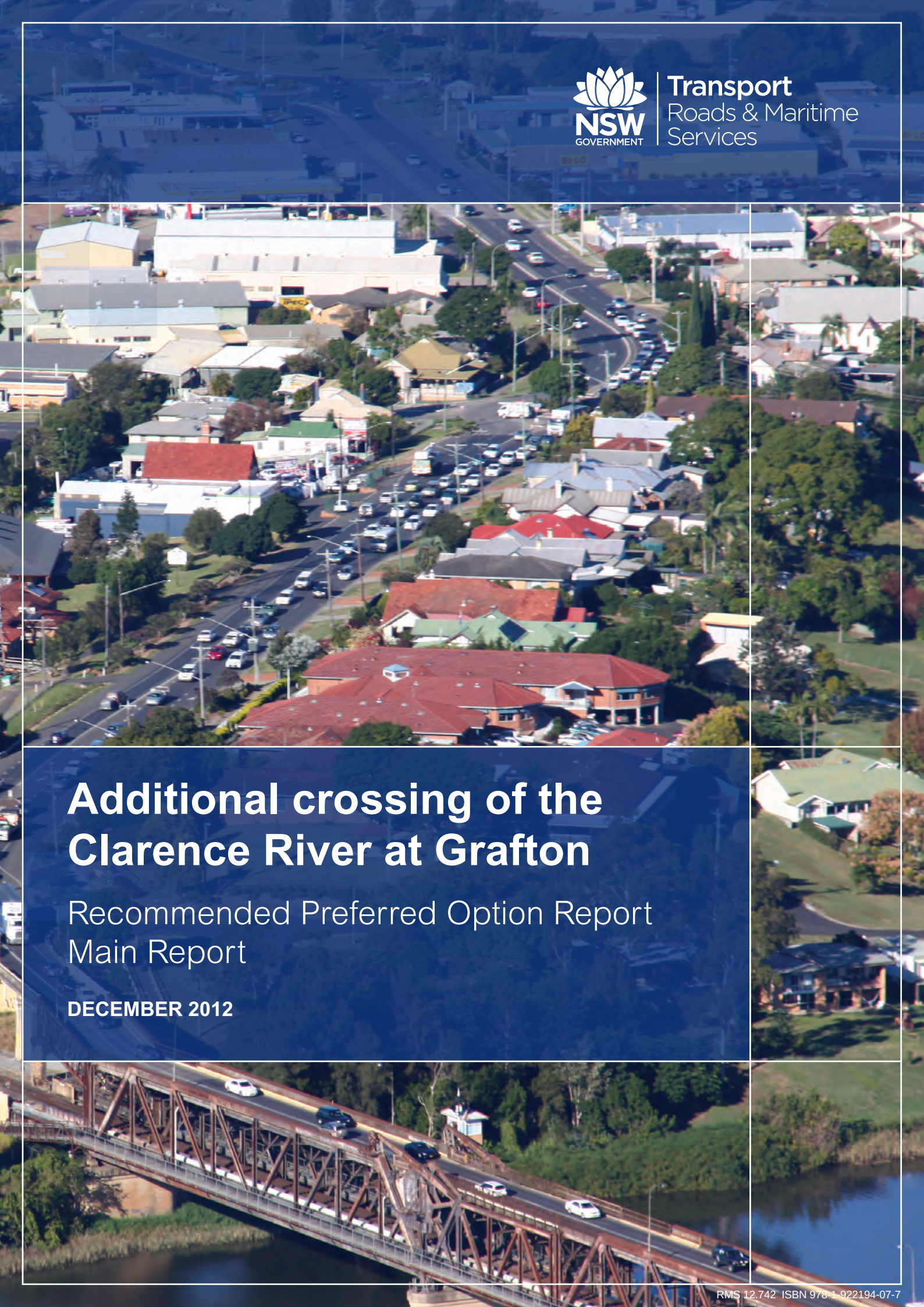

Transport
Roads & Maritime
Services

# Additional crossing of the Clarence River at Grafton

## Recommended Preferred Option Report
## Main Report

**DECEMBER 2012**

RMS 12.742 ISBN 978-1-922194-07-7

# Main Road 83 Summerland Way Additional Crossing of the Clarence River at Grafton

# Recommended Preferred Option Report

December 2012



Job number 220422

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# Executive summary

### Project purpose and objectives

Roads and Maritime Services (RMS) is currently undertaking investigations and community consultation to identify the preferred route for an additional crossing of the Clarence River at Grafton to address short-term and long-term transport needs. The key objectives for the additional crossing are to:

- Enhance road safety for all road users over the length of the project
- Improve traffic efficiency between and within Grafton and South Grafton
- Support regional and local economic development
- Involve all stakeholders and consider their interests
- Provide value for money
- Minimise impact on the environment.

### Background

Planning for an additional crossing of the Clarence River at Grafton was initially funded by the NSW Government, starting from 2002. Investigations were deferred in September 2005 and restarted in 2009.

In December 2010 RMS (formerly the Roads and Traffic Authority (RTA)) announced a revised approach to engage more effectively with the community and stakeholders in identifying a preferred route for an additional crossing. A community update issued in December 2010 identified 13 preliminary route options and invited community comment via a postal survey. Subsequent phone and business surveys were also carried out.

In June 2011, RMS published the *Feasibility Assessment Report* which describes the assessment undertaken on the 41 suggestions identified following the December 2010 to March 2011 community consultation period. Twenty-five preliminary route options in five corridors were identified for engineering and environmental investigation.

In January 2012, six route options were announced for further investigation. The short-listed options and short-listing process are documented in the *Preliminary Route Options Report – Final* (RMS, January 2012).

Design refinements and further field and technical investigations were undertaken on the six route options. These were documented in the *Route Options Development Report* (RMS, September 2012).

The six route options were subject to a consultation and assessment process in October and November 2012 to identify a recommended preferred location for an additional crossing of the Clarence River at Grafton. The selection process was based on the community feedback, technical investigations undertaken to date and the outcomes of a value management workshop.

### This report

The purpose of this report (*Recommended Preferred Option Report*) is to document the process followed for the assessment of the six route options and the identification of a recommended preferred option.

It also provides information on the community involvement and feedback following the display of the *Route Options Development Report* (RMS, September 2012).

## Summary of community feedback following the display of the *Route Options Development Report* in September 2012

A total of 118 submissions, including two petitions, were received between Monday 10 September and Friday 19 October 2012 in response to the display of the *Route Options Development Report* (RMS, September 2012). A total of 64 comments by 18 users were also posted on the online discussion forum.

Submissions covered a wide range of issues of concern to the community and stakeholders, including traffic and transport, socio-economic, environmental, cost, value for money and other concerns. One issue raised in many submissions centred on a key aim of the project, to improve traffic efficiency between Grafton and South Grafton. Respondents were however divided on the core goal of the crossing.

Submissions were received expressing support for and opposing each of the options with the majority of the submissions providing comment about why they supported or opposed an option or options. Many submissions either indicated a preference for an option away from the existing bridge described as 'out of town options' or a 'bypass of Grafton CBD', or for an option near the existing bridge, described as 'in town' options.

The submissions that opposed options close to the existing bridge generally argued in favour of options located away from and up or downstream of the existing bridge. Growth of the city and removing heavy traffic from the CBD were cited as the primary reasons for choosing a downstream option.

Supporters for options close to the existing bridge generally argued that these options would be well used and would relieve existing traffic congestion and provide a convenient alternative for existing communities. These submissions also expressed concern about and opposition to the 'out of town options', including concerns that these options would be ineffective in reducing traffic congestion and were too expensive.

### Independent review

An independent peer review of the traffic and transport assessments and best practice community consultation for this project was undertaken by Professors Graciela Metternicht and John Black from the Institute of Environmental Studies, Faculty of Science at the University of New South Wales (UNSW).

The peer review of the traffic and transport assessments concluded that:

"*The information base and modelling exercises undertaken by the consultants to RMS are more than adequate for the purposes of informing the selection of the preferred route bearing in mind all options are evaluated with one common set of traffic assumptions".*

The review of best practice community consultation for the project concluded that:

"*The (additional crossing of the Clarence River) case study analysis shows that the project team approach to community involvement and communication fulfilled the RMS policy, in regards to information gathering, consultation, community involvement and partnering with the public in the development of alternatives and the identification of the preferred solution. Furthermore, the research results show that most community involvement outcomes sought by the RMS policy have been achieved."*

### Value management workshop

A value management workshop was held on Tuesday 22 and Wednesday 23 October with participants from key stakeholders, the community, government agencies and the project team.

The purpose of the workshop was to consider the six options from a wide range of perspectives and evaluate the options against agreed and weighted criteria.

The workshop participants agreed that Options E and C should go forward for further consideration as they provided the best balance across social, environmental and functional issues. These two options provided the greatest improvements to the efficiency of the road network including during the AM and PM peak periods for similar cost and the same value for money.

The workshop participants also found that:

- Options 14 and 15 provided the least improvements to the efficiency of the road network including during the AM and PM peak periods. Options 14 and 15 were also among the poorest performing options when assessed against functional, socio-economic and environmental criteria, were the two most expensive options and provided the least value for money.
- Although Option 11 was the lowest cost option and provided the best value for money it was, on balance, a poorer performing option than Options E and C when assessed against functional, socio-economic and environmental criteria. In particular, Option 11 has substantial amenity impacts on a quiet residential area.
- Option A was, on balance, a poorer performing option than Options E and C when assessed against functional, socio-economic and environmental criteria. It was higher in cost than Option E and provided poorer value for money than both Options E and C. Its disadvantages include impacts on businesses, especially along Bent Street, South Grafton.

**Recommended preferred option**

Following the value management workshop, RMS undertook a further review of the options based on:

- The findings of the technical investigations and specialist studies undertaken for the project documented in the *Preliminary Route Options Report – Final* (RMS, January 2012) and *Route Options Development Report* (RMS, September 2012)
- Feedback received from the community and key stakeholders
- Outcomes of the October 2012 value management workshop.

The review concurred with the outcome of the value management workshop that Options E and C should go forward for further consideration.

Following further assessment of Options E and C, Option C has been preferred over Option E as the recommended preferred option because:

- On balance, it presents greater overall value to the community than Option E, in particular addressing long term connectivity, providing for economic growth and supporting Grafton as a regional centre.
- It best meets the project objectives.
- It provides better transport efficiency improvements over the whole of the road network for both the short and long term, including for road freight movements, as it:
    - Better supports the distribution of traffic flows between the eastern and western sides of South Grafton, especially traffic travelling to and from the south-east as it is located east of the existing bridge and provides better access to the Pacific Highway to the north and south and to Clarenza. Option C also provides good access to Armidale Road.

  - Provides a better road hierarchy as it provides a parallel road network with improved redundancy.
  - Avoids channelling traffic flows from both crossings into the junction of Fitzroy and Villiers Streets.
  - By directing traffic to the intersection of Villiers and Pound Streets, provides a better opportunity for traffic to travel around the edge of the Grafton CBD.
- It performs well in the other areas of the functional assessment criteria.
- It provides better outcomes in the socio-economic area, including its ability to better support Grafton as a regional centre, it has less impacts to businesses and fewer noise impacts.
- It provides better outcomes than Option E in terms of non-Aboriginal heritage by avoiding impacts on the important and intact heritage precinct around Villiers Street and Victoria Street. It also traverses through a shorter length of heritage conservation area.
- It performs comparatively to Option E in terms of capital cost and BCR at this stage of project development.

The recommended preferred option (Option C) is shown below in Figure 1.


Figure 1: Recommended preferred location for an additional crossing of the Clarence River at Grafton as of December 2012

### Invitation to comment

This report is being displayed for community comment. Please provide comments by:

- Writing to Chris Clark, RMS Project Manager, PO Box 546, Grafton NSW 2460
- Emailing graftonbridge@rms.nsw.gov.au.

Further details are available on the project website www.rms.nsw.gov.au/graftonbridge.

### What happens next

Community comments received on the recommended preferred option will be considered before a final decision is made on the preferred option for an additional crossing of the Clarence River at Grafton.

The process to identify a preferred option is shown in the flow chart in Figure 2 below.

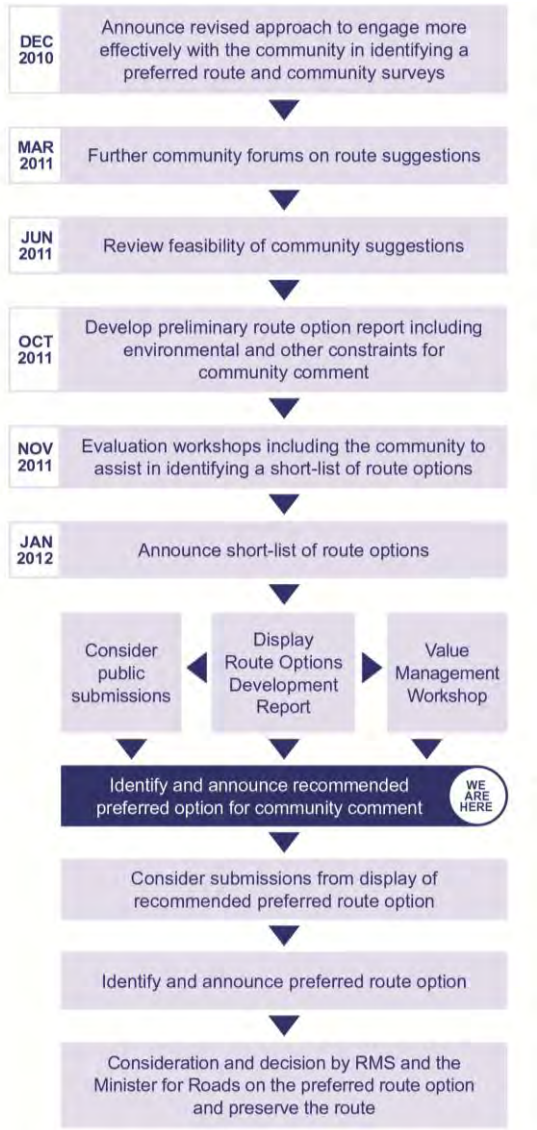


Figure 2: Process to identify a preferred option as of December 2012

Following a decision to proceed with the project, the concept design for the preferred option would be further refined and an environmental assessment would be prepared and displayed for community and stakeholder comment.

# Glossary of terms and abbreviations

| | |
|---|---|
| AM peak | Morning traffic peak period in Grafton. The three hour period between 7-10am was modelled and showed that the most critical hour is 8-9am. |
| ARI | Average recurrence interval (measured in years) is a term used to describe flood frequency. It is the long-term average number of years between floods of a certain magnitude. For example, a 100-year ARI flood is a flood that occurs or is exceeded on average once every 100 years. |
| AHD | Australian Height Datum, a common national plane of level approximately equivalent to the height above sea level. |
| Austroads | Austroads is the association of Australian and New Zealand road transport and traffic authorities. Austroads classifies motor vehicles into 12 classes as follows:<br>Light Vehicles: class 1 (eg sedan, 4WD) and class 2 (eg caravan).<br>Buses: class 3 (2 axle bus) and class 4 (3 axle bus).<br>Heavy Vehicles (rigid): class 3 (2 axle truck), class 4 (3 axle truck) and class 5 (4 axle truck).<br>Heavy Vehicles (articulated): class 6 (3 axle articulated truck), class 7 (4 axle articulated truck), class 8 (5 axle articulated truck) and class 9 (6 axle articulated truck).<br>Heavy Vehicles (B-double): class 10 (B-double truck), class 11 (double road train) and class 12 (triple road train). |
| ARTC | Australian Rail Track Corporation. |
| CBD | Central business district. |
| CVC | Clarence Valley Council. |
| DP&I | NSW Department of Planning and Infrastructure (former Department of Planning). |
| GIS | Geographic Information System |
| GNLALC | Grafton-Ngerrie Local Aboriginal Land Council. |
| Key stakeholder | The key stakeholders are groups who are proactively engaged during the project. |
| LEP | Local environmental plan. |
| Level of service | A measure of the quality of road operating conditions, including speed, travel time, freedom to manoeuvre, traffic interruptions, and comfort and convenience. |
| m | Million. |
| Microsimulation traffic model | Computer software package that has the ability to individually model each vehicle, including heavy vehicles within a road network. It enables a realistic representation of driver behaviour such as overtaking and lane changing and can also illustrate network performance. It is a particularly useful tool in modelling congested road networks and for predicting the likely impact of changes in traffic patterns resulting from changes to traffic flow (demand) and/or changes to the physical environment (road network). |
| 'No build' | This is the scenario if no additional crossing was built. The 'no build' scenario includes some additional roadworks that would be necessary to address localised congestion and capacity constraints as they arise to reasonably cater for expected demand in 2019. 'No build' is the standard terminology used for noise assessments. The 'no build' scenario is also referred to as the 'do minimum' scenario in traffic assessments or the base case in economic evaluations. |
| NSW | New South Wales. |
| PM Peak | Afternoon traffic peak period in Grafton. The three hour period between 4-7pm was modelled and showed that the most critical hour is 4-5pm. |
| Project | Additional crossing of the Clarence River at Grafton. |
| Project team | The team, comprising representatives of RMS, Arup (as the lead technical consultant) and other technical specialists, that is working on the project. |
| PROR | *Preliminary Route Options Report – Final* (RMS, January 2012). |
| Reduced level | The vertical distance between a survey point and the Australian Height Datum (AHD). |
| RMS | Roads and Maritime Services (formerly known as the RTA: Roads and Traffic Authority). |

| | |
|---|---|
| RMS Maritime | The maritime services division of Roads and Maritime Services (RMS). |
| RODR | *Route Options Development Report* (RMS, September 2012). |
| RPOR | *Recommended Preferred Option Report* (this report). |
| TfNSW | Transport for New South Wales. |
| TRAIN | Trans Regional Amalgamated Infrastructure Network. |
| UNSW | University of New South Wales |

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# 1 Introduction

## 1.1 Background

Roads and Maritime Services (RMS) is currently undertaking investigations and community consultation to identify the preferred route for an additional crossing of the Clarence River at Grafton to address short-term and long-term transport needs.

Since the early 1970s there have been various discussions and studies into an additional crossing of the Clarence River at Grafton. A number of these studies have been carried out during the past 10 years and provide the background to the current investigation. A timeline depicting the evolution of discussions and studies into an additional crossing of the Clarence River since the current bridge opened in 1932 is shown in Figure 3 below.

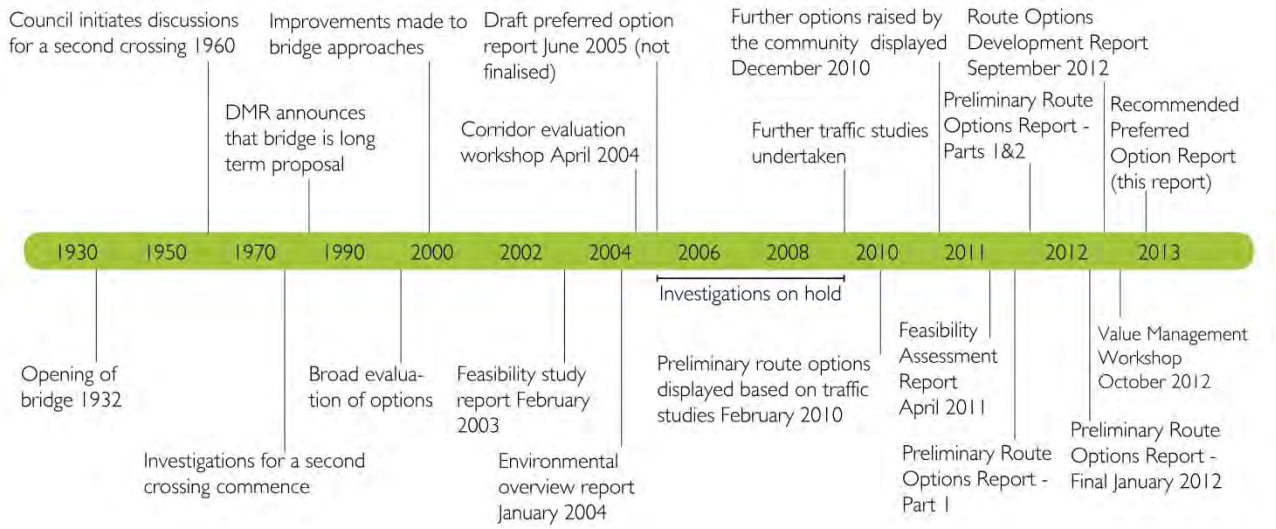


Figure 3: Timeline of discussions and studies into an additional crossing of the Clarence River

A revised approach to engage more effectively with the community and stakeholders to identify a preferred route for an additional crossing was announced in December 2010.

The revised approach was developed in response to sections of the community asking the then Minister for Roads and RMS to reconsider options for a second crossing as well as raising concerns about the basis and justification for identifying the four preliminary route options announced in February 2010.

Clarence Valley Council wrote to the Minister for Roads in September 2010 to ask that RMS survey the people of Grafton and surrounds about the location of a second crossing.

In December 2010, RMS made a commitment to undertake a process that would be transparent, involve all residents and stakeholders and make information available at the appropriate times, and not afterwards. The December 2010 community update also identified 13 preliminary options, including the additional nine options suggested by the community since the announcement of the four preliminary route options in February 2010.

RMS undertook three community surveys to gauge the views of residents and businesses regarding the additional crossing of the Clarence River at Grafton.

The responses to the surveys helped the project team to identify the key community issues for the project and the values held by the community. The responses also identified an additional 28

community suggestions for the location of the crossing, bringing the total number of suggestions to 41. At community forums in March 2011, RMS advised that the 41 suggested locations would be assessed for their feasibility, to identify those options that would be further considered and investigated.

In June 2011, RMS issued a community update and the *Feasibility Assessment Report* which identified 25 preliminary route options within five strategic corridors to go forward for further engineering and environmental investigations. Following consideration of community input, including the outcomes of a stakeholder evaluation workshop attended by members of the community, six short-listed options to go forward for further investigation were identified in January 2012. Four of the six short-listed options were based on suggestions received from the community. The short-listing process is documented in the *Preliminary Route Options Report – Final* (RMS, January 2012).

Following the announcement of the six short-listed options in January 2012, further investigations were carried out. These included technical and field investigations, traffic, flood and noise modelling and further design refinements to the six route options. The *Route Options Development Report* (RMS, September 2012) documents the investigations and assessment of the six short-listed route options against the project objectives.

The six route options were subject to an assessment process in October and November 2012 to identify a recommended preferred location for an additional crossing of the Clarence River at Grafton. The selection process was based on the community feedback, technical investigations undertaken to date and the outcomes of a value management workshop. This report (*Recommended Preferred Option Report*) documents the selection process undertaken and identifies the recommended preferred option.

## 1.2 Existing bridge

Approval for the design and construction of the existing bridge was granted in 1915. The bridge was originally intended to carry a railway and a footway. It was designed to accommodate two rail tracks, but only one was installed. The design included a moveable span ('bascule') to allow clearance for river navigation. In 1922, when design was well advanced, the then Minister for Works requested that the design be amended to include vehicular traffic in addition to the railway and pedestrian traffic. The addition of the upper roadway deck resulted in kinks at each end of the main bridge where the roadway diverts away from the railway. The bridge was completed and opened to traffic in 1932.

The Grafton Rail and Road Bridge over the Clarence River, shown in Figure 4, is listed on the State Heritage Register (SHR). The listing boundary for the item includes the structure, the piers, abutment and track formation for a distance of 10 metres in all directions from those elements (SHR No. 01036). As noted in the Statement of Heritage Impact (RTA, March 2005) the bridge exhibits significant technical characteristics. The bascule span of the bridge is of an unusual type in Australia and although no longer in use, is the largest railway bascule built in Australia. The bridge is the second to last steel truss rail bridge built in NSW and was constructed at the height of popularity of this type of bridge. The bridge is the only one in NSW to carry road and rail traffic on two separate levels.

The bridge is an important icon for both the local and regional communities. The bridge retains an important role for the present day community both in a functional sense and as a strong reminder of the history of the area.

The visual relationship between Grafton and the Clarence River is also fundamental to the urban experience of the town. As the dominant visual feature on the river, the bridge is a key urban landmark that makes a major contribution to the identity of the town.

Figure 4: Grafton Bridge from Fitzroy Street

## 1.3 The need for an additional crossing

The reasons an additional crossing of the Clarence River at Grafton is needed are as follows:

- Traffic counts undertaken in August 2010 indicate that the bridge was carrying 1360 vehicles per hour in the northbound direction for the AM peak and 1330 vehicles per hour in the southbound direction for the PM peak. *Guide to Traffic Management Part 3: Traffic studies and analysis* (Austroads, 2009) indicates that the theoretical capacity of the bridge could be considered to be in the range of 900 to 1400 vehicles per lane per hour. Based on the traffic flows recorded on the bridge and the information set out in the Austroads guide, it is apparent that the peak hour traffic flows across the bridge are at, or very close to, the practical capacity of the bridge.
- Strategic traffic modelling carried out as part of the selection of the short-listed options (detailed in *Technical Paper: Strategic Traffic Assessment* in Volume 2 of the *Preliminary Route Options Report – Final* (January 2012)) indicates substantial deterioration in network performance in future years under a "do minimum" scenario. Key model network results of the two hour AM peak "do minimum" modelling are shown in Table 1 below.

Table 1: "Do minimum" model network results

| Year | Total Trips | VKT | VHT | Average Speed (km/h) |
|---|---|---|---|---|
| 2011 Existing Conditions | 20,942 | 70,832 | 1,751 | 40.5 |
| 2019 Do minimum | 25,107 | 86,240 | 3,298 | 26.1 |
| 2029 Do minimum | 30,996 | 115,888 | 9,167 | 12.6 |
| 2039 Do minimum | 35,145 | 136,816 | 14,067 | 9.7 |
| 2049 Do minimum | 38,234 | 154,207 | 20,515 | 7.5 |

The average vehicle speed on the existing bridge under a "do minimum" scenario is shown in Figure 5 and shows substantial deterioration in travel speed in the future without any capacity enhancement.

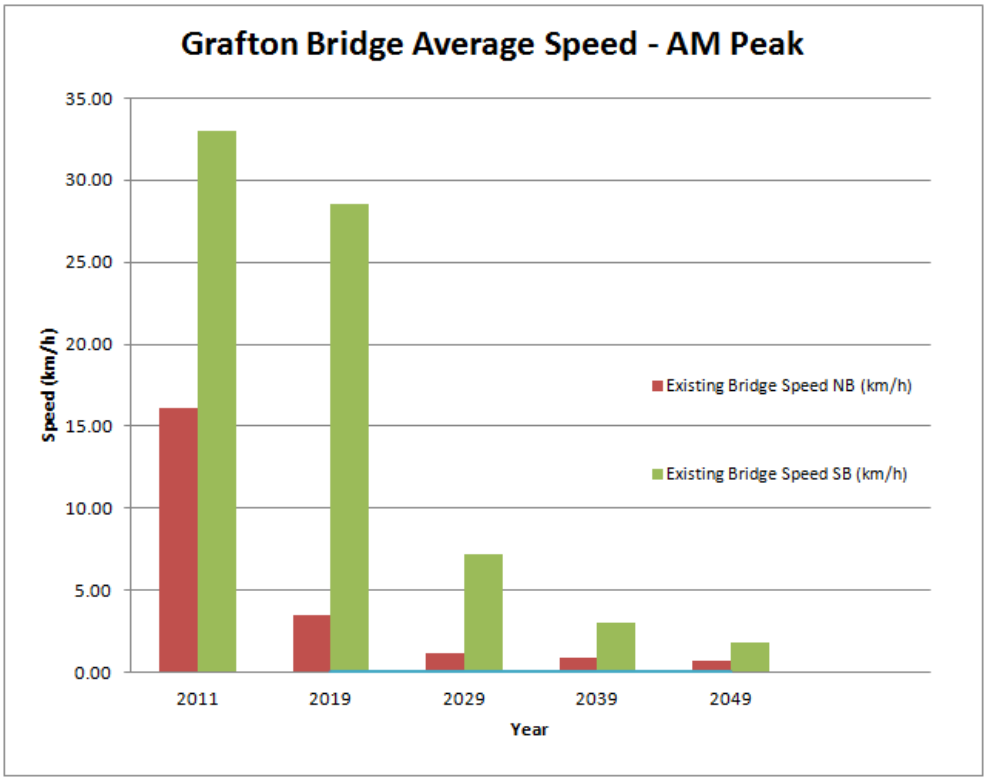


Figure 5: Grafton Bridge average speed (km/h)

- Microsimulation traffic modelling carried out as part of the route options assessment (detailed in *Technical Paper: Traffic Assessment* in Volume 2 of the *Route Options Development Report* (RMS, September 2012)) has shown that future year traffic demands would exceed the capacity of the existing bridge by 2029 and beyond.
- Existing traffic congestion associated with the existing bridge and the resultant delays affecting the Grafton community. Observed travel times of trips undertaken in surveys in 2008 and 2011 from the intersection of Bent Street and Gwydir Highway in South Grafton and the intersection of Fitzroy Street and Villiers Street in Grafton are shown in Table 2 below. These travel times are also reported in *Technical Paper: Traffic Assessment* in Volume 2 of the *Route Options Development Report* (RMS, September 2012) for use in calibration of the microsimulation model.

Table 2: Average travel time and speed between Bent Street/Gwydir Highway and Fitzroy Street/Villiers Street (based on surveys in 2008 and 2011)

| Direction | AM peak period (8-9am) | | PM peak period (4-5pm) | |
|---|---|---|---|---|
| | Average travel time (seconds) | Average speed (km/h) | Average travel time (seconds) | Average speed (km/h) |
| Southbound | 172(1) | 40.1 | 303(2) | 22.8 |
| Northbound | 355(1) | 19.4 | 204(3) | 33.8 |

(1) Average travel time based on 2011 survey

(2) Due to minimal travel time data recorded for the southbound route in the PM peak, a combination of the 2008 and 2011 travel time data has been used to determine the average observed travel time.

(3) 2011 travel time data was not observed on the northbound route in the PM peak and as such 2008 travel time data has been used to validate the route in the PM peak.

Note: Additional travel time surveys were undertaken by RMS in February and March 2012 when a vehicle was driven through the traffic stream. Typical recorded travel times between the Bent Street/Gwydir Highway intersection, South Grafton and Prince Street/Pound Street intersection, Grafton in the morning (AM) peak were between eight and 10 minutes.

- It is likely that future traffic growth will add to the existing congestion in peak hours, which in turn will decrease the average travel speed and increase travel times. This scenario will result in a reduced level of service on the existing bridge.
- The Grafton Bridge being the only crossing of the Clarence River for the Summerland Way and in the Grafton area. All trips between Grafton and South Grafton including local and through trips use the existing bridge as there is no practical alternative. This problem is exacerbated when the Pacific Highway is closed due to road traffic accidents or flooding.
- Growth and development in the Grafton area. Population forecasts over the next 30 years indicate substantial growth in both the Grafton area (50 per cent increase) and surrounding areas (109 per cent increase). The population growth forecasts are presented in Table 3 below. This is expected to increase the demand for the bridge crossing and contribute to further congestion. Current traffic delays in peak periods potentially affect people's travel behaviour and daily activity patterns and as a result may be constraining development.

Table 3: Forecast population growth in Grafton and surrounds

| | **Year** | | | |
|---|---|---|---|---|
| **Location** | **2010** | **2021** | **2031** | **2041** |
| Grafton | 10,761 | 11,255 | 11,255 | 11,255 |
| Junction Hill | 1,015 | 2,250 | 3,455 | 3,455 |
| South Grafton | 6,065 | 6,806 | 7,601 | 7,601 |
| Clarenza | 684 | 1,610 | 2,514 | 5,418 |
| **Total** | **18,525** | **21,921** | **24,825** | **27,729** |
| **Other areas** | | | | |
| Townsend, Maclean, James Creek, Gulmarrad | 4,800 | 6,800 | 8,800 | 8,800 |
| Coutts Crossing | 613 | 786 | 955 | 955 |
| Waterview Heights | 769 | 1,974 | 3,150 | 3,150 |
| **Total other areas** | **6,182** | **9,560** | **12,905** | **12,905** |

Source: CVC 2011.

Note: CVC advised projections up to year 2031. The 2041 projections are extrapolations based on the trends up to year 2031.

- The geometry of the existing bridge and resultant traffic constraints and safety issues. Extensive queuing and delays occur on the bridge approaches as the two lanes of traffic (in each direction) approaching the bridge, Fitzroy Street southbound and Bent Street northbound, must merge into a single lane on the bridge. The configuration of the bridge also introduces conflict with heavy vehicles. The safety implications of the shape of the existing bridge (the “kinks”) and the traffic delays and congestion that the kinks create, also impact on the need for an additional crossing. Long, heavy vehicles cannot negotiate the kinks without crossing the centrelines. This creates a risk of traffic crashes and also causes traffic in either direction to slow, which increases congestion and delays.
- The current B-double ban on the existing bridge during peak periods, restricts freight movement.
- The existing bridge and approach roads do not facilitate the economic viability of the South Grafton business area (Skinner Street).

- Deterioration in network performance increases the economic cost of travel. Substantial increases in trip costs can change travel behaviour, particularly for commercial trips.

## 1.4 Project purpose and objectives

This chapter outlines the project purpose and objectives developed by the project team. The supporting objectives were developed following community consultation.

### 1.4.1 Project purpose

To identify an additional crossing of the Clarence River at Grafton to address short-term and long-term transport needs.

### 1.4.2 Project objectives

The key objectives for the additional crossing of the Clarence River at Grafton are:

- Enhance road safety for all road users over the length of the project
- Improve traffic efficiency between and within Grafton and South Grafton
- Support regional and local economic development
- Involve all stakeholders and consider their interests
- Provide value for money
- Minimise impact on the environment.

### 1.4.3 Supporting objectives

The following supporting objectives assist in achieving the project objectives.

**Enhance road safety for all road users over the length of the project**

- Reduce the potential for road crashes and injuries on the bridge and approaches, including any intersections and connecting roads
- Provide safe facilities for pedestrians and cyclists.

**Improve traffic efficiency between and within Grafton and South Grafton**

- Provide efficient access for a second crossing of the Clarence River and for the State road network
- Provide a traffic management network which reduces delays between Grafton and South Grafton in peak periods to an acceptable level of service for 30 years after opening
- Provide adequate vertical clearance for heavy vehicles
- Consider demand management strategies to minimise delays to local and through traffic.

**Support regional and local economic development**

- Provide transport solutions that complement existing and future land uses and support development opportunities
- Provide improved opportunities for economic and tourist development for Grafton
- Provide for commercial transport including B-doubles where required

- Provide flood immunity for the bridge for a one in 100-year flood event, and for the approach roads for a one in 20-year flood event, where economically justified
- Provide navigational clearance from the additional crossing for river users.

**Involve all stakeholders and consider their interests**

- Develop solutions that consider community expectations for the project
- Satisfy the technical and procedural requirements of RMS with respect to the planning and design of the project
- Integrate input from the community into the development of the project through the implementation of a comprehensive program of community consultation and participation.

**Provide value for money**

- Achieve a justifiable benefit-cost ratio at an affordable cost
- Develop a strategy to integrate future upgrades into the project.

**Minimise impact on the environment**

- Minimise the impact on the social and economic environment, including property impacts
- Minimise the impact on residential amenity, including noise, vibration, air quality etc
- Minimise the impact on heritage
- Minimise impact on the natural environment
- Provide a project that fits sensitively into the built, natural and community context
- Minimise flooding impact caused by the project.

## 1.5 Purpose of this report

The purpose of this report (*Recommended Preferred Option Report*) is to document and provide the outcomes of the assessment process for the identification of a recommended preferred option.

This report:

- Identifies the strategic context and need for the additional crossing
- Summarises the community involvement activities and feedback received following the display of the *Route Options Development Report* (RMS, September 2012)
- Documents the results of the assessment of the route options and the value management process undertaken
- Outlines the next steps for a final decision on the preferred option for an additional crossing of the Clarence River at Grafton.

## 1.6 Assumptions

This report is intended to provide information on the selection process undertaken and identification of a recommended preferred option.

This report builds upon the previous investigations into an additional crossing of the Clarence River at Grafton that have been undertaken over the past 10 years, including the investigations documented in the *Preliminary Route Options Report – Final* (RMS, January 2012) and the *Route Options Development Report* (RMS, September 2012).

The project team has exercised all reasonable skill and care in preparing this report and has taken reasonable steps to ensure that the information contained in this report is accurate and up to date.

Key assumptions for the comparative assessment of the six route options are:

- The assumed date of opening of the additional crossing to traffic is 2019. Note that the actual year of opening will be subject to funding and may vary from this date.
- It is assumed that the Glenugie to Tyndale upgrade of the Pacific Highway (which bypasses South Grafton) will be open to traffic by the assumed date of opening of the additional crossing (2019).
- All options have been designed to operate with an adequate level of service 30 years after the assumed date of opening of the additional crossing, ie in 2049. It should be noted that the option layouts identify the works required to achieve sufficient capacity for the option to function adequately in 2049. Construction of the road network upgrades, eg intersection upgrades or widening of existing roads, may be staged over time following construction of the new bridge, as traffic demands increase.
- Large heavy vehicles (semi-trailers and B-doubles) will be required to use the additional crossing in preference to the existing bridge.
- Traffic patterns remain proportionally the same between the existing Pacific Highway and Centenary Drive.
- The Pacific Highway will continue to be the priority designated freight route for heavy vehicles travelling between Sydney and Brisbane. It is not the intention of the additional crossing to provide an additional freight corridor or to attract more heavy vehicles onto the Summerland Way.
- Population growth and development forecasts are consistent with those identified in the *Mid North Coast Regional Strategy* (DP&I, 2009). The forecasts consider land capacity and have been developed in consultation with Clarence Valley Council and the Department of Planning and Infrastructure.

The design presented in this report is a preliminary concept design for the recommended preferred option. This design may be further refined during the concept design phase based on further investigations and feedback from the community.

# 2 Planning and strategic context

## 2.1 Planning policies and strategic documents

The overarching policies and strategic documents relevant to an additional crossing and to the Clarence Valley local government area are:

- *NSW 2021: A Plan to Make NSW Number One* (NSW Government, 2011)
- *NSW Long Term Transport Master Plan (*TfNSW, 2012*)*
- *A New Planning System for NSW: Green Paper* (NSW Government, 2012)
- *Mid North Coast Regional Strategy* (DP&I, 2009)
- *Far North Coast Regional Strategy* (DP&I, 2006)
- *Mid North Coast Farmland Mapping Project Final Recommendations Report* (DP&I, 2008)
- *Northern Rivers Regional Plan 2011* (Regional Development Australia – Northern Rivers, 2011)
- *Clarence Valley Settlement Strategy* (Grafton Council *et al*, 1999)
- *Clarence River Way Masterplan* (CVC and Clouston Associates, 2009)
- *Grafton Waterfront Precinct Masterplan* (CVC and Clouston Associates, 2011)
- *Bike Plan and Pedestrian Access and Mobility Plan* (CVC and QED, 2008)
- *Clarenza Cycleway Options Study* (CVC and Lewis Ford & Associates Consulting Engineers, 2012)
- *South Grafton Heights Precinct - A Strategy for the Future* (CVC, 2007)
- *Upgrading the Pacific Highway: Technical Review of Inland Corridor (via Summerland Way)* (RTA, 2006)
- *Draft NSW Freight and Ports Strategy* (TfNSW, 2012)
- Trans Regional Amalgamated Infrastructure Network (TRAIN), proposal submitted by Nation Building Australia TRAIN to Infrastructure Australia, 2008
- Ecologically sustainable development principles. Schedule 2, numeral 7 of the NSW *Environmental Planning and Assessment Regulation 2000.*

These policies and documents are discussed below including a summary of how the project relates to them.

### 2.1.1 NSW 2021: A Plan to Make NSW Number One

*NSW 2021: A Plan to Make NSW Number One* (NSW Government, 2011) presents the NSW Government's strategy to move the State forward over the next 10 years. It is based on five principal strategies with underlying goals. The five strategies are to:

- Rebuild the economy – restore economic growth and establish NSW as the 'first place in Australia to do business'

- Return quality services – provide the best transport, health, education, policing, justice and family services, with a focus on the customer
- Renovate infrastructure – build the infrastructure that makes a difference to both our economy and people's lives
- Strengthen our local environment and communities – improve people's lives by protecting natural environments and building a strong sense of community
- Restore accountability to Government – talk honestly with the community, return planning powers to the community and give people a say on decisions that affect them.

The NSW 2021 goals relevant to transport under the plan are to reduce travel times, grow patronage on public transport by making it a more attractive choice, improve customer experience with transport services and improve road safety.

A recommended preferred option for an additional crossing of the Clarence River at Grafton will support the NSW 2021 plan transport goals by reducing travel times between Grafton and South Grafton and improving road safety.

### 2.1.2 NSW Long Term Transport Master Plan

The *NSW Long Term Transport Master Plan* (TfNSW, 2012) identifies transport challenges NSW needs to meet over the next 20 years and sets out the initiatives, solutions and actions the NSW Government will take to meet these challenges.

The plan states Transport for NSW, the Department of Planning and Infrastructure and local councils will prepare a detailed Regional Transport Plan for the NSW Northern Rivers region.

The plan also identifies as a 'medium to longer term' action the provision of an additional crossing of the Clarence River at Grafton that will "*improve access across the region and provide an alternative route to the Pacific Highway*" (page 252) and "*support Grafton as a major regional centre and relieve congestion on the existing bridge*" (page 253). A recommended preferred option will enable the implementation of this medium to longer term action.

The recommended preferred option will also support the *NSW Long Term Transport Master Plan* (TfNSW, 2012) vision of improving connectivity for regional NSW and support more reliable access to quality services, and to employment and educational opportunities.

### 2.1.3 A New Planning System for NSW: Green Paper

The green paper was released in July 2012 and proposes transformative changes to the planning system in NSW with a shift to a more strategic and streamlined system that facilitates economic growth and upfront community facilitation.

The new planning system aims to prepare and implement new regional growth plans, subregional delivery plans and local land use plans across NSW. Some of these new plans will be directly relevant to Grafton and the Clarence Valley.

A recommended preferred option for an additional crossing of the Clarence River at Grafton will be an infrastructure asset likely to be included in the new planning system's strategic planning for the NSW mid north coast region.

The next step of the planning reform is the development of a white paper and exposure bill which are expected to be released following the green paper's public consultation period.

### 2.1.4 Mid North Coast Regional Strategy

The *Mid North Coast Regional Strategy* (DP&I, 2009) provides a strategy to ensure that adequate land is available to accommodate the projected housing and employment needs of the NSW Mid North Coast region's population over the next 25 years.

Grafton is identified in the strategy as a major regional centre and also has the greatest capacity for commercial redevelopment. It is expected to take the majority of future commercial development in the Clarence subregion. Other major regional centres in the Mid North Coast region are Coffs Harbour, Port Macquarie and Taree.

The strategy also identifies Junction Hill and Clarenza as 'proposed urban release areas'.

A recommended preferred option will support the implementation of the *Mid North Coast Regional Strategy* (DP&I, 2009) as it would enhance the ability of Grafton to meet its functions as a major regional centre.

Population forecasts for Grafton and surrounds used for this project have been developed by Clarence Valley Council and the Department of Planning and Infrastructure. These forecasts are based on land capacity and are consistent with forecasts identified in the *Mid North Coast Regional Strategy* (DP&I, 2009).

### 2.1.5 Far North Coast Regional Strategy

The *Far North Coast Regional Strategy* (DP&I, 2006) provides a strategy to manage the region's expected high growth rate in a sustainable manner.

The strategy identifies the Pacific Highway and the Summerland Way as 'two major north–south corridors'. It identifies Casino and Kyogle as towns providing levels of services and employment to support the surrounding villages and rural settlements. The strategy notes Casino and Kyogle are located on major transport routes with access to interstate road and rail networks.

A recommended preferred option for an additional crossing of the Clarence River at Grafton will acknowledge the *Far North Coast Regional Strategy* (DP&I, 2006) and the towns of Casino and Kyogle as settlements connected to Grafton via the Summerland Way.

### 2.1.6 Mid North Coast Farmland Mapping Project Final Recommendations Report

The *Mid North Coast Farmland Mapping Project Final Recommendations Report* (DP&I, 2008) aims to identify and protect regionally significant farmland from urban and rural residential encroachment and land use conflict with the aim of keeping the best agricultural land in the Mid North Coast region available for food production for the benefit of current and future generations.

Regionally significant farmland is defined as "land capable of sustained use for agricultural production with a reasonable level of inputs and which has the potential to contribute substantially to the ongoing productivity and prosperity of a region" (DP&I, 2008).

The process for identifying a recommended preferred option for an additional crossing of the Clarence River at Grafton has considered the regionally significant farmland in the Grafton area as identified on maps in the *Mid North Coast Farmland Mapping Project Final Recommendations Report* (DP&I, 2008). A discussion of the route options in relation to regionally significant farmland is included in the *Route Options Development Report* (RMS, September 2012).

### 2.1.7 Northern Rivers Regional Plan 2011

The *Northern Rivers Regional Plan 2011* (Regional Development Australia – Northern Rivers, 2011) identifies regional issues, priorities and opportunities for the Northern Rivers region of NSW. The plan's 2020 vision for the Northern Rivers region is "a healthy, prosperous and sustainable future for the communities of the Northern Rivers region" (Regional Development Australia – Northern Rivers, 2011).

One of the priority issues identified in the plan is transport and the need to increase investment in transport infrastructure to enhance economic development.

A recommended preferred option will be consistent with the plan's vision and would support the economic development in Grafton, South Grafton and surrounds.

### 2.1.8 Clarence Valley Settlement Strategy

The *Clarence Valley Settlement Strategy* (Grafton Council *et al*, 1999) provides a vision for how the Clarence Valley can grow sustainably over the next 20 years. It seeks to locate population growth in areas where it would have the least environmental, social and economic costs.

The strategy forecasts that most of the new growth in the Clarence Valley would be within the towns of Grafton and Maclean. The strategy recognises that such growth would increase traffic pressures over the existing bridge at Grafton.

A recommended preferred option for an additional crossing of the Clarence River at Grafton will respond to the traffic demands of the existing population and forecast growth areas of Grafton and South Grafton while alleviating the traffic pressure over the existing bridge.

### 2.1.9 Clarence River Way Masterplan

The *Clarence River Way Masterplan* (CVC and Clouston Associates, 2009) is a tourism and infrastructure investment program aiming to position the Clarence River as one of the nation's great river experiences.

One of the masterplan strategies is to reposition Grafton as a 'River City' tourist destination by completing the following projects:

- Re-orient the city to the river, including both Grafton and South Grafton.
- Create a sense of arrival with a gateway statement that enhances first impressions of Grafton from the Pacific Highway and simplifies decision-making.
- Improve the cityscape through investment in a main street program for the CBD, but primarily Prince Street for its waterfront linkage and Fitzroy Street for its role in providing a gateway to the town and creating positive first impressions for visitors.
- Promote the development of a waterfront precinct adjacent to the town centre. Focus on the redevelopment and vitalisation of the core river edge from Queen Street to below the Grafton Bridge.
- Improve the presentation of retail and commercial areas for tourism.
- Encourage extended trading hours for restaurants and cafes.
- Facilitate investment in new infrastructure and improve accommodation presentation levels to meet expectations of target markets.

- Investigate options for development of the State Rail Authority land on the river's edge on both sides of the river as public parkland.
- Through negotiation with private landholders, investigate options to provide safe public waterfront access or easements that respect privacy and security.
- Improve public access to the waterfront through existing public open space.

The masterplan also identifies the potential for a marina integrated with the redevelopment of the Kemp Street bowling club and a jetty/pontoon immediately downstream of the existing bridge in Grafton.

The process for identifying a recommended preferred option has considered the *Clarence River Way Masterplan*. Assessments of the route options with respect to the masterplan were included in the *Route Options Development Report* (RMS, September 2012).

### 2.1.10 Grafton Waterfront Precinct Masterplan

The *Grafton Waterfront Precinct Masterplan* (CVC and Clouston Associates, 2011) proposes a revitalisation program for the river edge area between Queen Street and the Grafton Bridge, Grafton. This area covers the existing rowing club, sailing club, Memorial Park and a substantial portion of privately owned land in front of residential and church properties.

The process for identifying a recommended preferred option for an additional crossing of the Clarence River at Grafton has considered the masterplan.

### 2.1.11 Bike Plan and Pedestrian Access and Mobility Plan

Clarence Valley Council's *Bike Plan and Pedestrian Access and Mobility Plan* (CVC and QED, 2008) is a comprehensive strategic approach to identifying a cycling and pedestrian network. The plan's objectives are to:

- Increase use of the bike and pedestrian network for short trips
- Reduce the number of missing links and severance within the bike and pedestrian network
- Reduce the number of bike and pedestrian accidents
- Improve connectivity with other transport modes, particularly bus, car and train
- Provide pedestrian facilities that cater for the needs of all pedestrians including people with disabilities, commuters, children, seniors and recreational walkers
- Meet obligations under the *Commonwealth Disability Discrimination Act 1996* and Disability Standards for Accessible Public Transport
- Link with Safer Routes to Schools projects
- Allow the bike and pedestrian networks to complement each other (both existing and planned networks).

A recommended preferred option will complement the *Bike Plan and Pedestrian Access and Mobility Plan* (CVC and QED, 2008) by providing an additional pedestrian and cyclist connection over the Clarence River.

### 2.1.12 Clarenza Cycleway Options Study

The *Clarenza Cycleway Options Study* (CVC and Lewis Ford & Associates Consulting Engineers, 2012) identifies and assesses route options for the construction of a shared footpath/cycleway facility between the existing shared path north of the South Grafton Railway Station and the McAuley Catholic College in Hennessy Drive, off the Pacific Highway at Clarenza.

The study presents a route between South Grafton Railway Station and the Pacific Highway (near Bunnings Warehouse), four route options between the Pacific Highway (near Bunnings Warehouse) and the South Grafton Levee Crossing and two route options between the levee crossing and the McAuley Catholic College.

At its meeting in June 2012, Council adopted an alignment for the cycleway and decided to commence discussions with RMS on the options of a bridge or tunnel crossing of the existing Pacific Highway.

A recommended preferred option for an additional crossing of the Clarence River at Grafton will have the potential to complement the proposed footpath/cycleway to Clarenza by providing a footpath/cycleway on the new bridge which could be linked to the Clarenza cycleway.

### 2.1.13 South Grafton Heights Precinct - A Strategy for the Future

The *South Grafton Heights Precinct - A Strategy for the Future* (CVC, 2007) aims to:

- Identify areas in South Grafton for future residential development
- Ensure that future residential development is compatible with local character and amenity
- Ensure that future residential development and planning provisions have regard to relevant legislation and contemporary guidelines
- Provide strategic planning input into the Clarence Valley local growth management strategy.

The strategy provides for over 700 lots for residential development to about the year 2030 in the South Grafton Heights Precinct located on Bent Street, South Grafton.

Clarence Valley Council updated the strategy in November 2011 to enable a change of zoning on part of the Grafton and District Golf Course site. The proposed zone is Rural (Residential) or similar with the intention to enable development of large residential lots consistent with the rural-residential allotments on the opposite side of Bent Street. The amended strategy was placed on public exhibition between February and March 2012. The *Clarence Valley Local Environmental Plan* 2011 (CVLEP, December 2011) includes an update of the zoning around the golf course. Part of the RE2 (Private Recreation) has been rezoned to R5 (Large Lot Residential).

A recommended preferred option will provide an additional transport link over the Clarence River that would meet the future transport demands generated by the *South Grafton Heights Precinct - A Strategy for the Future* (CVC, 2007) development.

### 2.1.14 Upgrading the Pacific Highway: Technical Review of Inland Corridor (via Summerland Way)

*Upgrading the Pacific Highway: Technical Review of Inland Corridor (via Summerland Way)* (RTA, 2006) is a strategic document that reviews an inland transport corridor as an alternative to the Pacific Highway between Grafton and Tyagarah/Ewingsdale. The technical review consists of an assessment of two alternative inland routes and compares the outcomes of the assessment

against the outcomes of planning investigations for upgrading the Pacific Highway between Grafton and Tyagarah/Ewingsdale.

The technical review concludes that the inland corridor is not a viable alternative to upgrading the Pacific Highway because:

- It would not take substantial volumes of traffic off the Pacific Highway
- The traffic that would use the Summerland Way would not justify the cost of the upgrade
- It would cost more than the Pacific Highway upgrade
- The Pacific Highway would require upgrading even if the Summerland Way were upgraded
- The majority of traffic remaining on the Pacific Highway would require continuing investment to upgrade the highway even if the inland corridor were built
- It would have to be completed in one stage, which means that other sections of the Pacific Highway identified for upgrade would be delayed.

While the report does not identify the Summerland Way as the preferred transport corridor, it remains a State road. A recommended preferred option for an additional crossing of the Clarence River at Grafton has the potential to improve access to the State road network as well as addressing local traffic issues by responding to the existing and future local transport demands between Grafton and South Grafton.

### 2.1.15 Draft NSW Freight and Ports Strategy

The *Draft NSW Freight and Ports Strategy* (TfNSW, 2012) aims to support economic growth in NSW through the delivery of an efficient and effective freight route.

The draft strategy was released for public comment in November 2012. The final strategy is due for release in mid-2013.

The strategy includes a case study regarding links to the northern rivers – Woodenbong to Legume. The case study notes that there have been a number of proposals in recent years for the development of upgraded links between the Northern Rivers and South East Queensland. In particular, there have been proposals to upgrade the Summerland Way north of Kyogle as an alternative route to the Pacific Highway and to provide access to a proposed industrial and distribution precinct at Bromelton near Beaudesert. In addition, there have been requests to upgrade the section of Main Road 622 between Woodenbong and Legume.

The case study concludes that while both these projects would provide benefits in the long term, the substantial costs involved make it difficult for them to be ranked at the top of the priority list. However, strategic upgrading projects that will improve road safety, reduce travel times and facilitate aces by high productivity vehicles are likely to be warranted.

This is consistent with *Upgrading the Pacific Highway: Technical Review of Inland Corridor (via Summerland Way)* (RTA, 2006) as described above and also consistent with the project assumption that the Pacific Highway will continue to be the priority designated freight route for heavy vehicles travelling between Sydney and Brisbane.

A recommended preferred option for an additional crossing of the Clarence River at Grafton has the potential to improve access to the State road network as well as addressing local traffic issues by responding to the existing and future local transport demands between Grafton and South Grafton.

### 2.1.16 Trans Regional Amalgamated Infrastructure Network (TRAIN)

The Trans Regional Amalgamated Infrastructure Network (TRAIN) proposal is for a network of road, rail and water infrastructure covering a large area of north-eastern NSW and south-eastern Queensland.

The TRAIN proposal was one of 59 projects submitted in 2011 to Infrastructure Australia for consideration and assessment, as noted in *Communicating the Imperative for Action* report to the Council of Australian Governments (Infrastructure Australia, June 2011). However, the TRAIN proposal was not one of the 47 projects that were included in the 2011 Infrastructure priority list in Appendix C of the report. Six of the projects on the priority list (including the upgrade of the Pacific Highway) were identified as 'Ready to Proceed' projects while another seven projects were recommended for project development funding.

The TRAIN proposal is not included in the 42 project submissions listed in the 2012 report *Infrastructure Australia Progress and Action* (Infrastructure Australia, June 2012), and is not included in the 2012 Infrastructure priority list in Appendix D of the report. The Pacific Highway upgrades remain on the 2012 Infrastructure priority list under the 'Ready to Proceed' category.

A recommended preferred option for an additional crossing of the Clarence River at Grafton will provide improved access for heavy vehicles to the Summerland Way, noting however, the Pacific Highway is the main freight corridor for vehicles travelling between Brisbane and Sydney through northern NSW.

### 2.1.17 Ecologically sustainable development principles

Application of the ecologically sustainable development principles began through the identification of constraints relevant to the additional crossing. These constraints guided the development of preliminary route options and the selection of the short-list of route options. Social, environmental, economic and engineering design evaluation criteria used in the project also reflect the ecologically sustainable development principles outlined below.

Schedule 2, numeral 7 of the NSW *Environmental Planning and Assessment Regulation 2000* defines the ecologically sustainable development principles as follows:

a) **The precautionary principle**, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

   i. careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment

   ii. an assessment of the risk-weighted consequences of various options

b) **Inter-generational equity**, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations

c) **Conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration

d) **Improved valuation, pricing and incentive mechanisms**, namely, that environmental factors should be included in the valuation of assets and services, such as:

i. polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement

ii. the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste

iii. environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Further, under Section 3A of the *Environment Protection Biodiversity Conservation Act 1999*, the principles of ecologically sustainable development require:

- Decision-making processes to effectively integrate both long-term and short-term environmental, economic, social and equitable considerations
- Consideration of the precautionary principle
- Consideration of inter-generational equity
- Conservation of biological diversity and ecological integrity
- Improved valuation, pricing and incentive mechanisms to be considered.

The ecologically sustainable development principles will continue to be considered during the concept and detailed design, construction, operation and decommissioning stages of the project.

# 3 Route options

This chapter summarises the process followed for selection of the six route options and then describes the further design development and refinement of these route options undertaken as part of the route options assessment (*Route Options Development Report* (RMS, September 2012)).

## 3.1 Identification of the short-list of route options

In December 2010 RMS announced a revised approach to engage more effectively with the community and stakeholders in identifying a preferred option for an additional crossing.

A community update issued in December 2010 identified 13 preliminary route options, including options suggested by the community, and invited community comment via a postal survey. Subsequent phone and business surveys were also carried out. A total of 437 responses to the postal survey were received between 6 December 2010 and 8 March 2011. Respondents to the postal survey identified a total of 28 additional suggestions for the additional crossing. These, together with the 13 identified in the December 2010 community update, brought the total number of suggestions for an additional crossing to 41.

In June 2011, RMS published the *Feasibility Assessment Report* which describes the assessment undertaken on the 41 suggestions identified following the December 2010 to March 2011 community consultation period. Twenty-five preliminary route options in five corridors were identified for engineering and environmental investigation.

Following the release of the June 2011 *Feasibility Assessment Report*, the project team undertook engineering refinements on the 25 preliminary route options. A comparative assessment process was also undertaken to identify the best option or options within each corridor. The outcomes of the technical investigations, community feedback, and the community and stakeholder evaluation workshop provided the inputs to the short-listing process.

The selection of the short-list of options included a TfNSW and RMS workshop. The workshop concurred with the five options (Options E, A, 11, 14 and 15) recommended by the November 2011 community and stakeholder evaluation workshop. The workshop also concluded that Option C should also be included in the short-listed options as, on balance it was the best performing option within Corridor 2.

In January 2012, six route options (Options E, A, C, 11, 14 and 15) were announced for further investigation. The short-listing process is documented in *the Preliminary Route Options Report – Final* (RMS, January 2012).

## 3.2 Development of route options

Following the announcement of the six short-listed options in January 2012, further design development and refinement of the route option was carried out. The purpose was to develop the design of each option ensuring that the layouts would meet the broad project objectives in terms of traffic capacity, functionality, and compliance with RMS technical requirements while also addressing to the extent possible the constraints and opportunities identified in the earlier investigations and feedback from the display of the *Preliminary Route Options Report - Final* (RMS, January 2012).

The project team developed the design and layout of each option in sufficient detail to allow further investigations to be carried out and subsequently to allow the comparative assessment of the route options.

The development of the route options was informed by input from the traffic modelling, RMS design guidelines, geotechnical surveys, safety assessments and the locations of major public utilities. The traffic modelling was a critical input since it determined the extent of layout improvements and upgrades necessary for each option to meet the key project objective and supporting objective related to traffic efficiency.

In September 2012, RMS published the *Route Options Development Report* which documents the further investigations and comparative assessment carried out on the six route options.

## 3.3 Key features of route options

This section provides details on the key features of each of the six route options. These are summarised in Table 4 and shown in Figure 6.

Plans of the six route options were included in the September 2012 Community Update that was made widely available during the display of the *Route Options Development Report* (RMS, September 2012). Detailed descriptions of the options are provided in the *Route Options Development Report* (RMS, September 2012).

Table 4: Route options

| Option | Summary of the location in relation to existing bridge | Connection | River bridge length (m) | Viaduct length (including minor waterway structures) (m) | Traffic lane arrangement for new bridge | Traffic lanes arrangement for existing bridge | Pedestrian/ cyclist shared path location | Minimum maritime clearance for the navigable channel (m) as agreed with NSW Maritime (now part of RMS)* | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Horizontal | Vertical |
| E | Upstream | Cowan St, South Grafton to Villiers St, Grafton | 618 | 68 | 1 northbound lane and 1 southbound lane | 1 northbound lane and 1 southbound lane | Downstream side of bridge | 2 clear channels of 35 m each | 9.1 |
| A | Upstream | New bridge parallel to and immediately upstream of the existing bridge connecting Bent St, South Grafton and Fitzroy St, Grafton | 471 | 145 | 2 northbound lanes and 1 southbound lane | 1 southbound lane | Upstream side of bridge | 2 clear channels of 35 m each | 9.1 |
| C | Downstream | Junction of the Pacific Hwy and the Gwydir Hwy, South Grafton to Pound St, Grafton | 458 | 122 | 1 northbound lane and 1 southbound lane | 1 northbound lane and 1 southbound lane | Upstream side of bridge | 2 clear channels of 35 m each | 9.1 |
| 11 | Downstream | The existing Pacific Hwy north of South Grafton to Fry St, Grafton | 387 | 450 | 1 northbound lane and 1 southbound lane | 1 northbound lane and 1 southbound lane | Upstream side of bridge | 2 clear channels of 35 m each | 17 |
| 14 | Downstream | The existing Pacific Hwy north of South Grafton to North St, Grafton, via Kirchner St | 617 | 1068 | 1 northbound lane and 1 southbound lane | 1 northbound lane and 1 southbound lane | Upstream side of bridge | 2 clear channels of 35 m each | 17 |
| 15 | Downstream | The existing Pacific Hwy north of South Grafton to the Summerland Way north of Grafton, via Kirchner St | 617 | 1128 | 1 northbound lane and 1 southbound lane | 1 northbound lane and 1 southbound lane | Upstream side of bridge | 2 clear channels of 35 m each | 17 |

* As agreed with NSW Maritime (now part of RMS).

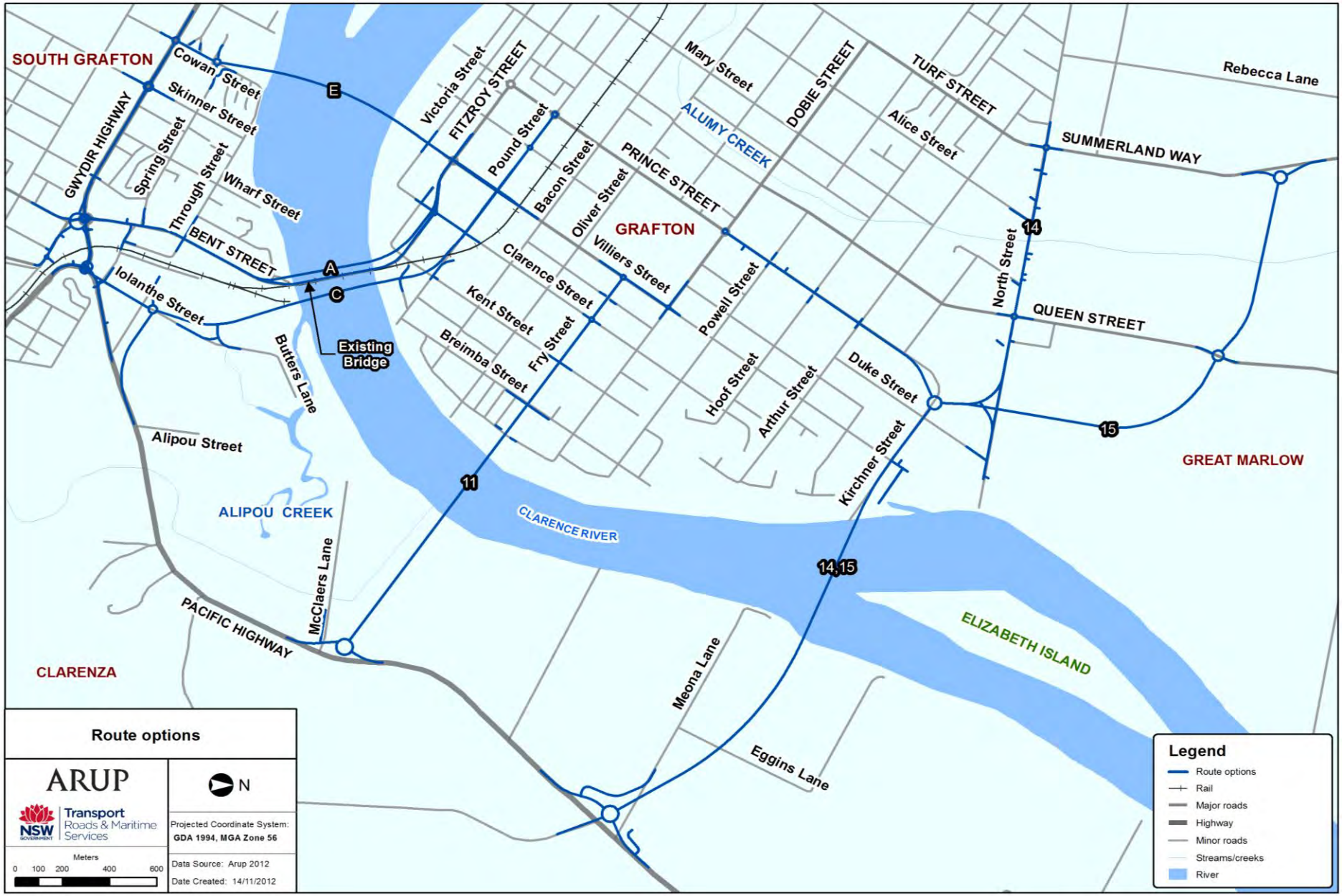


Figure 6: Route options for an additional crossing the Clarence River at Grafton

# 4 Community involvement and feedback following display of *Route Options Development Report*

This chapter provides a summary of the community involvement and feedback activities undertaken and feedback received following the release of the *Route Options Development Report* (RMS, September 2012).

## 4.1 Community and stakeholder consultation

### 4.1.1 Community consultation activities

The community involvement activities carried out during the display of the *Route Options Development Report* (RMS, September 2012) were:

- Telephone contact with property owners potentially directly affected by the six route options.
- Staffed display at Grafton Shoppingworld on 13 September 2012 from 10am to 5pm; and on 4 October 2012 from 10am to 5pm.
- Briefing session on 14 September 2012 for the community members invited to present at the public forum on 18 September 2012.
- Public forums at the Grafton Community Centre on 18 September 2012 from 6pm to 8pm, and on 9 October 2012 from 6pm to 8pm, recorded on video and made available on the project website.
- Information display at the Grafton Community Centre on 19 September 2012 from 11am to 2pm and 3pm to 6pm; and at the South Grafton Ex-Servicemen's Club on 25 September 2012 from 10am to 2pm.
- 2GF Radio forum on 10 October 2012 from 9am.
- Call for nominations between 10 September 2012 and 10 October 2012 from community members to participate in the value management workshop.
- Static (unstaffed) project displays at the following locations:
    - Roads and Maritime Services Pacific Highway Office, 21 Prince Street, Grafton.
    - Roads and Maritime Services Motor Registry Office, 3 King Street, Grafton.
    - Roads and Maritime Services Regional Office, 31 Victoria Street, Grafton.
    - Grafton Council Chambers and Grafton Library, 2 Prince Street, Grafton.
    - Ulmarra Petrol Station/Post Office, Pacific Highway, Ulmarra.
    - South Grafton News and Gifts store, 38 Skinner Street, South Grafton.
    - General Store Coutts Crossing, Armidale Road, Coutts Crossing.
    - Junction Hill Family Store, 5 Casino Road, Junction Hill.
    - Maclean Council Office, 50 River Street, Maclean.
    - Yamba Library, Wooli Street, Yamba.

- Project online discussion forum on the project website (http://haveyoursay.nsw.gov.au/graftonbridge). Members of the community were able to register and post their comments and views on the route options until 10 October 2012.
- Interactive maps were accessible online from the project website showing issues and potential constraints associated with the route options were available to the community (www.rms.nsw.gov.au/graftonbridge).
- Traffic modelling simulations were accessible online from the project website showing 2011 peak hour travel across the existing bridge and 2019 and 2049 peak hour travel across each route option (www.rms.nsw.gov.au/graftonbridge).
- Toll free project information line and email address provided the opportunity for members of the Grafton community and other stakeholders to contact the project team with any comments or questions they had regarding the *Route Options Development Report* (RMS, September 2012).
- Invitation to comment on the *Route Options Development Report* (RMS, September 2012) between 10 September and 12 October 2012. Feedback on the *Route Options Development Report* (RMS, September 2012) was accepted at the staffed displays and information sessions, via the project website, mail, toll free project information line, email or hand delivery.
- Publication of a detailed Community Update outlining options and key findings from the *Route Options Development Report* (RMS, September 2012).
- Publication of all relevant project documents on the project website (www.rms.nsw.gov.au/graftonbridge).
- RMS staff were also available to talk with the community one on one at the Prince Street office.

The feedback received from these activities is summarised in Chapter 4.2. A report on the submissions received and RMS' responses to the issues raised is provided in Appendix 1.

### 4.1.2 Stakeholder consultation activities

RMS also carried out further consultation with a number of stakeholders within the project area since the release of the *Route Options Development Report* (RMS, September 2012) as summarised in Table 5.

A register of all meetings undertaken as part of the project is provided on the project website: www.rms.nsw.gov.au/graftonbridge

Table 5: Stakeholder consultation since the release of the *RODR* (RMS, September 2012)

| Stakeholder | Consultation date | Topics discussed |
|---|---|---|
| Clarence Valley Council | October 2012 | • Update on the project<br>• Potential impacts on planning for Corcoran Park<br>• Concerns and queries regarding the preferred option selection process<br>• Options 14 and 15 and how they relate to Kirchner Street<br>• Options 14 and 15 and future access to the park and boat ramp facilities |
| Fire and Rescue in Grafton and South Grafton and the Ambulance Service of NSW in Grafton | October 2012 | • Fire and ambulance servicing areas<br>• Use of existing crossing<br>• Route options<br>• Services response times |

| Stakeholder | Consultation date | Topics discussed |
|---|---|---|
| Potentially affected residents | Various | • The short-list and the process to select the options<br>• Technical investigations<br>• Property impacts/issues<br>• Community issues |
| Grafton Chamber of Commerce and Industry | October 2012 | • Update on the project and process to short-list<br>• Summary of the options<br>• Demonstration of the traffic visualisations<br>• Next steps |

## 4.2 Feedback received

Feedback has been received through the various community and stakeholder consultation activities carried out for the project, as described in Chapter 4.1.1 and 4.1.2.

This chapter provides a snapshot of the respondents and issues raised since the release of the *Route Options Development Report* (RMS, September 2012). Full details of the feedback received are presented in Appendix 1.

Two submissions identified errors in technical papers in Volume 2 of the *Route Options Development Report* (RMS, September 2012). In response to the submissions, the summary of heritage items in the vicinity of the short-listed options in *Technical Paper: Non-Aboriginal Heritage* has been updated and *Technical Paper*: *Noise Assessment* has been updated to include three noise loggers that were omitted from the noise study and the technical paper due to a lack of, or spurious, data being recorded at these locations. The corrections made to these technical papers have not altered the results of the investigations, discussions or recommendations of the reports.

A total of 118 submissions were received between Monday 10 September and Friday 19 October 2012 in response to the display of the *Route Options Development Report* (RMS, September 2012). A summary of submissions received is outlined in Table 6.

Table 6: Summary of submissions received

| Submission group types | Number of submissions received |
|---|---|
| Individuals | 106 |
| Community groups (each accompanied by a petition) | 2 |
| Government agencies | 2 |
| Businesses | 3 |
| Non-government organisations | 5 |
| **Total** | **118** |

As noted in Table 6 two petitions were received by the project team. One petition included 203 signatures collected in 2012. The other petition was a copy of a petition originally submitted in 2011 that was resubmitted during the *Route Options Development Report* (RMS, September 2012) display period. This petition included about 1000 signatures collected during 2010 and 2011. Both petitions were coordinated by community groups that have participated in the public forums and maintained an interest in the project.

A total of 64 comments by 18 users were also posted on the online discussion forum.

### 4.2.1 Overview of issues raised

The community and stakeholder feedback received has been examined to identify the issues raised. The issues identified have been collated and corresponding responses to the issues have been provided and are documented in Appendix 1.

Submissions covered a wide range of issues of concern to the community and stakeholders, including traffic and transport, socio-economic, environmental, cost, value for money and other concerns. One issue raised in many submissions centred on a key aim of the project, to improve traffic efficiency between Grafton and South Grafton. Respondents were however divided on the core goal of the crossing.

Submissions were received expressing support for and opposing each of the options with the majority of the submissions providing comment about why they supported or opposed an option or options. Many submissions either indicated a preference for an option away from the existing bridge described as 'out of town options' or a 'bypass of Grafton CBD', or for an option near the existing bridge, described as 'in town' options.

The submissions that opposed options close to the existing bridge generally argued in favour of options located away from and up or downstream of the existing bridge. Growth of the city and removing heavy traffic from the CBD were cited as the primary reasons for choosing a downstream option.

Supporters for options close to the existing bridge generally argued that these options would be well used and would relieve existing traffic congestion and provide a convenient alternative for existing communities. These submissions also expressed concern about and opposition to the 'out of town options', including concerns that these options would be ineffective in reducing traffic congestion and were too expensive.

Key issues raised, in no particular order, are:

- The importance of the unique, nationally recognised, historical aspects of Grafton valued by the community, including avenues and individual trees, affordable and heritage listed housing, community connectivity, local businesses and local amenities
- The need to protect the fabric of Grafton and avoid irreversible changes to areas of high amenity, heritage, natural and cultural value
- General agreement that relief of traffic congestion was required, but disagreement about how this could be best achieved
- A desire to minimise the amount of heavy vehicle traffic within the centre of Grafton, near schools and other sensitive locations
- Concern about introducing traffic and associated noise and air quality impacts to areas currently not subject to substantial traffic volumes
- The value placed on the relationship of the town to the river and opportunities to protect and enhance recreation and natural and heritage features
- The future of the region and Grafton's location relative to growth areas within the NSW north coast and south east Queensland
- Transport requirements for existing and growing urban areas, agriculture and industry in the region and inter-state and the role of Summerland Way within this context
- Concern about the flooding and drainage issues that affect the town and how particular options might exacerbate them

- Alternative suggestions about how congestion might be relieved by reducing demand for car travel before a long term solution is implemented
- The need to maintain and improve the viability of bus services and ensure that bus users are not disadvantaged
- A dissatisfaction with current levels of traffic noise and traffic volumes, and driver behaviour of heavy vehicles and B-doubles in particular
- Disagreement with the adequacy, scope and findings of the traffic investigations and the supporting traffic counts and population projections underpinning the conclusions of the *Route Options Development Report* (RMS, September 2012)
- Stated lack of trust in the findings of the traffic study and components was used as an argument in support of alternative views on the utilisation of particular options and the related benefit-cost ratios of the options
- Appreciation of the opportunity to participate in decision making but frustration with the cost, time and multiple processes required to resolve the issue
- The need to take a long term view and ensure that investigations were based on accurate information about the likely future needs and character of the city
- Ensuring the safety of other more vulnerable road users such as pedestrians, cyclists and school children.

There was general agreement that any option needs to address:

- The problems of congestion impeding free access between urban areas on either side of the river
- The current and future needs of Grafton, surrounding suburbs and users of regional and inter-state transport
- The delay caused by trucks and other large vehicles crossing the bridge
- Access for emergency vehicles across the river
- The impact of the additional crossing on flood flows, flood mitigation works and shifting islands
- The protection of heritage, community amenity and safety and ecologically significant areas.

Issues identified by the community along with further community feedback received on this report will be considered before a decision is made on the preferred option.

### 4.2.2 Responses to issues raised

The feedback received since the release of the *Route Options Development Report* (RMS, September 2012) and the responses to each of the issues raised are described in detail in Appendix 1.

## 4.3 Value management workshop

Community members were invited to nominate to participate in the value management workshop. Participants in the value management workshop included members of the community, key stakeholders, the project team, Clarence Valley Council and government agencies. The workshop was held following the display of the *Route Options Development Report* (RMS, September 2012) in Grafton on 23 and 24 October 2012. The outcomes of this workshop are presented in Appendix 2 and summarised in Chapter 5.1.

## 4.4 Independent review

An independent peer review of the traffic and transport assessments and best practice community consultation for this project was undertaken by Professors Graciela Metternicht and John Black from the Institute of Environmental Studies, Faculty of Science at the University of New South Wales (UNSW).

The verification process included an independent peer review of the published reports on traffic assessment of the route options for an additional crossing of the Clarence River at Grafton. It also included a review of the community consultation processes including:

- Attending the public forums at the Grafton Community Centre on 18 September 2012 from 6pm to 8pm, and on 9 October 2012 from 6pm to 8pm
- Attending the 2GF Radio forum on 10 October 2012 from 9am
- Attending part of the value management workshop on 23 and 24 October 2012
- Reviewing submissions from the community on the six route options identifying specific issues raised on the traffic studies.

The peer review of the traffic and transport assessments concluded that:

"*The information base and modelling exercises undertaken by the consultants to RMS are more than adequate for the purposes of informing the selection of the preferred route bearing in mind all options are evaluated with one common set of traffic assumptions*".

The review of best practice community consultation for the project concluded that:

"*The (additional crossing of the Clarence River) case study analysis shows that the project team approach to community involvement and communication fulfilled the RMS policy, in regards to information gathering, consultation, community involvement and partnering with the public in the development of alternatives and the identification of the preferred solution. Furthermore, the research results show that most community involvement outcomes sought by the RMS policy have been achieved. Additional participatory techniques for improved consultation and collaboration (e.g. participatory mapping, scenario analysis) may be considered by RMS in the future to foster co-decision, that is, the cooperation with stakeholders towards an agreement for solution and implementation of the preferred option."*

## 4.5 Future community and stakeholder involvement activities

Upcoming community involvement activities include:

- Display of this report for community comment
- Staffed displays.

Community comments are invited. These can be provided by sending an email to graftonbridge@rms.nsw.gov.au, writing to Grafton Bridge project, PO Box 546, Grafton NSW 2460, phoning 1800 633 332 (free toll) or visiting the shop front at the Pacific Highway office on 21 Prince Street, Grafton.

Community feedback on the recommended preferred option will be considered before a final decision is made on the preferred option for an additional crossing of the Clarence River at Grafton.

# 5 Assessment of the route options

This chapter describes the value management process and the methodology followed for the assessment of the route options and recommendation of a preferred route. The assessment was informed by the traffic modelling and the technical and environmental investigations described in the *Route Options Development Report* (RMS, September 2012).

## 5.1 Value management process

A value management workshop was held in Grafton on Tuesday 23 and Wednesday 24 October 2012. The value management workshop was a facilitated forum where participants reviewed, assessed and evaluated the route options against agreed assessment criteria.

The purpose of the workshop was for participants to discuss the six route options to gain a shared understanding of which option provides the best balance across functional, socio-economic and environmental issues, while also taking cost and value for money into consideration.

The workshop participants, methodology and outcomes are further documented in Appendix 2.

### 5.1.1 Workshop participants

Community members were invited to nominate to participate in the workshop by completing a nomination form included in the September 2012 Community Update. Those who nominated were required to attend a pre-workshop briefing on Tuesday 16 October 2012 from 6pm to 8pm at Grafton Community Centre, and be either:

- A property owner, resident or business owner/tenant impacted on or near one of the route options, or
- A regular bridge user who does not live in the vicinity of one of the route options.

At the close of the briefing session on Tuesday 16 October, those community members who nominated to participate in the workshop were requested to break up into seven groups and self-select one participant from each group to attend the workshop. Six of the groups were based on being a resident or business owner/tenant impacted on or near one of the route options. The seventh group was based on being a regular bridge user. A reserve was also identified for each group in case the selected participant was unable to attend the workshop.

Where three or more members of the group wished to participate in the workshop and the group could not self-select a participant and reserve, the names of those people wishing to participate in the workshop were placed into a hat and names were randomly selected by the briefing facilitator. Where two members of the group wished to participate in the workshop and the group could not self-select a participant and reserve, the participant and reserve were selected by the toss of a coin by the briefing facilitator.

Representatives of key stakeholders were also invited to participate in the value management workshop.

An information pack was provided to the selected participants and representatives of key stakeholders. It included:

- *Route Options Development Report* (RMS, September 2012)
- September 2012 Community Update

- The draft executive summary of the *Proposal for Additional Bridge Crossing of the Clarence River at Grafton - Peer Review of Traffic and Transport and Best Practice Community Consultation* (UNSW, October 2012)
- *Draft Route Options Community Feedback Report* (RMS, October 2012)
- Presentation from the briefing session.

Further information was available for participants at the workshop including:

- A memorandum summarising feedback from the emergency services
- *Proposal for Additional Bridge Crossing of the Clarence River at Grafton - Peer Review of Traffic and Transport and Best Practice Community Consultation* (UNSW, October 2012)
- Updated technical papers from the *Route Options Development Report* (RMS, September 2012) including:
    - *Technical Paper: Social and Economic Issues* (to include the results of the additional business surveys)
    - *Technical Paper: Non-Aboriginal Heritage* (to address community feedback, refer to Chapter 4.2)
    - *Technical Paper: Noise Assessment* (to address community feedback, refer to Chapter 4.2).

The workshop was led by an independent accredited facilitator. Participants at the workshop on 23 and 24 October 2012 included seven community members, six key stakeholders and six members of RMS or the project team. The community participants were residents or business owners impacted on or near each of the route options and a regular bridge user. Key stakeholders included participants from the Department of Planning and Infrastructure, Grafton Chamber of Commerce and Industry, NSW Police and Emergency Services, Clarence Valley Council, Grafton-Ngerrie LALC and the freight industry. The project team comprised five representatives of RMS and Arup.

Additional RMS and Arup project team members were at the value management workshop to provide background information, technical advice and support to the workshop participants.

### 5.1.2 Workshop methodology

At the workshop, participants discussed the issues associated with the existing bridge, listed their assumptions for assessing the options for the additional crossing, considered and developed weighted assessment criteria and evaluated the six route options against the assessment criteria to determine the group's recommended preferred option/s.

### 5.1.3 Workshop outcomes

The conclusions identified by the participants at the workshop were:

- The four focus groups formed from the workshop participants expressed preferences for either Option C or Option E or were unable to decide between Option E and Option C
- The workshop participants agreed that Options A, 11, 14 and 15 are the least preferred options as they did not perform as well as Options E and C when assessed against the option assessment criteria and the project objectives

- It was difficult to decide between Options E and C because:
  - Option C is the best performing option assessed against functional criteria
  - Option E is the best performing option assessed against environmental criteria
  - Options E and C performed equally well against socio-economic criteria
  - The capital cost and benefit-cost ratios for Options E and C were similar
- The workshop participants agreed that if Option C was selected as the preferred route option, additional consideration would need to be given to mitigating the adverse environmental impacts associated with Aboriginal heritage during construction, the impact on the material fabric of the town, visual experience of the bridge and the ecological impacts
- The workshop participants agreed that if Option E was selected as the preferred route option, additional consideration would need to be given to mitigating the adverse functional impacts associated with the pinch point at Villiers Street (freight movements in the town and the alternative route in emergencies), transport efficiency across the network and safety aspects.

The report on the value management workshop is included in Appendix 2.

## 5.2 Comparative assessment of route options

An option assessment workshop was conducted on Wednesday 31 October 2012 with the intent of selecting the recommended preferred option. The three key inputs into the workshop were:

- The findings of the technical investigations and specialist studies undertaken for the project documented in the *Preliminary Route Options Report – Final* (RMS, January 2012) and *Route Options Development Report* (RMS, September 2012)
- Feedback received from the community and key stakeholders
- Outcomes of the October 2012 value management workshop.

The workshop was a facilitated forum where participants reviewed the work undertaken at the value management workshop, in particular the assessment criteria, their weightings and the route option evaluation, and then re-evaluated the route options in an endeavour to determine a recommended preferred option.

### 5.2.1 Workshop participants

The workshop was led by an independent accredited facilitator. Participants at the workshop on 31 October 2012 included:

- Steve Arnold (RMS General Manager, Project Development)
- Bob Higgins (RMS Project Director)
- Ed Scully (RMS Infrastructure Communications Manager)
- Alison Nash (RMS Senior Environmental Officer)
- James Green (RMS Maritime)
- Ben Schnitzerling (Arup Project Director)
- Chris Clark (RMS Project Manager).

Additional RMS and Arup project team members and a representative of Clarence Valley Council provided background information, technical advice and support to the workshop participants.

### 5.2.2 Workshop methodology

Information was presented at the workshop including background information such as the context of the project, work undertaken to date and community feedback on the *Route Options Development Report* (RMS, September 2012).

Participants then reviewed the weighted assessment criteria developed at the value management workshop against the project objectives in the *Route Options Development Report* (RMS, September 2012), and refined and re-weighted the criteria as necessary to ensure that it reflected the project objectives. This is discussed further in Appendix 3.

Presentations were given based on information from the *Route Options Development Report* (RMS, September 2012) on the six route options in terms of the three categories of functional, socio-economic, and natural and built environment.

Following each presentation, the group conducted a comparative evaluation across the six route options with the refined assessment criteria. The evaluation was informed by available quantitative and qualitative data, including the findings of the technical investigations and specialist studies documented in the *Route Options Development Report* (RMS, September 2012). Workshop participants had the opportunity to put forward views based on the indicator results and their own knowledge and experience for discussion amongst the group.

When the relative rankings of the options were clear under each of the three categories of functional, socio-economic and natural and built environment, the cost and value for money criteria were introduced.

### 5.2.3 Workshop outcomes

The outcomes of the workshop were:

- The workshop participants concluded that Options E and C provided the best balance against the project objectives and functional, socio-economic, environmental, cost and value for money criteria and noted that the earlier value management workshop expressed a preference for these two options.
- The workshop participants found it difficult to decide between Options E and C for the following reasons:
    - Option E and C performed equally well against functional and socio-economic criteria.
    - Option E was considered the best performing option assessed against environmental criteria.
    - The capital cost and benefit-cost ratios for Options E and C were similar.
- The workshop participants agreed that Options A, 11, 14 and 15 are the least preferred options as they do not perform as well as Options E and C when evaluated against the project objectives and weighted assessment criteria.
- Option C may become the preferred option if emphasis was placed on the long term benefits to Grafton's future growth areas since it is closer to the proposed development areas south and south east of the river and its connection to the Pacific Highway for heavy vehicles servicing the town. However, Option C requires additional consideration to mitigating the potential adverse natural and built environmental impacts, including those associated with Aboriginal heritage during construction and the material fabric of the town.
- Option E may be the preferred option if the emphasis is placed on the need to link the South Grafton CBD and its existing residential areas with the Grafton CBD. Consideration needs to be

given to the substantially lower cost of Stage 1 of Option E ($146 million) than that of Stage 1 of Option C ($182 million). However, Option E does not cater for heavy vehicles servicing the Grafton CBD as well as Option C and additional consideration needs to be given to mitigating the adverse functional impacts associated with the traffic "pinch point" at the intersection of Villiers and Fitzroy Streets. There were also some concerns in terms of freight vehicles accessing the town and alternative routes in emergencies, transport efficiency across the network and relative safety aspects that would need to be addressed.

It was agreed that the group should reconvene at another workshop to carry out a more detailed evaluation and comparison of Options E and C, with a sensitivity analysis, in order to identify a recommended preferred route.

The report on the assessment workshop is included in Appendix 3.

## 5.3 Comparative assessment of Options E and C

A second option assessment workshop was held on Monday 12 November 2012. This workshop was a facilitated forum where participants further evaluated Options E and C in order to determine a recommended preferred option.

### 5.3.1 Workshop participants

The workshop was led by an independent accredited facilitator. Participants at the workshop on 12 November 2012 included:

- Bob Higgins (RMS Project Director)
- Ed Scully (RMS Infrastructure Communications Manager)
- Alison Nash (RMS Senior Environmental Officer)
- James Green (RMS Maritime)
- Ben Schnitzerling (Arup Project Director)
- Chris Clark (RMS Project Manager)
- Craig Leckie (RMS Network Manager, Hunter Region).

Additional RMS and Arup project team members and a representative of Clarence Valley Council provided background information, technical advice and support to the workshop participants.

### 5.3.2 Workshop methodology

A brief summary of the first option assessment workshop was presented at the workshop by the facilitator.

Participants then reviewed the conclusions reached at the end of the first option assessment workshop and considered further information focused on the established and weighted assessment criteria on the two options that previous workshops had concluded were the most likely options to proceed (being either Option E or Option C).

Further information focusing on the assessment criteria was collated and presented by the project team to assist with the comparative assessment of Options E and C.

The Stage 1 scope of works and costs for Options E and C were looked into in more detail for the second assessment workshop. As a result, the Stage 1 costs for Option C were revised as shown

in Table 7 below. Further details of the revised Stage 1 costs for Option C can be found in Chapter 6.2.7.

Table 7: Indicative Stage 1 costs

| **Indicative Stage 1 costs** | **Option E** | **Option C** |
|---|---|---|
| *RODR* indicative Stage 1 costs | $146 million | $182 million |
| Revised indicative Stage 1 costs | $146 million | $161million |

The project team also revisited the future land uses in the Grafton area as presented in the Mid North Coast Regional Strategy (Figure 7) and collated figures showing the traffic origins and destinations for trips in the 2010 surveys and 2049 model. These figures are shown in Figure 8, Figure 9, Figure 10, Figure 11, Figure 12 and Figure 13 and summarised in Table 8 and Table 9 below.

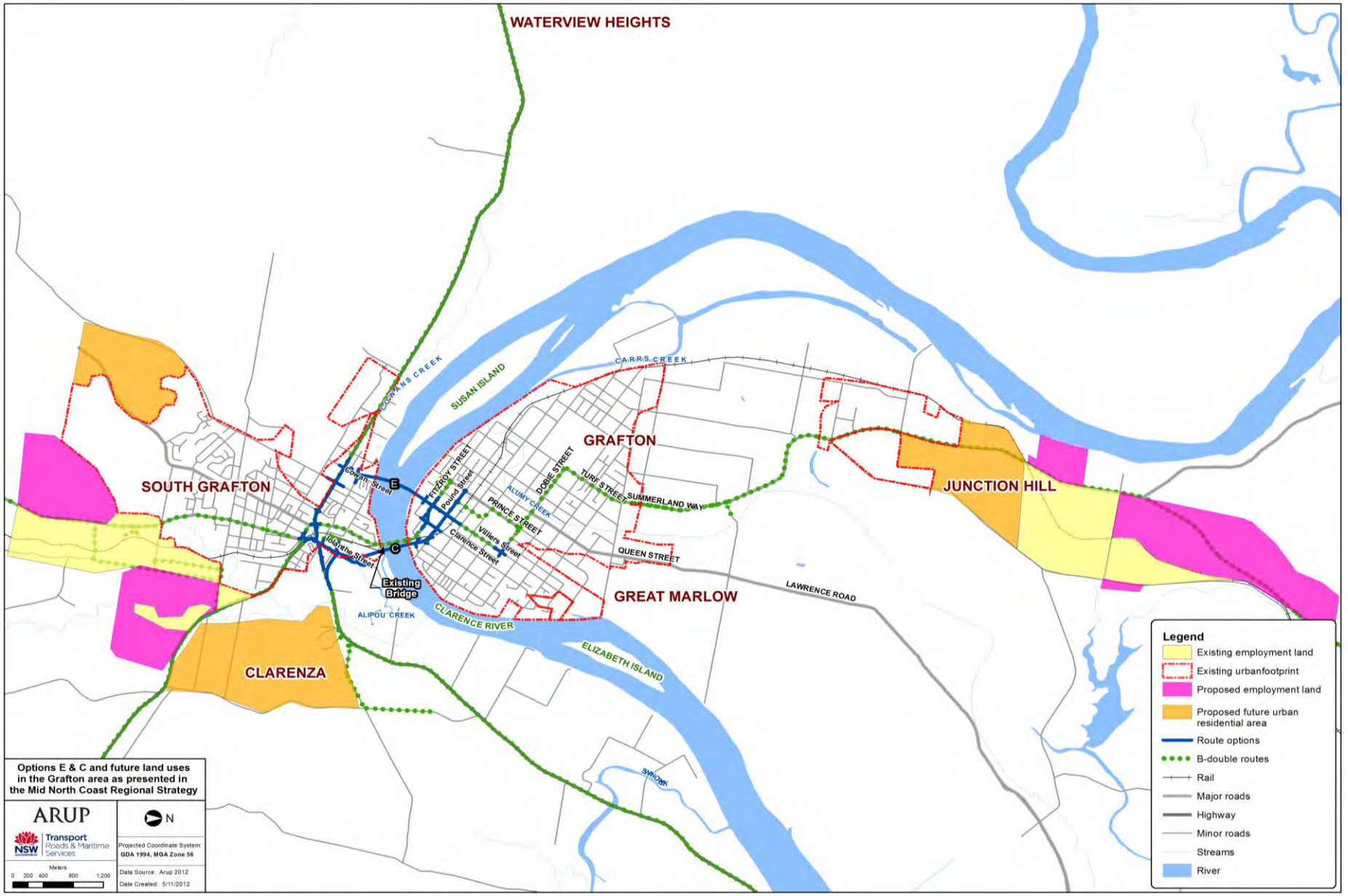


Figure 7: Future Land uses in the Grafton area as presented in the *Mid North Coast Regional Strategy* (DP&I, 2009)

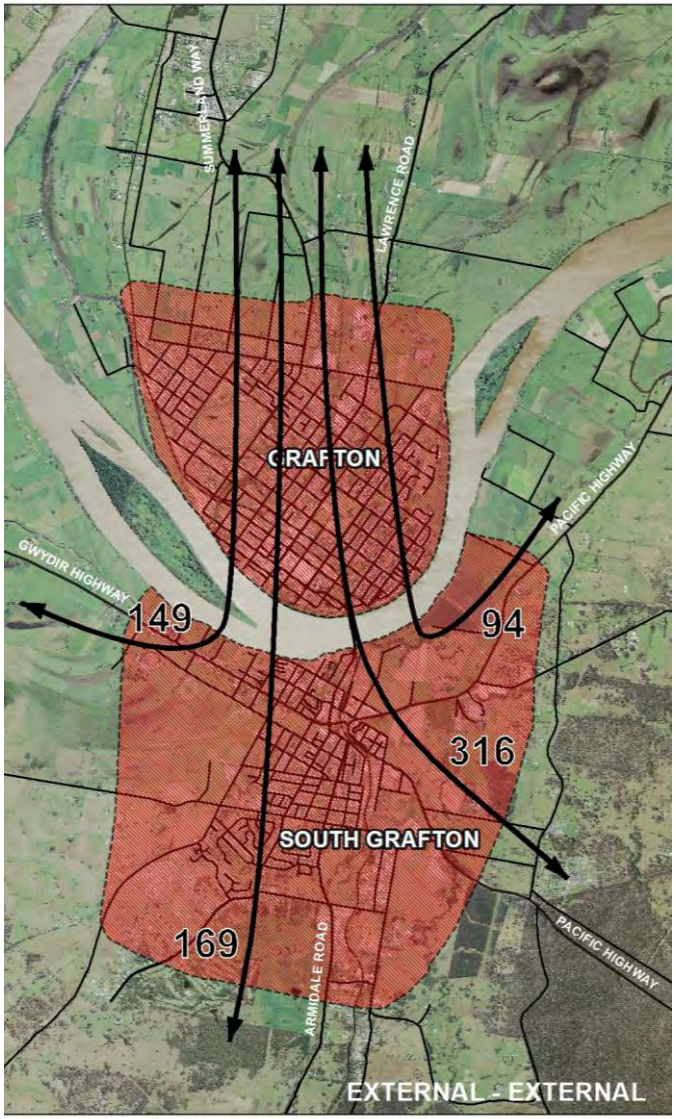


Figure 8: External to external daily cross river volumes for all vehicles in 2010

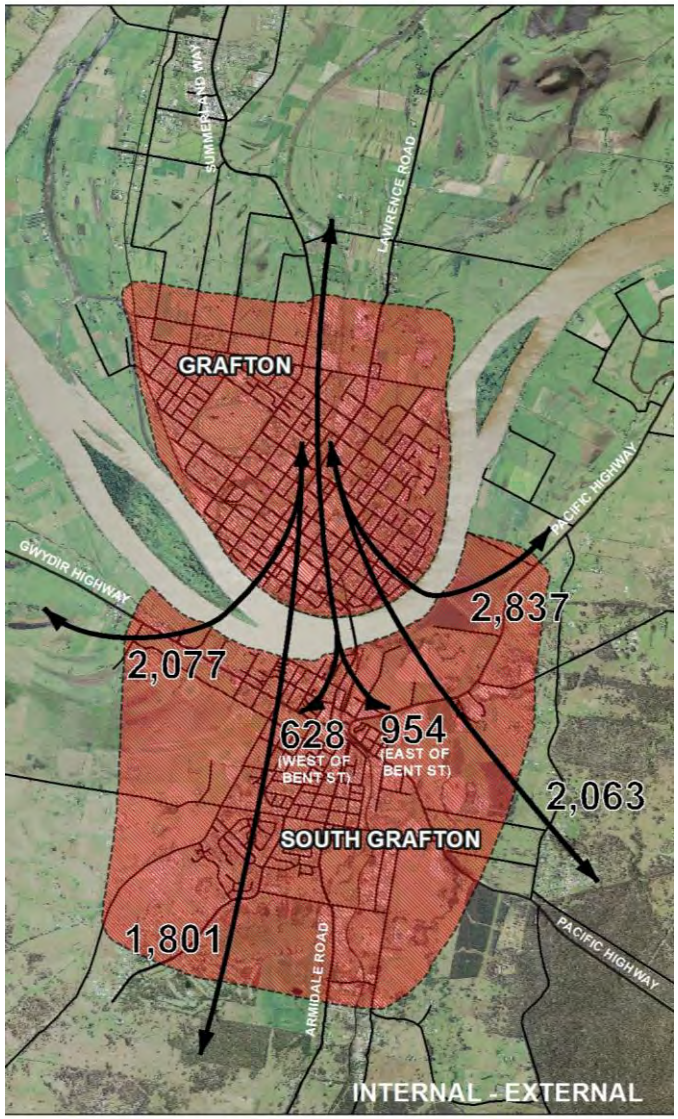


Figure 9: Internal to external daily cross river volumes for all vehicles in 2010

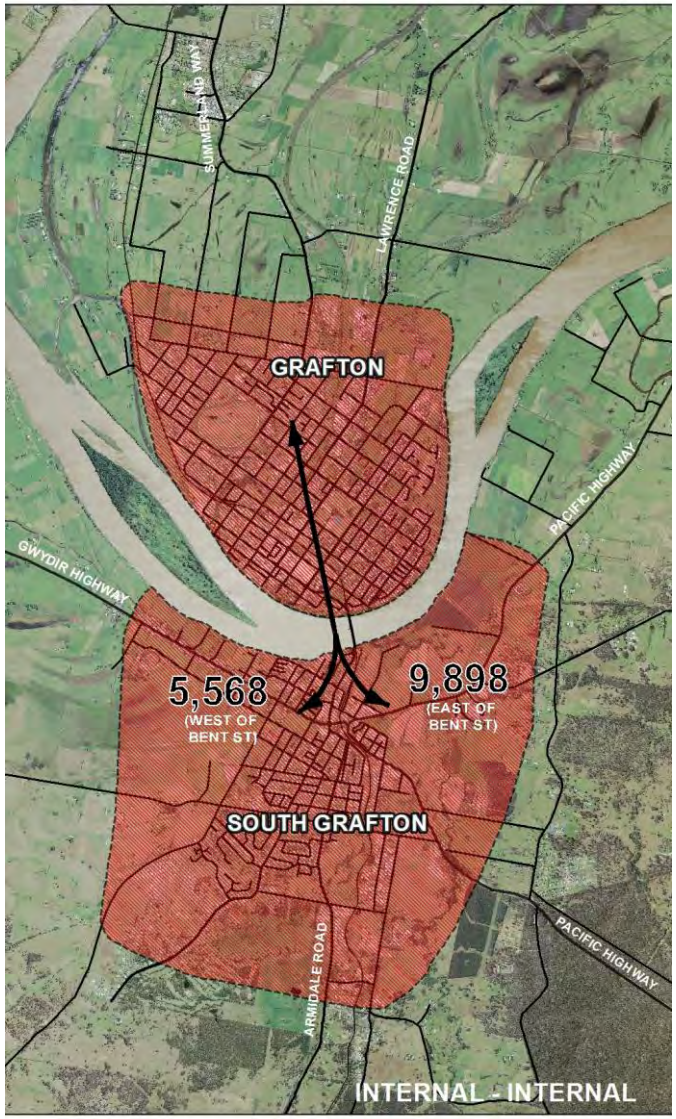


Figure 10: Internal to internal daily cross river volumes for all vehicles in 2010

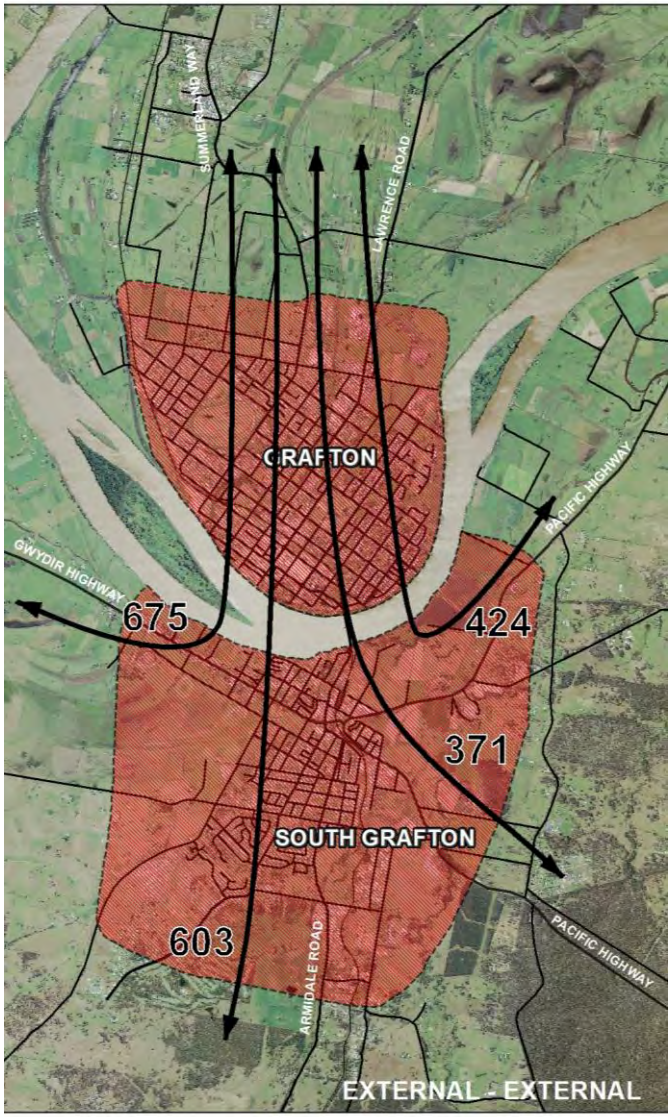


Figure 11: External to external daily cross river volumes for all vehicles in 2049

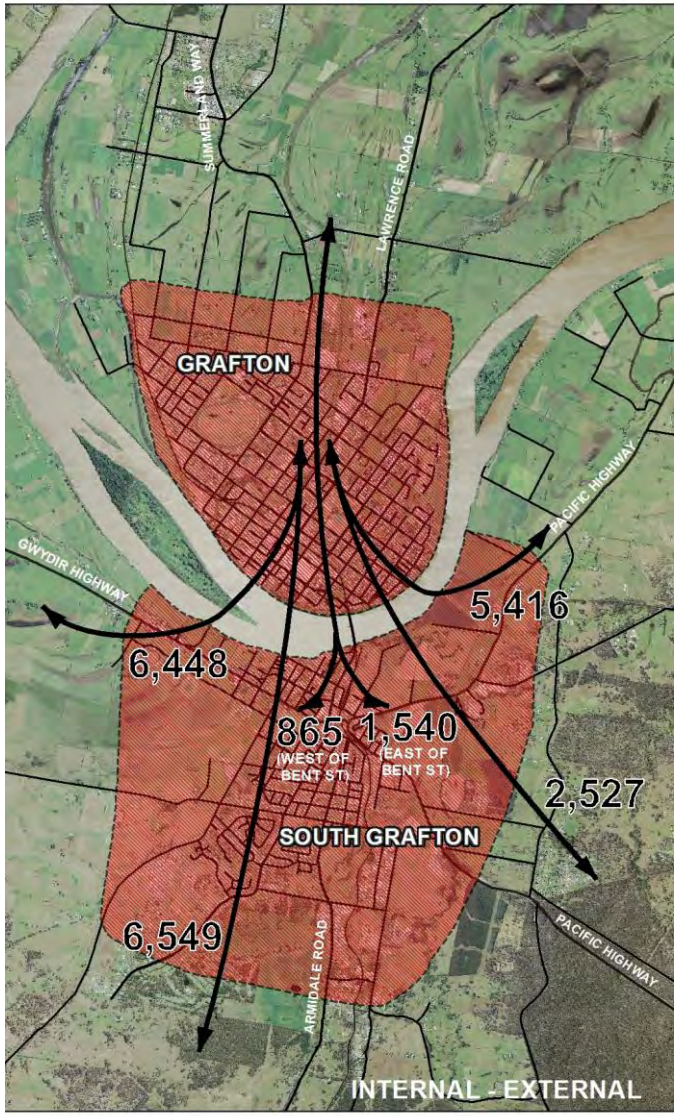


Figure 12: Internal to external daily cross river volumes for all vehicles in 2049

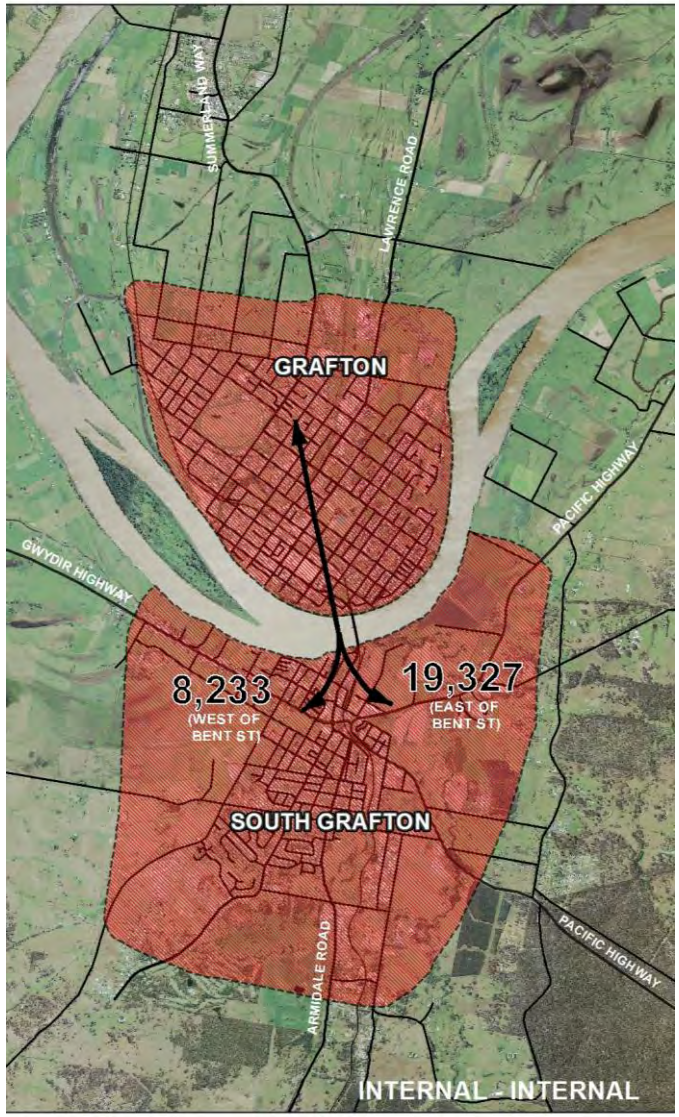


Figure 13: Internal to internal daily cross river volumes for all vehicles in 2049

Note: The split between internal and external trips in Figure 11, Figure 12 and Figure 13 is based on the Paramics model extents shown in the *RODR Technical Paper: Traffic Assessment* Figure 3.1. As a result the breakdown into internal and external trips shown above is slightly different from that used for the 2010 survey results shown in Figure 8. Figure 9 and Figure 10.

Table 8: 2010 traffic survey results (daily cross river traffic volumes)

| **Origin/ destination on south side of Clarence River** | **Locality** | | |
|---|---|---|---|
| | **West of Bent St** | **Armidale Rd south of South Grafton** | **East of Bent St** |
| External to external | | | |
| - Gwydir Highway | 149 | | |
| - Armidale Road | | 169 | |
| - Pacific Highway south | | | 316 |
| - Pacific Highway north | | | 94 |
| Internal to external | | | |
| - Gwydir Highway | 2,077 | | |
| - Armidale Road | | 1,801 | |
| - South Grafton | 628 | | 954 |
| - Pacific Highway south | | | 2,063 |
| - Pacific Highway north | | | 2,837 |
| Internal to internal | | | |
| - South Grafton | 5,568 | | 9,898 |
| **TOTAL** | **8,422** | **1,970** | **16,162** |

Table 9: 2049 traffic modelling results (daily cross river traffic volumes)

| **Origin/ destination on south side of Clarence River** | **Locality** | | |
|---|---|---|---|
| | **West of Bent St** | **Armidale Rd south of South Grafton** | **East of Bent St** |
| External to external | | | |
| - Gwydir Highway | 675 | | |
| - Armidale Road | | 603 | |
| - Pacific Highway south | | | 371 |
| - Pacific Highway north | | | 424 |
| Internal to external | | | |
| - Gwydir Highway | 6,448 | | |
| - Armidale Road | | 6,549 | |
| - South Grafton | 865 | | 1,540 |
| - Pacific Highway south | | | 2,527 |
| - Pacific Highway north | | | 5,416 |
| Internal to internal | | | |
| - South Grafton | 8,233 | | 19,327 |
| **TOTAL** | **16,221** | **7,152** | **29,605** |

Note: The split between internal and external trips in Table 9 is based on the Paramics model extents shown in the *RODR Technical Paper: Traffic Assessment* Figure 3.1. As a result the breakdown into internal and external trips shown above is slightly different from that used for the 2010 survey results shown in Table 8.

Both the 2010 surveys and 2049 traffic model show that on the south side of the river appreciably more traffic has an origin or destination to the east of Bent Street than to the west of Bent Street.

The participants then comparatively re-evaluated Options E and C against the weighted assessment criteria established in the previous technical group option assessment workshop in each of the three categories of functional, socio-economic criteria and natural and built environment criteria. The participants used a finer evaluation scale as well as the options' strategic cost estimates and benefit-cost ratios, and the additional information collated by the project team to determine a recommended preferred option.

Workshop participants also had the opportunity to put forward views based on the indicator results and their own knowledge and experience for discussion amongst the group.

Once the evaluation was completed, a ranking was established for each option within each of the three categories and with the strategic capital cost estimates and benefit-cost ratios considered.

### 5.3.3 Workshop outcomes

The workshop unanimously recommended that Option C should be the preferred option to move forward as:

- On balance, it presents greater overall value to the community, in particular addressing the long term connectivity and growth in the Grafton region, without presenting unmanageable impacts or risks.
- It best meets the project objectives.
- It provides better transport efficiency improvements over the whole of the road network for both the short and long term, including for road freight movements, as it:
    - Better supports the distribution of traffic flows between the eastern and western sides of South Grafton, especially traffic travelling to and from the south-east as shown in Figure 8, Figure 9, Figure 10, Figure 11, Figure 12, Figure 13, Table 8 and Table 9 above as it is located east of the existing bridge and provides better access to the Pacific Highway to the north and south and to Clarenza. Option C also provides good access to Armidale Road.
    - Provides a better road hierarchy as it provides a parallel road network with improved redundancy.
    - Avoids channelling traffic flows from both crossings into the junction of Fitzroy and Villiers Streets.
    - By directing traffic to the intersection of Villiers and Pound Streets, provides a better opportunity for traffic to travel around the edge of the Grafton CBD.
- It performs well in the other areas of the functional assessment criteria.
- It provides better outcomes in the socio-economic area, including its ability to better support Grafton as a regional centre, it has less impacts to businesses and minimises noise impacts.
- It provides better outcomes than Option E in terms of non-Aboriginal heritage by avoiding impacts on the important and intact heritage precinct around Villiers Street and Victoria Street. It also traverses through a shorter length of heritage conservation area.
- It performs comparatively to Option E in terms of capital cost and BCR at this stage of project development.

Subject to:

- Managing the potential risks and impacts on Aboriginal cultural heritage (particularly the Golden Eel site) and other environmental impacts. This will require close ongoing consultation with the Aboriginal community (with respect to Aboriginal cultural heritage issues)
- Careful consideration and management of potential impacts on state heritage listed items and other non-Aboriginal heritage elements including archaeological sites.
- Minimising the identified impacts on the urban design and the landscape character of Grafton.
- Identifying ways to promote pedestrian and cyclist connectivity to South Grafton.
- Investigation and management of potential contaminated land at the old railway site at South Grafton.
- Minimising traffic noise impacts and ecological impacts.
- Detailed environmental impact assessment and, following any decision or approval to proceed, development of appropriate management plans (construction and ongoing operational plans) to avoid, manage and mitigate impacts of the preferred option.

The report on the assessment workshop is included in Appendix 4.

# 6 Recommended preferred option

This chapter summarises the processes and rationale leading to the identification of the recommended preferred option, describes the recommended preferred option, and also discusses potential impacts of the recommended preferred option during construction and operation.

## 6.1 Identification of recommended preferred option

Option C has been identified as the recommended preferred option for the additional crossing of the Clarence River at Grafton.

The three key inputs into the selection of the recommended preferred option for the additional crossing of the Clarence River at Grafton were:

- The findings of the technical investigations and specialist studies undertaken for the project documented in the *Preliminary Route Options Report – Final* (RMS, January 2012) and the *Route Options Development Report* (RMS, September 2012)
- Feedback received from the community and key stakeholders
- Outcomes of the October 2012 value management workshop.

The selection of the recommended preferred option included two assessment workshops conducted on 31 October and 12 November 2012.

Both the value management workshop on 23 and 24 October 2012 and the option assessment workshop on 31 October 2012 recommended that Options E and C be considered further for the recommended preferred option for the additional crossing of the Clarence River. The workshops also concluded that:

- Options 14 and 15 provided the least improvements to the efficiency of the road network including during the AM and PM peak periods. Options 14 and 15 were also among the poorest performing options when assessed against functional, socio-economic and environmental criteria, were the two most expensive options and provided the least value for money.
- Although Option 11 was the lowest cost option and provided the best value for money it was, on balance, a poorer performing option than Options E and C when assessed against functional, socio-economic and environmental criteria. In particular, Option 11 has substantial amenity impacts on a quiet residential area.
- Option A was, on balance, a poorer performing option than Options E and C when assessed against functional, socio-economic and environmental criteria. It was higher in cost than Option E and provided poorer value for money than both Options E and C. Its disadvantages include impacts on businesses, especially along Bent Street, South Grafton.

Following further assessment of Options E and C at the workshop on 12 November 2012, Option C was identified as the recommended preferred option over Option E as:

- On balance, it presents greater overall value to the community than Option E, in particular addressing long term connectivity, providing for economic growth and supporting Grafton as a regional centre.
- It best meets the project objectives.
- It provides better transport efficiency improvements over the whole of the road network for both the short and long term than Option E, including for road freight movements, as it:

  - Better supports the distribution of traffic between the eastern and western sides of South Grafton, especially traffic travelling to and from the south-east as it is located east of the existing bridge and provides better access to the Pacific Highway to the north and south and to Clarenza. Option C also provides good access to Armidale Road.
  - Provides a better road hierarchy as it provides a parallel road network with improved redundancy.
  - Avoids channelling traffic from both crossings into the junction of Fitzroy and Villiers Streets.
  - By directing traffic to the intersection of Villiers and Pound Streets, provides a better opportunity for traffic to travel around the edge of the Grafton CBD.
- It performs well in the other areas of the functional assessment criteria.
- It provides better outcomes in the socio-economic area than Option E, including its ability to better support Grafton as a regional centre as it has less impacts to businesses and fewer noise impacts.
- It provides better outcomes than Option E in terms of non-Aboriginal heritage by avoiding impacts on the important and intact heritage precinct around Villiers Street and Victoria Street. It also traverses through a shorter length of heritage conservation area.
- It performs comparatively to Option E in terms of capital cost and benefit cost ratio at this stage of project development.

## 6.2 Description of recommended preferred option

### 6.2.1 Location

Option C would be located about 70 metres east (downstream) of the existing bridge.

### 6.2.2 Road network upgrades

This option would connect to the Pacific Highway at Iolanthe Street in South Grafton to Pound Street in Grafton.

It would include a new roundabout at the junction of the Gwydir Highway and the Pacific Highway south-west of Bunnings Warehouse. The Pacific Highway to the north-east would be diverted to the north side of Bunnings Warehouse with a new roundabout where it connects to the bridge approaches. In South Grafton, just before the bridge abutment, the alignment crosses an abandoned rail spur.

The new northern approach would be lowered beneath the existing railway viaduct (between Kent Street and Clarence Street) to achieve a vertical clearance of 5.3 metres and would connect to the existing road network in Grafton at Pound Street.

The option would extend along Villiers Street beneath the existing railway viaduct (between Pound Street and Bacon Street) where the vertical clearance would be increased to 5.3 metres. Greaves Street would also be lowered to provide the same four metre clearance beneath the new viaduct as is available under the existing viaduct.

The major intersection of Pound Street and Villiers Street would be upgraded from a roundabout to a signalised intersection. The intersection of Pound Street and Clarence Street would be upgraded to a signalised intersection. A new roundabout would be provided at the intersection of Clarence Street and Craig Street. Pound Street would be upgraded to four lanes between Clarence Street

and Prince Street with provision for turning movements at intersections. Parking facilities on Pound Street and Clarence Street would also be upgraded.

The existing bridge would remain with one northbound lane and one southbound lane.

It should be noted that the Option C layout identifies the works required to achieve sufficient capacity for the option to function adequately in 2049. Construction of the road network upgrades, eg intersection upgrades or widening of existing roads, may be staged over time following construction of the new bridge, as traffic demands increase. Refer to Chapter 6.2.8.

A summary of the road network upgrades required for Option C in 2049 is shown in Table 10.

Table 10: Road network upgrades for Option C (2049)

| Item | | Description | |
|---|---|---|---|
| New connection | | • Between the Pacific Hwy/Gwydir Hwy in South Grafton and Clarence St/Pound St in Grafton, with new bridge just downstream of existing bridge<br>• Realignment of the Pacific Hwy in the vicinity of Bunnings Warehouse to a new link road on the north side of Bunnings | |
| Road upgrades | | Iolanthe St | • Upgrade to 4 lanes from the Pacific Hwy to new roundabout south of new bridge |
| | | Pacific Hwy/Gwydir Hwy | • Upgrade to 4 lanes in the vicinity of Bent St and Ryan St |
| | | Greaves St | • To be lowered beneath the approach viaduct |
| | | Villiers St | • Upgrade to 4 lanes between Fitzroy St and Pound St<br>• To be lowered beneath railway |
| | | Pound St | • To be lowered beneath railway viaduct<br>• Upgrade to 4 lanes between Clarence St and Prince St, with additional turning lanes at intersections<br>• Upgrade parking between Villiers St and Prince St |
| | | Clarence St | • Upgrade parking between Craig St and Pound St |
| | | • New left-in/left-out accesses at the old Pacific Hwy, Spring St west, Clarence St north, New St<br>• Closure of Kent St (at Pound St), Fitzroy St (south-east of Villiers St), Pound St (near Bridge St), Iolanthe St (north of Bunnings Warehouse), the Pacific Hwy (south of Bunnings Warehouse)<br>• General modifications to road markings | |
| Intersections | New signalised intersections | Pound St/Clarence St | • Upgrade existing intersection with traffic signals |
| | | Pound St/Villiers St | • Replace existing roundabout with traffic signals |
| | New roundabouts | • Realigned Pacific Hwy/Iolanthe St/new bridge approach<br>• Pacific Hwy/Gwydir Hwy<br>• Ryan St/Viaduct Rd<br>• Craig St/Clarence St | |
| | Upgraded roundabouts (and approach roads) | • Gwydir Hwy/Skinner St<br>• Pound St/Duke St<br>• Villiers St/Dobie St | |

### 6.2.3 Proposed bridge

The proposed bridge would be approximately 458 metres long and 15.9 metres wide and would be on a constant very large radius horizontal curve (4500 metres radius) over the Clarence River.

The bridge would include one northbound lane and one southbound lane for vehicles and a shared path 3.1 metres wide on the western (upstream) side of the bridge.

Beneath the bridge, there would be two clear navigable channels 35 metres wide and with a minimum vertical clearance of 9.1 metres.

The current preliminary concept design for the bridge would provide a 44 metre span on the South Grafton side, followed by five 74 metre long spans across the river to match the existing bridge (except for the shorter bascule lift span), and a 44 metre long span on the Grafton side. There would also be approach viaducts on either side of the bridge; 64 metres long (with two 32 metre long spans) on the South Grafton side, and 58 metres long (with two 29 metre long spans) on the Grafton side.

A typical bridge cross section for Option C is shown in Figure 14.

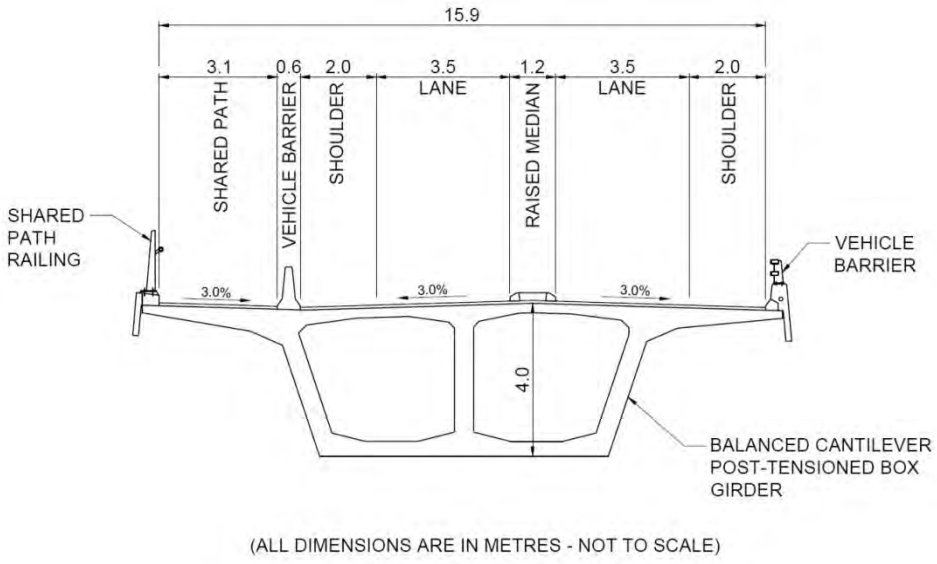


Figure 14: Option C – typical bridge cross section

### 6.2.4 Drainage

The bridge would be almost flat but with slight longitudinal grades of 0.1 per cent falling from a high point in the middle of the river back to the South Grafton and Grafton sides. A drainage network with closely spaced pits and longitudinal pipes within the bridge superstructure would collect runoff and direct it to collection points on each side of the river. On both sides of the river the drainage network would extend along the viaduct structures.

The bridge approach would be lowered beneath the existing railway viaduct along Pound Street between Kent Street and Clarence Street. Drainage mitigation measures would provide the required flood immunity during:

- Intense short duration storms, resulting in local drainage catchment runoff exceeding the capacity of the stormwater drainage network
- Long duration storms resulting in elevated flood levels within the Clarence River, reducing stormwater network outflow.

In order to achieve the required flood immunity during these 20-year ARI events, flood levels need to be reduced. The following flood mitigation measures have been developed as one option which would allow flood free access to the new bridge in these 20-year ARI event floods:

- A catch drain north of Option C
- A detention basin south of Option C with a capacity of 560 cubic metres (about 2.8 metres by 20 metres by 10 metres) and a design bed level of 0.7 m AHD
- A pump station with capacity of two cubic metres per second to extract water from the detention basin
- Box culverts (with dimensions 8 metres by 0.5 metres by one metre) beneath Option C to provide connectivity between the catchment north of Option C and the proposed detention basin
- Increasing the capacity of the existing gravity drainage system from the Kent Street/Pound Street area by the addition of three 1050 millimetre diameter gated outlet pipes discharging into the Clarence River.

The above drainage features have been sized ensuring that the efficiency of the proposed drainage infrastructure is limited by the proposed pump capacity, not the associated detention basin or culverts under Option C.

Although this drainage strategy has a primary objective focused on achieving the desired flood immunity requirements for Option C, it should be acknowledged that this measure will have a residual benefit for surrounding property owners. The drainage strategy will successfully reduce the occurrence of local stormwater flooding within an area of problem drainage within Grafton.

The conceptual drainage strategy has been designed to be free draining (not requiring pumping) during local rainfall events which occur when the Clarence River is not in flood. When the Clarence River is in flood, elevated water levels within the Clarence River do not allow for gravity drainage from Grafton, requiring the use of the pumps to drain the Pound/Kent Street area.

A more detailed assessment of flood mitigation will be undertaken following confirmation of the preferred route option.

### 6.2.5 Geotechnical issues

Based on the available geotechnical data, the reduced levels (RL) for the pile toe for the approach viaducts and river crossings would vary between approximately RL -18 m AHD for the southern approach and approximately RL -26 m AHD for the northern approach viaduct. These pile toe levels assume a three-metre rock socket. The pile size and length will be refined once bridge loadings and a detailed design have been completed. The pile toe levels are indicative and subject to further geotechnical investigation to confirm the ground conditions assumed.

No major embankment issues were identified for Option C.

Potentially contaminated land has been identified on ARTC land located at the former locomotive depot, off Alipou Lane in South Grafton. Remediation and management would be required for the site to be suitable for on-going commercial/industrial use due to metal and total petroleum hydrocarbon contamination found in soils associated with diesel refuelling facility, coal stores etc. This site is not listed on Environmental Protection Authority's contaminated land public record or the Clarence Valley Local Environmental Plan.

### 6.2.6 Bridge construction method

Option C would probably be constructed using a combination of balanced cantilever spans for the river crossing and prestressed beam-and-slab construction methods for the viaducts. Refer to Appendix 2 of the *Route Options Development Report* (RMS, September 2012) for a description of these construction methods.

### 6.2.7 Strategic cost estimate

Strategic cost estimates for the design, construction and commissioning of the recommended preferred option were investigated and are documented in *Technical Paper: Strategic Cost Estimates* in Volume 2 of the *Route Options Development Report* (RMS, September 2012). A summary breakdown of the items that have been allowed for in the strategic cost estimates is provided in Table 11.

The strategic cost estimate for the 2049 road network upgrades for Option C is $231 million.

The strategic cost estimate for the design, construction and commissioning includes allowances for:

- Concept development (based on the engineering drawing presented in Chapter 6.2.11)
- Detailed design and documentation
- Geotechnical conditions including depth to rock and soft soil treatments
- Property acquisition costs (acquisition was identified via Geographic Information System (GIS) and estimated via historical property sales within the immediate area)
- Utility adjustment costs (cost allowances were estimated based on adjustments that may be required for major utilities potentially impacted by Option C)
- Infrastructure construction costs
- Handover costs.

### 6.2.8 Indicative Stage 1 construction

As noted in the *Route Options Development Report* (RMS, September 2012), a preliminary assessment has been carried out to identify the indicative extent of road network upgrades and intersection improvements that might be constructed initially.

The extent and cost of the Stage 1 works associated with Option C has been reviewed since the release of the *Route Options Development Report* (RMS, September 2012). A reduction in scope is proposed by deferring the construction of two key elements which had previously been identified as part of Stage 1:

- Defer the realignment of the Pacific Highway to the northern side of Bunnings Warehouse
- Defer construction of the main Gwydir Highway/ Pacific Highway roundabout and replace it with a smaller roundabout connecting Pacific Highway/ Iolanthe Street/ Spring Street.

A reduced Stage 1 cost of $161 million has been estimated based on the scope of works which includes the following (as shown in Figure 15):

- Upgrade to two lanes each way along Gwydir Highway between Bent Street and the Pacific Highway.

- Existing priority intersection to remain at the intersection of the Pacific Highway and Gwydir Highway with minor modification to the left turn from the Gwydir Highway to the Pacific Highway.
- Existing alignment to remain on the Pacific Highway east of the Gwydir Highway (ie not diverted to the north east of Bunnings Warehouse) with a minor adjustment to connect to the new roundabout at Iolanthe Street. A new carpark access into Bunnings Warehouse, and a new heavy vehicle entry to the Bunnings Warehouse loading dock area off the existing Pacific Highway alignment.
- A new roundabout with one circulating lane at the intersection of Pacific Highway, Iolanthe Street and Spring Street.
- One lane in each direction along Iolanthe Street through to the bridge.
- Minor realignment at end of Iolanthe Street to connect to new bridge approach.
- Lowering the bridge approach roadway under the railway viaduct at Pound Street and through to Clarence Street.
- Unsignalised intersection at the intersection of Pound Street and Clarence Street with one through lane in each direction on Pound Street.
- Clarence Street works (but no roundabout at Bent Street).
- Rebuild pavement on Pound Street from Clarence Street to Villiers Street to one lane plus shoulder in each direction with minor widening to two approach lanes and two exit lanes at Villiers Street roundabout.

The indicative scope of the Stage 1 works will be reviewed following confirmation of the preferred route option. The scope of works will be subjected to traffic modelling to confirm the scope and extent of Option C works that would be constructed initially.

Table 11: Option C strategic cost summary

| No. | Item description | Stage 1 (revised) strategic cost estimate ($m) | Full strategic cost estimate including Stage 1 ($m) |
|---|---|---|---|
| 1 | Project development | 6 | 17 |
| 2 | Investigation and design | 6 | 6 |
| 3 | Property acquisitions | 33 | 42 |
| 4 | Public utility adjustments | 2 | 5 |
| 5 | Construction | | |
| 5.1 | Roadworks | 35 | 78 |
| 5.2 | Bridge over Clarence River | 66 | 66 |
| 5.3 | Viaducts | 9 | 9 |
| 5.4 | Overpass (above existing roads/creeks) | 0 | 0 |
| 5.5 | Flood mitigation (raising levees) | 1 | 1 |
| 5.6 | Project management and insurance | 4 | 6 |
| | Sub-total | 115 | 160 |
| 6 | Handover | 1 | 2 |
| **Total** | | **161** | **231** |

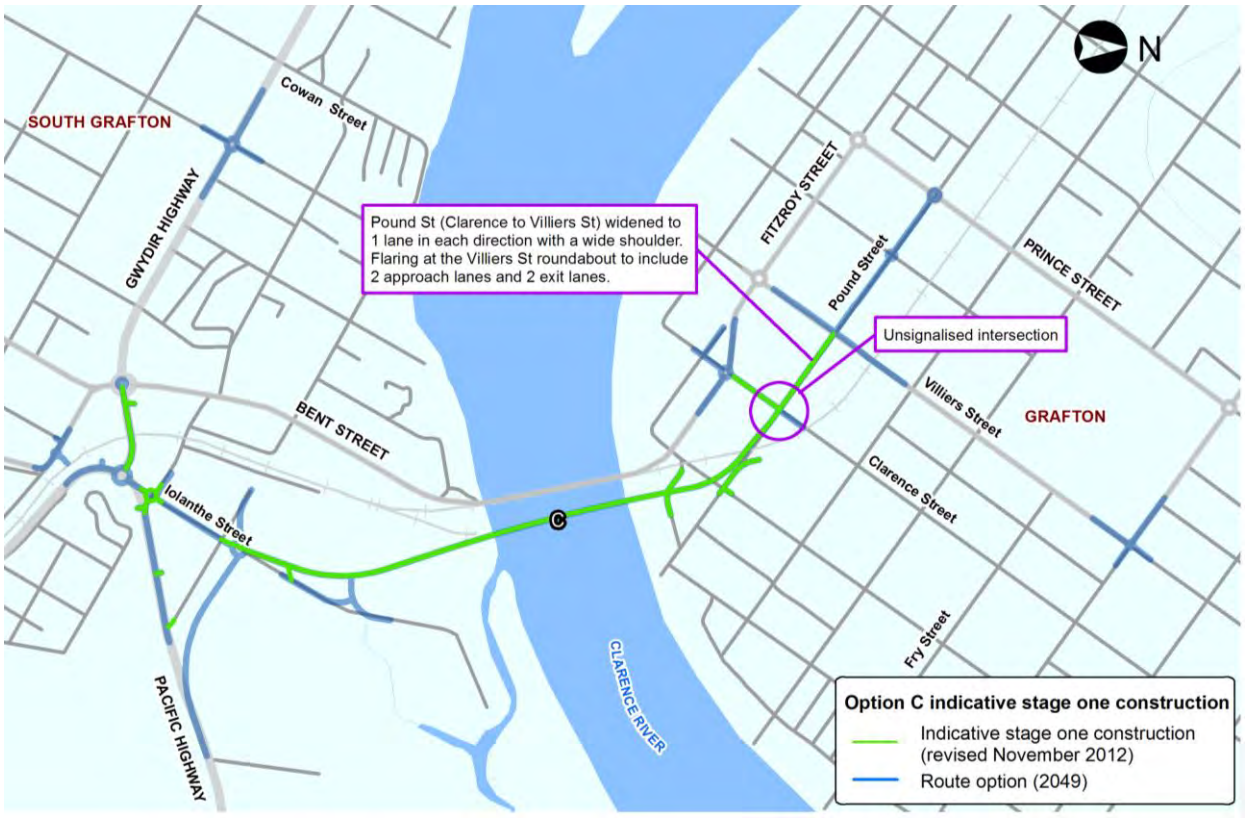


Figure 15: Revised indicative extent of the Stage 1 works for Option C

### 6.2.9 Economic evaluation

An economic evaluation for the recommended preferred route option has been undertaken and is documented in *Technical Paper: Economic Evaluation* in Volume 2 of the *Route Options Development Report* (RMS, September 2012). This included the calculation of the benefit-cost ratio (BCR). The benefit-cost ratio over 30 years from 2019 based on strategic costs estimates for Option C is 1.6.

### 6.2.10 Artist impressions

Artist impressions of the recommended preferred option are shown in Figure 16 and Figure 17.


Figure 16: Aerial perspective artist impression of Option C looking south


Figure 17: Eye-level perspective artist impression of Option C looking west

### 6.2.11 Engineering plans and longitudinal section drawings

An engineering plan and longitudinal section drawing of the recommended preferred option is shown on the following page.

PRINTED DATE 13/07/2012

NEW ROUNDABOUT
KELLY ST
RYAN ST
GWYDIR HWY
SPRING ST
CRISP AVE
THROUGH ST
WHARF ST
RIVERSIDE DR
CLARENCE RIVER
VICTORIA ST
VILLIERS ST
FITZROY ST
PACIFIC HWY
NEW ROUNDABOUT
NEW LEFT IN/LEFT OUT
NEW LEFT IN/LEFT OUT
BENT ST
PROPOSED NAVIGATION CHANNELS
MINIMUM CLEARANCES:
VERTICAL: 9.1m ABOVE MHWS
HORIZONTAL: 2 x 35m
UPGRADE VILLIERS ST TO FOUR LANES (WITH TURNING LANES) BETWEEN FITZROY ST AND POUND ST
PROPOSED TAFE BUILDING WORKS
NEW ROUNDABOUT
NEW CARPARK ACCESS
NEW ROUNDABOUT
MAIN
NORTHERN
RAILWAY
EXISTING BRIDGE - ONE LANE IN EACH DIRECTION
POUND ST
UPGRADE PARKING ON CLARENCE ST
UPGRADE INTERSECTION WITH TRAFFIC SIGNALS
PACIFIC HWY
IOLANTHE ST
PROPOSED VIADUCT
PROPOSED PIERS
PROPOSED BRIDGE - ONE LANE IN EACH DIRECTION
PROPOSED VIADUCT
CLARENCE ST
BRIDGE ST
GREAVES ST
GREAVES ST TO BE LOWERED TO PROVIDE 4.0m CLEARANCE BENEATH VIADUCT
POUND ST TO BE LOWERED TO PROVIDE HIGH VEHICLE CLEARANCE (5.3m) BENEATH RAILWAY
JOIN LINE - SEE INSET 3

MAIN PLAN

UPGRADE ROUNDABOUT
GWYDIR HWY
NEW LEFT IN/LEFT OUT
NEW ST
SKINNER ST

INSET 1 - ROAD UPGRADES
SKINNER ST/GWYDIR HWY
INTERSECTION

INSET 1
INSET 3
MAIN PLAN
KEY PLAN
NOT TO SCALE
INSET 2

## LEGEND:

- PROPOSED EMBANKMENT
- CADASTRAL BOUNDARY
- INDICATIVE ROAD BOUNDARY
- PROPOSED SHARED PATH
- PROPOSED PIERS AND ABUTMENT STRUCTURES

## NOTES:

1. THE PLANS SHOW NETWORK IMPROVEMENTS REQUIRED FOR THE TRAFFIC VOLUMES MODELLED IN 2049. NOT ALL IMPROVEMENTS WOULD BE REQUIRED AT OPENING BUT WOULD BE ADDED IN STAGES AS TRAFFIC DEMAND GROWS.
2. CADASTRAL BOUNDARIES ARE INDICATIVE ONLY.
3. ACCESS SHOWN FOR MAJOR COMMUNITY FACILITIES AND BUSINESSES.

VILLIERS ST
DOBIE ST
UPGRADE ROUNDABOUT

INSET 2 - ROAD UPGRADES
DOBIE ST/VILLIERS ST
INTERSECTION

POUND ST
PRINCE ST
UPGRADE ROUNDABOUT
UPGRADE POUND ST TO FOUR LANES (WITH TURNING LANES) BETWEEN CLARENCE ST AND VILLIERS ST
SHOPPING WORLD
UPGRADE PARKING ON POUND ST
RAILWAY
NORTHERN
MAIN
REPLACE ROUNDABOUT WITH TRAFFIC SIGNALS
DUKE ST
VILLIERS ST
VILLIERS ST TO BE LOWERED TO PROVIDE HIGH VEHICLE CLEARANCE (5.3m) BENEATH RAILWAY
JOIN LINE - SEE MAIN PLAN

INSET 3 - ROAD UPGRADES
POUND ST/VILLIERS ST/PRINCE ST

PROPOSED NAVIGATION CHANNELS
MINIMUM CLEARANCES:
VERTICAL: 9.1m ABOVE MHWS
HORIZONTAL: 2 x 35m TO MATCH EXISTING
Q100 YEAR FLOOD LEVEL R.L. 8.1m APPROX.
(BASED ON LOWER CLARENCE RIVER FLOOD STUDY REVIEW, WBM 2004)
POUND ST TO BE LOWERED TO PROVIDE HIGH VEHICLE CLEARANCE (5.3m) BENEATH RAILWAY
GWYDIR HWY
PACIFIC HWY/ SPRING ST
THROUGH ST
PROPOSED BRIDGE
EXISTING LEVEL
MHWS R.L. 0.416m
GREAVES ST
CLARENCE ST
VILLIERS ST
PROPOSED EMBANKMENT
PROPOSED VIADUCT
PROPOSED PIERS
CLARENCE RIVER
PROPOSED VIADUCT
GREAVES ST TO BE LOWERED TO PROVIDE 4.0m CLEARANCE BENEATH VIADUCT
VILLIERS ST TO BE LOWERED TO PROVIDE HIGH VEHICLE CLEARANCE (5.3m) BENEATH RAILWAY

PROPOSED BRIDGE LONGITUDINAL SECTION
SCHEMATIC LOOKING UPSTREAM
NOT TO SCALE

D DRAFT RODR - REV 6 MMF 11/07/2012

Transport Roads & Maritime Services
NSW GOVERNMENT

ARUP
Arup Pty Ltd
ABN 18 000 966 165

0 50 100 150 200 250
SCALE 1:5000m SCALE @ A3
ALL PLANS SHOWN AT 1:5000 AT A3 UNLESS SHOWN OTHERWISE

MAIN ROAD 83 - SUMMERLAND WAY
ADDITIONAL CROSSING OF THE CLARENCE RIVER AT GRAFTON
OPTION C - PLAN AND LONGITUDINAL SECTION

DRAWING 3

OPTION C

220422_SK9031.dwg

## 6.3 Potential impacts

This chapter provides a summary of the potential impacts of the recommended preferred option based on the *Route Options Development Report* (RMS, September 2012) to assist with the environmental impact assessment of the proposal and the identification of opportunities to avoid, manage and mitigate these potential impacts during the further development and implementation of the proposal.

These potential impacts are associated with the extent of road network upgrades and intersection improvements that would be necessary to cater for estimated traffic volumes in 2049. Potential impacts for the Stage 1 scope of works as described in Chapter 6.2.8 may be less, but further investigations would be required following confirmation of the preferred option in order to confirm the scope of works that would be constructed initially. The information provided in this chapter is preliminary and based on technical investigations and community consultation undertaken to date.

The potential impacts summarised in this chapter will be confirmed and assessed in detail during the planning approval stage of the project.

Some issues associated with the recommended preferred option are likely to have high or moderate impacts (actual or perceived) and a detailed environmental impact assessment will be necessary to determine the level of potential impact and to develop appropriate measures to avoid, manage and mitigate the impacts. These issues are:

- Social, economic, property and land use
- Urban design, visual impact and landscape character
- Noise and vibration
- Flooding and hydrology
- Non-Aboriginal heritage
- Aboriginal heritage
- Ecology
- Traffic management, access and safety
- Planning.

Other issues associated with the recommended preferred option are considered to be of lesser consequence taking into consideration the characteristics of the additional crossing, the existing environment and the implementation of standard management and safeguard measures. It is expected that these other issues are not likely to be key issues; however the potential impact of these other environmental issues will also be assessed further in the environmental impact assessment for the additional crossing.

### 6.3.1 Social, economic, property and land use impacts

The recommended preferred option would benefit the Grafton community by providing an additional transport option across the Clarence River and reducing traffic congestion and travel times during peak hour periods.

Potential social, economic, property and land use issues identified for the recommended preferred option are summarised as follows.

**Construction stage**

- Some 24 residences/buildings would need to be acquired. These are mostly located in the central Grafton area. Impacts on residents affected by acquisition, including loss of a home and established social networks, anxiety and stress, potential relocation away from employment, loss of connection to social and community services and facilities which support residents daily life, impacts following relocation and impacts on household finances.
- Acquiring residential properties may have the potential to change the overall housing affordability in the Grafton area.
- Potential impact on the viability of two businesses.
- Demolition or relocation of Basmar Hall, a privately owned community facility.
- Impacts on existing open public space and community facilities would be minimal. Option C passes close to the boat mooring area immediately downstream of the existing Grafton Bridge. However RMS has been advised by maritime stakeholders that Option C would not impact boats moored at Pound Street and would allow the same river access for visiting sailors/yachts. The Clarence River Visitor Information Centre loses visual prominence and is unlikely to be seen by southbound tourists entering Grafton so adequate signage would be required.
- Some 4.5 hectares of regionally significant farmland would be impacted. This is located across two rural properties in South Grafton.
- Impacts on the visual amenity of residents and road users as a result of construction works.

**Operational stage**

The recommended preferred option would benefit the wider community by providing an additional transport option across the Clarence River, reducing traffic congestion and travel times during peak hours. It would improve road safety, including removal of heavy vehicles from the existing bridge and improved access for service delivery and emergency services.

The recommended preferred option would provide greater integration of Grafton and South Grafton, economically and socially, improve access to employment, health and community services, retail and community centres and recreation sites. It would allow improvements to the public transport network and improve pedestrian and cyclist access across the river.

The recommended preferred option would improve levels of connectivity between the Iolanthe Street industrial area in South Grafton, and Grafton generally; in particular better connection would be provided to the residential area in the east of Grafton, connecting an established residential area with employment zones. This option would also provide better connectivity to the Clarenza growth area, the South Grafton growth area, and between the Grafton and South Grafton CBDs.

Some impacts that would be generated by the operation of the recommended preferred option are:

- The amenity of residents along Greaves Street, Grafton is likely to be impacted by the presence of the northern bridge approach and increased road traffic in the street.
- Impacts upon community cohesion in the Greaves Street and Bridge Street areas of Grafton due to changes in access to properties and the introduction a physical barrier along Pound Street.
- Changes in access arrangements to residential and agricultural properties on Butters Lane, off Iolanthe Street in South Grafton and the TAFE in Grafton.

- Some diversion of traffic from existing routes would have minor adverse impacts on Bent and Fitzroy Street businesses, but a cluster of businesses in Pound Street (between Clarence Street and Duke Street) is likely to benefit. Businesses located around the intersection of Spring Street and the Pacific Highway (including McDonald's and Hungry Jacks) may be potentially vulnerable to decreased traffic flows as Grafton-bound traffic coming south along the Pacific Highway connects to the new bridge approach at the new Through Street and Iolanthe Street roundabout.
- Land required for the recommended preferred option alignment would be permanently changed to road infrastructure land uses. This includes land currently zoned as Business Development (B5), Infrastructure (SP2), Tourist (SP3) and Primary Production (RU1) in the South Grafton area, and land currently zoned as Public Recreation (RE1) and General Residential (R1) in the Grafton area.

### 6.3.2 Urban design, visual impact and landscape character impacts

The recommended preferred option is likely to impact the visual integrity of the existing bridge, the surrounding built environment, the existing landscape and street pattern, the urban connectivity and urban development of Grafton and South Grafton. These impacts are summarised below and will be confirmed and assessed in detail in the environmental impact assessment.

**Construction stage**

The construction stage of the recommended preferred option is likely to have the following impacts:

- Construction sites and works are likely to impact the visual amenity for road and river users
- Physical works along sections of Pound Street, Greaves Street, Clarence Street and Villiers Street in Grafton would have impacts on the visual amenity of some sensitive receivers located in proximity to the construction works
- Construction activities related to the bridge structure would impact the visual amenity towards the existing bridge and the visual amenity of sensitive receivers located in proximity to the riverbank.

**Operational stage**

The recommended preferred option would have the following impacts and issues during the operation of the additional crossing:

- Impacts on views to, and visual character of, the existing bridge.
- Close proximity between crossings limits opportunity for the new crossing to have its own visual expression.
- Permanent viaducts and artificially elevated structures would potentially act as permanent physical barriers. They would impact some cross connections mostly on the northern foreshore in Grafton and also would potentially result in some fragmentation of the existing residential neighbourhoods in Grafton.
- The proposed widening of Pound Street and Iolanthe Street would impact the existing street scale and form of the area.
- The existing landscape character would be impacted on both sides of the river particularly the Greaves Street and Pound Street area.

- Urban patterns on both sides of the river would be impacted as neither approach road is aligned with existing road reserves.
- The recommended preferred option has the potential for new strip development to occur that would potentially detract from the Grafton and South Grafton town centres.

### 6.3.3 Noise and vibration impacts

The following potential noise and vibration issues have been identified for the recommended preferred option.

**Construction stage**

The construction of the recommended preferred option is likely to impact a number of sensitive noise receivers located mostly in Grafton due to construction traffic and the operation of construction plant and equipment. The extent of impact would vary according to the relative relationship of the construction works to the receiver location, intervening structures and the nature of construction works at various stages of the construction process.

Construction works would generally occur during standard working hours but some construction work may need to be undertaken outside of standard working hours to maintain the operational integrity of existing roads.

There is potential for construction vibration impacts on nearby buildings and other structures. The level of impact will depend on the construction techniques used and the offset distances between the vibration source and the sensitive receiver.

**Operational stage**

Traffic noise from the operation of the additional crossing has the potential to impact noise sensitive receivers located along impacted roads.

Preliminary noise modelling undertaken for the project (refer to *Technical Paper: Noise Assessment* in Volume 2 of the *Route Options Development Report* (RMS, September 2012)) estimated that 616 residential properties would potentially experience noise exceedances during the day (634 in the 'no build' scenario) and 462 residential properties would potentially experience noise exceedances during night (468 in the 'no build' scenario), 10 years after opening assuming there is no noise mitigation measures in place. Reasonable and feasible noise mitigation measures will be considered during the refinement of the concept design and environmental impact assessment of the project to address noise exceedances at these sensitive receivers.

### 6.3.4 Flooding and hydrology impacts

A summary of the identified flooding and hydrology issues from the recommended preferred option is presented below.

**Construction stage**

A large flood in the Clarence River during the construction stage would have potential direct impacts on the recommended preferred option. A major rainfall event within Grafton could also potentially directly impact construction works involved in lowering Pound Street under the rail viaduct and associated drainage upgrades.

**Operational stage**

The recommended preferred option would have the following impacts:

- Potential impacts to peak flood levels under a 20 Year ARI Event and a 100 Year ARI Event are expected to be minor provided Grafton/South Grafton levees are raised upstream for an approximate length of 8400 metres and 9700 metres respectively.
- Potential impacts to afflux as a result of construction of the new bridge are expected to be negligible.
- The section of the route passing beneath the North Coast Railway viaduct in Grafton is known to experience existing local drainage issues. This section would achieve immunity during the 20 year ARI event provided the following drainage strategy is implemented:
  - A catch drain north of Option C
  - A detention basin south of Option C with a capacity of 560 cubic metres (about 2.8 metres by 20 metres by 10 metres) and a design bed level of 0.7 m AHD
  - A pump station with capacity of two cubic metres per second to extract water from the detention basin
  - Box culverts (with dimensions 8 metres by 0.5 metres by one metre) beneath Option C to provide connectivity between the catchment north of Option C and the proposed detention basin.
  - Increasing the capacity of the existing gravity drainage system from the Kent Street/Pound Street area by the addition of three 1050 millimetre diameter gated outlet pipes discharging into the Clarence River.

The above drainage features have been sized ensuring that the efficiency of the proposed drainage infrastructure is limited by the proposed pump capacity, not the associated detention basin or culverts under Option C.

Although this drainage strategy has a primary objective focused on achieving the desired flood immunity requirements for Option C, it should be acknowledged that this measure will have a residual benefit for surrounding property owners. The drainage strategy will successfully reduce the occurrence of local stormwater flooding within an area of problem drainage within Grafton.

The conceptual drainage strategy has been designed to be free draining (not requiring pumping) during local rainfall events which occur when the Clarence River is not in flood. When the Clarence River is in flood, elevated water levels within the Clarence River do not allow for gravity drainage from Grafton, requiring the use of the pumps to drain the Pound/Kent Street area.

### 6.3.5 Non-Aboriginal heritage impacts

The recommended preferred option would impact the non-Aboriginal heritage of the Grafton area. A summary of these impacts are as follows.

**Construction stage**

- Visual impacts to the Grafton Rail and Road Bridge which is a State Heritage Register listed item.
- Adverse direct and indirect impacts on several listed built heritage items and cultural plantings. It is noted that no direct impacts on items listed on the State Heritage Register were identified in the *Route Options Development Report* (RMS, September 2012).
- Direct impact on the following archaeological sites: the railway terminus (South Grafton), the potential archaeological site on the TAFE grounds, the potential maritime sites on the banks of

the Clarence River, the potential maritime sites on the river bed and the "Grafton Punt", which is identified on the Australian National Shipwrecks Database.

- There would be impact on areas in Grafton which are listed within the Heritage Conservation Area. The recommended preferred option runs through approximately 2760 metres of the Heritage Conservation Area in Grafton. The recommended preferred option would also impact the South Grafton Conservation Area as it runs through approximately 390 metres of this area due to roadworks associated with the upgrade of the intersection of the Gwydir Highway and Skinner Street.

**Operational stage**

- Visual impacts to the Grafton Rail and Road Bridge which is a State Heritage Register listed item
- Heritage vistas to and from buildings adjacent to the route would be permanently altered
- Ongoing vibration from the operation of the recommended preferred option may potentially impact any non-Aboriginal archaeological items that are not directly affected.

### 6.3.6 Aboriginal heritage impacts

Potential Aboriginal heritage issues have been identified for the recommended preferred option as summarised below. Consultation with the Grafton-Ngerrie Local Aboriginal Land Council (GNLALC) will continue through the new phase of the project and in accordance with RMS *Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI)*.

**Construction stage**

- The recommended preferred option alignment is located in close proximity to the Golden Eel site (a spiritual area of high significance to the Aboriginal people) and could potentially have impacts on the Aboriginal cultural heritage of this area during construction. Careful consideration will be required during development of the construction methodology and identification of construction sites in the South Grafton bridge approach to minimise any impacts on the Golden Eel site. A physical barrier, eg a 1.8 metre high (person proof) wire mesh fence, could be used to prevent access to the site during construction. The indicative location of the barrier is shown in *Technical Paper: Aboriginal Heritage* in Volume 2 of the *Route Options Development Report* (RMS, September 2012) following consultation with Grafton-Ngerrie Local Aboriginal Land Council. The exclusion zone for construction should be clearly identified on construction plans and Construction Environmental Management Plan etc.
- Potential direct impacts to unknown/ unidentified archaeological items that may be uncovered, disturbed, damaged or destroyed during construction works may also occur.

**Operational stage**

The operation of the additional crossing could have a permanent impact on the intrinsic Aboriginal cultural value of the Clarence River and Alipou Creek and its surrounds due to the permanent presence of an additional crossing. The permanent presence of an additional crossing could also have an impact on the aesthetic value of the Golden Eel site.

### 6.3.7 Ecology impacts

Ecology issues related to the construction and operation of the recommended preferred option are summarised as follows.

**Construction stage**

The construction of the recommended preferred option would have the following potential impacts:

- Potential impact on known habitat for threatened fauna species including the little bentwing-bat, the eastern bentwing-bat roosting under the existing bridge and eastern freetail bat and the southern myotis foraging in the riparian zone
- Clearing of about 1450 square metres of endangered ecological communities comprising of Reedlands – Freshwater Wetlands on Coastal Floodplain (about 600 square metres), Degraded Riparian Forest - Sub-tropical Coastal Floodplain Forest (about 150 square metres) and Remnant Eucalypts - Sub-tropical Coastal Floodplain Forest (about 700 square metres)
- Clearing of native and exotic plantings
- Potential introduction and/or spread of weeds, including noxious weeds
- Potential direct impacts to fish passage through the installation of in-stream structures for construction in Clarence River
- Potential impact to aquatic vegetation and habitat through the installation of in-stream structures likely to require clearing and disturbance of the river banks and bed
- Potential mobilisation of sediments and pollutants, which may enter in Alipou Creek and/or the Clarence River.

**Operational stage**

Potential flora and fauna impacts resulting from the operation of the additional crossing include:

- Potential direct impacts to aquatic vegetation and fish passage through the installation of in-stream structures
- Impact on remaining riparian vegetation along the Clarence River through the increase in edge effects
- Potential mortality of bats and other fauna individuals during the operation of the project.

### 6.3.8 Traffic management, access and safety

Traffic management, access and safety issues related to the construction and operation of the additional crossing are summarised below.

**Construction stage**

- The construction of the recommended preferred option is likely to generate temporary disruption to road traffic, pedestrians and cyclists as well as increased traffic volumes from construction vehicles along Iolanthe Street in South Grafton and Pound Street in Grafton
- Vehicle access to some properties in close proximity to the bridge approaches would be impacted during construction
- Maritime traffic along the Clarence River has the potential to be temporarily disrupted during the construction stage
- Construction of the recommended preferred option could be completed with minimal impacts to existing traffic movements using the existing bridge.

**Operational stage**

- There would be permanent changes to existing traffic movements and permanent road modifications at Iolanthe Street, Pacific Highway/Gwydir Highway, Greaves Street, Villiers Street, Pound Street, Bridge Street and Clarence Street.
- The following local roads would be closed: Kent Street (at Pound Street), Fitzroy Street (south of Villiers Street), Pound Street (near Bridge Street), Iolanthe Street (north of Bunnings Warehouse), the Pacific Highway (south of Bunnings Warehouse).
- The project would also result on an additional pedestrian/cyclist shared path that would connect Graton and South Grafton. The shared path would retain the primary highway route through streets that form key connections in the pedestrian and cycle networks, retaining exposure of these vulnerable road users to through traffic and heavy vehicles.

### 6.3.9 Planning

As discussed below, the recommended preferred option has the potential to complement some of the policies and strategic documents relevant to an additional crossing in the Clarence Valley local government area.

The recommended preferred option has the potential to complement the *Bike Plan and Pedestrian Access and Mobility Plan* (CVC and QED, 2008) by providing an additional pedestrian and cyclist connection over the Clarence River and by providing more direct pedestrian and cyclist access between Grafton and the Clarenza area.

The recommended preferred option has the potential to complement the *Clarenza Cycleway Options Study* (CVC and Lewis Ford & Associates Consulting Engineers, 2012) by linking to the proposed Clarenza cycleway and providing improved pedestrian and cyclist access to the Clarenza area.

There are opportunities to integrate the recommended preferred option with the proposed *Clarence River Way Masterplan* (CVC and Clouston Associates, 2009), by incorporating streetscaping/ embellishment along roads that would be upgraded such as Pound Street and Clarence Street and improving Grafton's arrival experience, through an extended tree-lined approach to the bridge.

### 6.3.10 Other impacts

Other potential impacts that will be considered in detail in an impact environmental assessment for the project are summarised below.

**Soils and water quality**

The following impacts have the potential to occur during the construction of the recommended preferred option:

- Erosion impacts due to the exposure of soils during construction. This may potentially impact on water quality of Alipou Creek and the Clarence River
- Water quality impacts from accidental spillages of materials during construction including chemicals and run-off from exposed or unclean surfaces
- Potential for groundwater contamination where groundwater intersection occurs during construction

- Potential exposure of acid sulfate soils to the air as a result of excavation and construction works, resulting in the potential for sulphuric acid to impact groundwater, soils and waterways in addition to the built environment
- Potential impact on salinity as a result of changes to the local landscape, which affects the way salt and water move through the environment and where they concentrate
- Potential to expose and impact on contaminated land off Alipou Lane in South Grafton, by spreading contamination and releasing contaminants into the ground water.

Operational impacts related to soils and water quality include:

- Water quality impacts as a result of any spills that may occur from bridge maintenance activities or vehicle accidents
- Potential scouring on the Clarence River banks and bed due to changes to river hydraulics caused by the additional piers
- Changes to groundwater movement during operation as a result of construction works
- Water quality impacts from road runoff containing suspended solids, nutrients from atmospheric fallout, spills and other pollutants from vehicle, tyre and pavement wear.

**Air quality**

Air quality impacts during the construction stage of the project would include dust generation, earthworks, spoil storage and transport, vehicular and plant and equipment emissions. These impacts would be temporary and confined to the construction period.

Operational impacts to air quality that would result from the road traffic of the additional crossing would be widely dispersed and not confined to specific receptors.

**Greenhouse gases and climate change**

The recommended preferred option has the potential to contribute to climate change through the generation of direct and indirect greenhouse gas emissions during its construction stage.

The recommended preferred option has also the potential to be impacted by climate change due to changes in rainfall intensity and extreme temperatures may potentially impact the operation of the additional crossing.

**Risks and hazards**

Risks and hazards to human health and the environment have the potential to arise as a result of incidents during the construction and operational stages of the project.

The quantities of hazardous substances that would be stored during the construction of the project are likely to be small.

The main potential incident of concern for the additional crossing would be the accidental release of hazardous substances during operation from vehicles transporting these substances across the bridge. This risk is considered to be low given existing stringent legislative controls for the transport of dangerous goods and given the minor proportion of vehicles transporting dangerous goods.

**Utilities**

Existing public utilities and services within or close to the recommended preferred option would be potentially disrupted or relocated. Consultation with utility providers will continue during the concept design stage to identify:

- Utility requirements for the additional crossing
- Utilities and services that would require temporal disruption, relocation and or adjustments.

**Resource and waste management**

Liquid and solid waste streams would be generated during the construction of the recommended preferred option, including construction and demolition waste, vegetation waste, packaging materials and liquid wastes.

**Cumulative impacts**

Cumulative impacts are incremental environmental impacts that are caused by past, present or reasonably foreseeable future activities which, when combined, may have a cumulative effect. When considered in isolation, the environmental impacts of any single project upon any single receiver or resource may not be significant. Significant effects may arise, however, when individual effects are considered in combination, either within the same project or together with other projects.

The impacts of the construction and operation of the recommended preferred option may add to impacts from other activities and projects in the Grafton and South Grafton area.

# 7 Next steps

The process to identify a preferred option is shown in the flow chart in Figure 18 below.

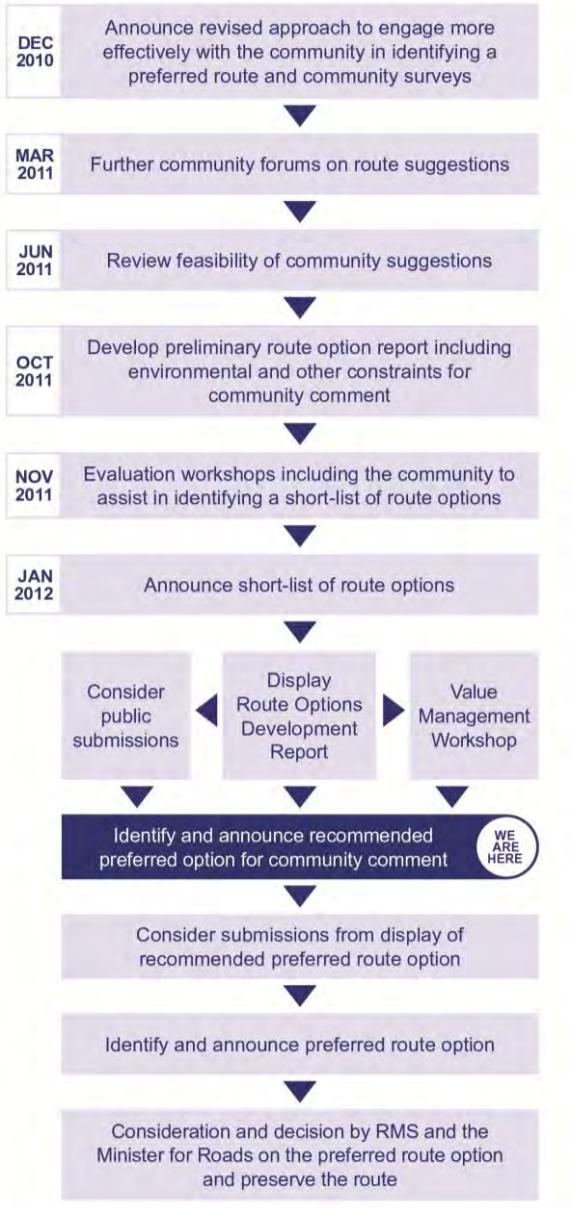


Figure 18: Process to identify a preferred option as of December 2012

Community comments received on the six route options, the investigations undertaken and the outcomes of the value management workshop have been inputs into a decision on the recommended preferred option.

Community feedback on the recommended preferred option will be considered before a final decision is made on the preferred option for an additional crossing of the Clarence River at Grafton.

Following a decision to proceed with the project, the concept design for the preferred option would be further refined and an environmental assessment would be prepared and displayed for community and stakeholder comment.

# Appendix 1 – Route Options Submissions Report