange/A option has the least impact on the natural environment but has the greatest potential risk to flood impacts.



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Figure 5: Modified options developed at the Value Management Workshop

- Modified Purple, Green and Red options have more potential scope for improvement than the Orange/A option.
- The Orange/A option and the Modified Purple option have greatest impact from a social and local economic perspective, because of potential impacts on houses and agricultural land. However, they also have the greatest potential benefits in terms of maintaining access for local road users and supporting local businesses that rely on the highway.
- The inclusion of an interchange at Tyndale could improve the functional aspects of the Modified Purple option.
- There was a larger difference between scores in the ranking from a natural environment perspective than from a social and local economic perspective.
- There needs to be a further analysis of traffic data before a preferred route is chosen.
- If an easterly option (ie. an option other than Orange/A) is selected as the preferred route, improvements to the existing highway will need to be explored to address road corridor safety issues.

8. Project team route selection workshop – assessment of route options

A two-day route selection workshop was held in April 2006 to assess all of the route options against the assessment criteria. For the Wells Crossing to Harwood Bridge section this includes the four route options and two possible connections for the Wells Crossing to Harwood Bridge section. For the Harwood Bridge to Iluka Road section this includes the corridor that was displayed, together with two additional options to the east and west of Harwood.

The assessment criteria used in the route selection workshop were developed specifically to address the Pacific Highway Upgrade Program objectives as well as the specific project objectives and closely reflected the criteria agreed at the Value Management Workshop.

The route selection workshop was an appropriate tool to bring together the relevant RTA representatives and technical team members of the Sinclair Knight Merz project team to:

- Review the four route options and two possible connections placed on public display for the Wells Crossing to Harwood Bridge section of the upgrade.
- Review the corridor for the upgrade of the highway between Harwood and Iluka Road, placed on public display, as well as options developed to the west and east of Harwood
- Review the location and clearance of a new bridge, or bridges, over the Clarence River.
- Review the outcomes of investigations undertaken to date.
- Review the details of submissions received in response to the public display of route options.

- Review the outcomes of the Value Management Workshop including further review of the options as modified at the workshop (resulting in ‘refined’ options), identification of a favoured section between the existing highway to the west of Pillar Valley and investigation of an interchange at Tyndale.
- Evaluate all options against the assessment criteria.
- On balance of the assessment and taking into consideration the submissions received during the public display and the outcomes of the Value Management Workshop, recommend a preferred route for the NSW Minister for Roads’ consideration.

The key outcomes from the route selection workshop, for the section between Wells Crossing and Harwood Bridge, were:

- Development of three options: a Refined Purple option, a Refined Red option and the Orange/A option (which cannot be refined).
- The ranking of the refined options at the route selection workshop was broadly consistent with the ranking of the modified options at the Value Management Workshop.
- The Orange/A option has the least potential for impacts on the highly sensitive ecological features of the study area. It performs the best against the natural environment criteria.
- For the Orange/A option between South Grafton and Tyndale the risk of flooding impacts, and potentially the number of people who may be affected by any increase in flood level, is substantially greater than other options. The risk of flooding impacts and the potential consequences of changes in flooding for rural communities and towns such as Grafton was a significant consideration in the ranking of the Orange/A option in the social and local economic criteria.
- The Orange/A option was assessed to have the greatest potential for social impacts because of the number of people predicted to experience noise impacts, the many houses requiring acquisition, and the potential for impacts on agricultural land.
- The Refined Purple option was assessed to have the best functional performance of all the route options, with the inclusion of interchanges at Glenugie and Tyndale that would create better opportunities for local and regional traffic to access Grafton and other towns.
- Of the refined options, Refined Purple is the shortest route and would result in the greatest travel time savings.
- The inclusion of interchanges at Glenugie and Tyndale was assessed to result in improved performance of the Refined Purple option in relation to impacts on the local economy and businesses.
- The potential risk of adverse flooding impacts between Tyndale and Harwood Bridge was assessed to be manageable given the much smaller scale of the Shark Creek basin and the nature of flood behaviour in that area.

- The Refined Purple option would have direct impact on many of the houses close to the highway between Tyndale and Harwood Bridge.
- The Refined Purple option would have direct impact on land identified as prime land for sugar cane farming, although for the most part this would involve impacts adjacent to the existing highway corridor and would be minimised by designing the road to be as narrow as possible.
- The Refined Red option was assessed to have significant environmental impacts.
- The Refined Red option was assessed to perform best in terms of minimising overall noise impacts, acquisition of houses and impacts on agricultural land. It would, however, result in larger changes in amenity for residents in more remote parts of the study area that are not currently subject to impacts from major roads. It would also divert through traffic a long distance from Grafton, and has the potential to have a greater adverse impact than the other options on the local economy.
- Given the large number of vehicles that would continue to use the existing highway for the Refined Purple and Refined Red options, the section of the highway that is not part of the upgraded route must be improved as part of the project.

On balance, it was concluded at the route selection workshop that the option that best meets the objectives of the project is the Refined Purple option, combined with a package of measures to improve the safety of the existing highway. This option was assessed to perform the best because it avoids key risk areas in terms of both ecology and flooding and balances outcomes in relation to the functional, social and local economic, and environmental criteria.

For the section between Harwood Bridge and Iluka Road, the key outcomes from the route selection workshop, were:

- The main issues relate to community impacts on Harwood village and impacts on agricultural land and the opportunity to stage the development of the upgrade. The RTA has not determined at what time in the future this section of the project would be developed to a full motorway (Class M) standard.
- Options to the east or west of Harwood present traffic and access difficulties in initial development to Class A standard. Splitting of northbound and southbound traffic through and around Harwood village has the potential to result in greater amenity impacts. It would also be difficult and potentially more costly to ensure appropriate access to and from the upgraded highway was provided for properties and local traffic, including cane trucks requiring access to Harwood Mill.
- An option to the east of Harwood or to the west (to a lesser extent) would result in substantial additional impacts on cane farms both to the south and north of the Clarence River, and particularly on Harwood Island.

- Option 1, along the existing road corridor, provides the most cost effective and efficient solution in terms of initial development to an arterial highway standard, with the use of the existing highway as the north bound carriageway, and a new carriageway built to the east under a motorway scenario.
- Option 2, east of Harwood, would have the greatest impact on Endangered Ecological Communities and mangroves. It could result in more substantial impacts on shipping and boating activity on the Clarence River downstream of the existing Harwood Bridge.
- Option 3, west of Harwood, would directly impact a greater number of houses.

The options considered for this section of the project are all potentially feasible. On balance, it was concluded that Option 1 is preferred because it best meets the objectives of the project, in relation to staging, use of the existing road asset and minimised impacts on cane lands.

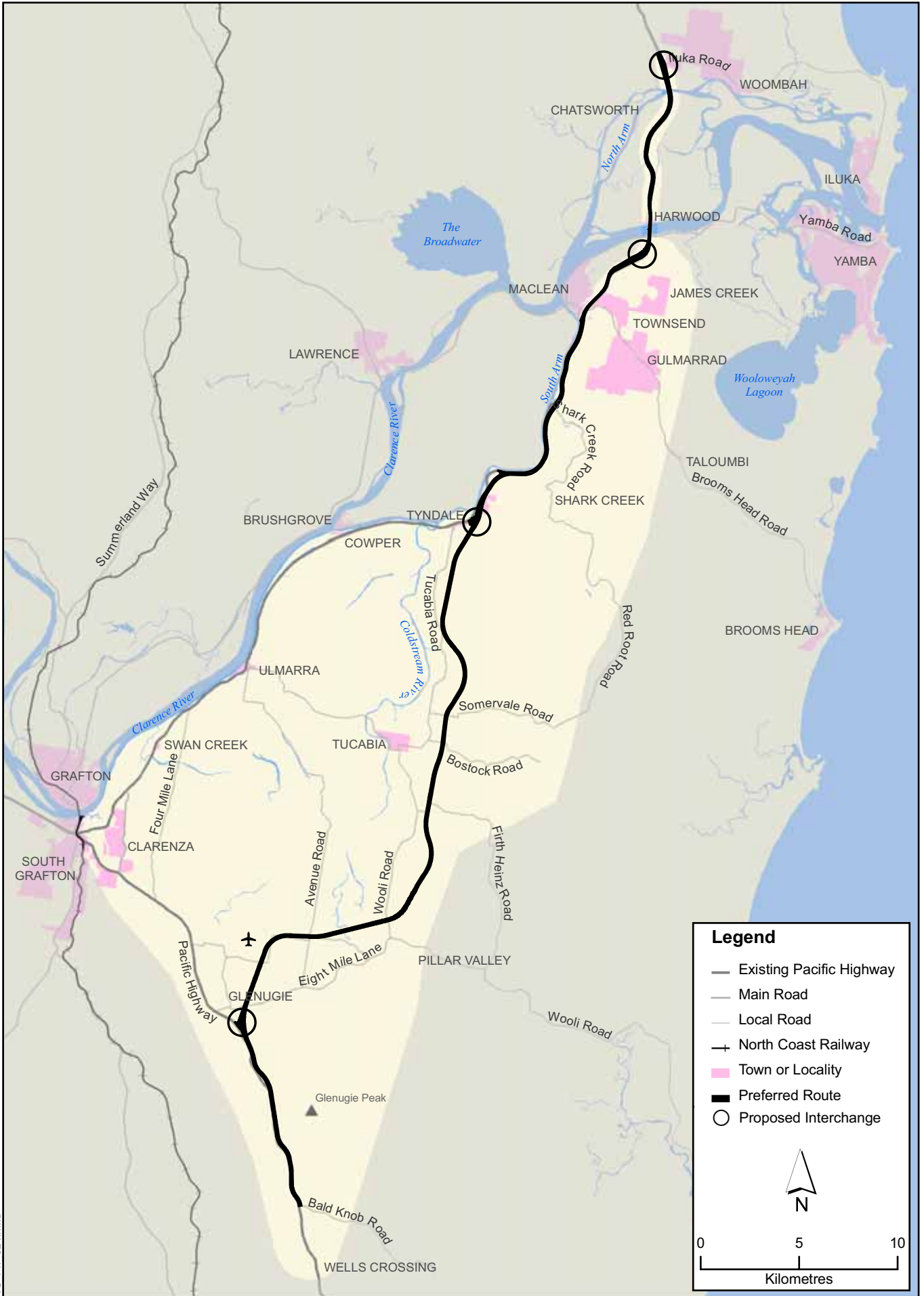
Given this, the preferred location for a new bridge (or bridges) over the Clarence River is adjacent and east of the existing bridge. A decision was not made whether the bridge would be a fixed bridge (height of 30m) or an opening bridge. This will be determined during the concept design phase.

9. Preferred route

The preferred route was selected in August 2006 and after consideration of the following:

- Issues raised in community submissions from the public display of route options which took place between 21 October 2005 to 2 December 2005.
- The outcomes from the Value Management Workshop held in March 2006.
- The findings of technical studies, including additional investigations undertaken following the Value Management Workshop.
- Recommendations from the route selection workshop held in April 2006.
- Adjustments to the alignment along the length of the preferred route to minimise impacts on properties, ecological features such as Endangered Ecological Communities, houses and businesses, and to make maximum use of the road reserve of the existing Pacific Highway.
- Identification of areas for further refinement subject to further investigation and consultation with property owners.
- Preliminary estimates for the project, including environmental management measures.
- A package of measures to improve the existing highway between Glenugie and Tyndale.

Between Wells Crossing and Harwood Bridge the preferred route is the refined Purple option (a combination of the Purple/B and Orange/A options, and the connection at Tyndale). Between Harwood and Iluka Road the preferred route is within and to the east of the existing road corridor (Option 1). The preferred route is shown in **Figure 6**.



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Figure 6: The preferred route

In this report the preferred route corridor is generally shown as 150 metres wide. It is wider in some locations such as interchanges and narrower where constraints restrict the road width. This is wider than the road reserve that would ultimately be acquired, which would generally be about 100 metres. The road reserve boundary and road footprint will be refined during the concept design and detailed environmental impact assessment. Consultation with individual land owners, and with Council in relation to local roads and the future arrangements for the existing highway, will be necessary prior to finalising the alignment and this would occur during the concept design and environmental assessment period.

Overview of the preferred route - Wells Crossing to Harwood Bridge

The preferred route starts at Bald Knob Road, approximately 23 kilometres south of Grafton. The route would be generally located on the eastern side of the existing highway which would be retained as a local road. The route would be through Glenugie State Forest, avoiding private property impacts and minimising noise impacts.

An interchange with the existing highway would be provided at Glenugie where the alignment of the preferred route deviates from the existing highway. This interchange would provide access to Grafton, Glenugie, Grafton Airport, Pillar Valley, Tucabia, Minnie Water and Wooli.

North of Eight Mile Lane, the preferred route passes to the east of Grafton Airport and turns north-east along Old Six Mile Lane, passing through open farmland and bushland. Some adjustments to local roads would be required to maintain access to properties along this part of the route.

As it travels north, the preferred route passes through a mix of open grazing land and remnant bushland, largely on private property. The preferred route generally avoids the floodplain, travelling along the edge of the low range extending south from Bondi Hill, to the east of Wooli Road and Tucabia Road.

An interchange to the east of Tyndale would provide a connection to the existing Pacific Highway. This interchange would result in the majority of traffic that currently uses the existing highway between Harwood Bridge and Tyndale using the preferred route, improving road safety.

Between Tyndale and Maclean, the preferred route for the most part follows the existing Pacific Highway. The existing road reserve is not wide enough to accommodate the upgraded highway. The northbound carriageway of the upgraded highway would generally follow the existing highway and be within the existing road reserve. The southbound carriageway and the local road would be constructed to the east and would encroach into private property. North of Tyndale and near Shark Creek, the preferred route deviates from the alignment of the existing highway to meet design standards.

Adjacent to Maclean Hill and Townsend, the corridor width is minimised to reduce impacts on residences and areas of ecological value.

A full interchange would be located at Yamba Road, south of the Harwood Bridge. This would provide access to Maclean, Townsend, Gulmarrad, James Creek, Yamba, Harwood and other towns in the area.

Overview of the preferred route - Harwood Bridge to Iluka Road

Between Harwood and Iluka Road the route follows the alignment of the existing Pacific Highway and would be located as much as possible within the existing road reserve. Initially, this section of the road would be constructed from the interchange south of Harwood Bridge to Iluka Road as an arterial highway (Class A) standard road. Only one new carriageway and bridge over the Clarence River would be required. At a time when traffic demand warrants it, this section of the road would be upgraded to Class M with an additional bridge and carriageway, and the existing bridge would be used as a local service road or alternative route.

The new bridge or bridges would be on the eastern side of the existing Harwood Bridge. The bridge height and design options will be further investigated as part of the preferred route concept design. Options currently being considered are a fixed bridge of 30 metres clearance or an opening bridge with a deck height the same as the existing Harwood Bridge.

Through Harwood, the existing road reserve would be widened to the east. For future planning purposes, provision is to be made for two new bridges and carriageways. However, initial development of the project through Harwood to Class A standard would involve one new bridge and one new carriageway.

North of Harwood village initial development of the project to Class A standard would involve one new carriageway and service roads where required to maintain access to properties. Some widening of the road reserve would be necessary.

At the North Arm, one new bridge would be necessary as part of upgrading to Class A or to Class M, and this would be constructed to the east of the existing bridges.

A full interchange would be located at Iluka Road, providing access to Woombah and Iluka.

Improvements to the existing highway

As part of the project, the RTA proposes to undertake a substantial package of improvements to the existing Pacific Highway between Glenugie and Tyndale. This is to address road safety for motorists who continue to use the existing highway and would contribute to a safer overall traffic corridor. The improvements would be developed and implemented in consultation with Clarence Valley Council, which is likely to take over responsibility for the maintenance of the existing highway following construction of the preferred route.

The improvement measures could include some or all of the following:

- Realignment of bends that do not currently meet 100km/h design standards.
- Widening of road shoulders in some sections where they currently provide insufficient room for vehicles to pull off the carriageway.
- Upgrade of some major intersections to “seagull” treatments.
- Provision of additional overtaking lanes.
- Installation of wire rope on the road edges or medians in areas where the potential for accidents involving head on collisions or vehicles running off the road is highest.

The Ulmarra bypass will be considered as part of this process.

Reasons why the preferred route was selected

All route options considered for the project have advantages and disadvantages when considered against the broad range of functional, social and environmental criteria. The preferred route has been selected because it provides the best balance of objectives when all the assessment criteria for the project are considered.

Flooding is a key area of potential uncertainty and risk for the project. In considering the route options, the risk of changes to flooding behaviour and the potential for impacts on local communities in the catchment has been recognised as an important issue. The potential for some route options to have a major impact on flooding was an important factor in the decision on the preferred route.

Of particular relevance for this project is the level of uncertainty surrounding potential impacts on a number of threatened species and other ecological values of the study area. The level of information available on ecological conditions in the study area is limited because the study area is very large and there have been few previous studies. The available information and investigations for the project show that there is a high diversity of species (including threatened species), high value habitats and the presence of potentially the last viable breeding sub-population of the coastal Emu endangered population. A precautionary approach has therefore

been adopted in the consideration of the route options and the preferred route avoids areas of greatest ecological value. The preferred route has been assessed to have a manageable level of ecological impact and further investigation will be undertaken to assess impacts and the effectiveness of mitigation measures.

In functional terms, the route would recognise the travel time needs of through traffic and the importance of delivering benefits for the high proportion of local and regional highway users. It is noted that the preferred route would perform well in terms of providing access for emergency vehicles.

The social impacts of the preferred route are shared between communities within the study area and have been balanced with the need to maintain local access for highway related businesses and to encourage future economic growth.

A significant benefit of the preferred route is the ability to stage construction by building sections of the preferred route and undertaking improvements to the existing highway. Staged development provides a more cost effective solution to the achievement of the objectives of the project for all traffic that uses the Pacific Highway corridor.

While the preferred route provides a number of advantages, potential adverse impacts are acknowledged. A number of issues will need to be addressed in the next stages of the development of the project. These include:

- Social impacts including a large number of houses that would need to be demolished and the number of properties that would need to be acquired.
- Noise impacts.
- Impacts on agricultural activities, the cane industry, and on local businesses.
- Ecological impacts including impacts on Endangered Ecological Communities, high quality habitat and wildlife corridors used by a number of fauna including the coastal Emu.
- Changes to property access and to local roads.

10. Project cost estimates

Strategic cost estimates have been prepared for the preferred route, including allowance for a substantial package of improvements for the existing highway and environmental mitigation measures. The estimates are based on the motorway style roadway scenario for the whole length of the upgrade between Wells Crossing and Iluka Road. The estimates were based on preliminary plans and long-sections of the preferred route as well as preliminary geotechnical and hydrological investigations of the study area.

The total cost of the project has been estimated at \$1,800 million, based on a motorway standard highway for the whole route. The total cost for the project with a motorway standard highway between Wells Crossing and Harwood Bridge and an arterial standard road between Harwood Bridge and Iluka Road has been estimated at \$1,580 million. The total cost for the project for the whole route as an arterial standard motorway has been estimated at \$1,470 million. These costs include an allowance of \$110 million for improvements to the existing highway between Glenugie, South Grafton and Tyndale.

11. Next steps

The proposed next steps for the Wells Crossing to Iluka Road project are to:

- Refine the alignment and prepare the concept design for the preferred route.
- The RTA will make an assessment regarding the application of Part 3A of the *Environmental Planning and Assessment Act 1979* during the course of the route development and assessment process.
- The proposal would be the subject of an environmental assessment, which would examine in more detail the potential impacts of the preferred route. The environmental assessment may include a statement of commitments in respect of environmental management and mitigation measures proposed to be undertaken if the project is approved.
- If assessed under Part 3A, submit the proposal to the NSW Department of Planning for approval by the Minister for Planning.
- When completed, the environmental assessment would be publicly exhibited and submissions sought. The RTA may be asked to prepare a report on the submissions, consider modifications to the project to minimise environmental impacts and revise its statement of commitments.
- The Department of Planning would consider the environmental assessment, the public submissions and any report requested from the RTA in recommending to the NSW Minister for Planning whether the project should be approved.