Additional crossing of the Clarence River at Grafton

Preliminary Route Options Report
Final

JANUARY 2012
Additional crossing of the Clarence River at Grafton

Preliminary Route Options Report
Volume 1 - Main Report

JANUARY 2012
This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 220422
# Contents

**Volume 1 – Main report**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Summary</td>
<td>i</td>
</tr>
<tr>
<td>Glossary of terms and abbreviations</td>
<td>v</td>
</tr>
<tr>
<td><strong>1 Introduction</strong></td>
<td>1</td>
</tr>
<tr>
<td>1.1 Background</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Purpose of this report</td>
<td>2</td>
</tr>
<tr>
<td>1.3 Structure of this report</td>
<td>2</td>
</tr>
<tr>
<td>1.4 Assumptions and limitations</td>
<td>3</td>
</tr>
<tr>
<td><strong>Part 1 - Existing environment, issues and constraints</strong></td>
<td>5</td>
</tr>
<tr>
<td>2 Project strategic context, need and objectives</td>
<td>5</td>
</tr>
<tr>
<td>2.1 Strategic context</td>
<td>5</td>
</tr>
<tr>
<td>2.2 The need for an additional crossing</td>
<td>12</td>
</tr>
<tr>
<td>2.3 Project purpose and objectives</td>
<td>13</td>
</tr>
<tr>
<td>3 Community involvement and feedback</td>
<td>15</td>
</tr>
<tr>
<td>3.1 December 2010 community update and staffed displays</td>
<td>15</td>
</tr>
<tr>
<td>3.2 Community and business surveys</td>
<td>17</td>
</tr>
<tr>
<td>3.3 Community forums: March 2011</td>
<td>18</td>
</tr>
<tr>
<td>3.4 June 2011 community update</td>
<td>19</td>
</tr>
<tr>
<td>3.5 Community forums: June 2011</td>
<td>19</td>
</tr>
<tr>
<td>3.6 Preliminary Route Options Report – Part 1: August 2011</td>
<td>19</td>
</tr>
<tr>
<td>3.7 August 2011 information and feedback sessions</td>
<td>20</td>
</tr>
<tr>
<td>3.8 Preliminary Route Options Report – Parts 1 and 2: October 2011</td>
<td>20</td>
</tr>
<tr>
<td>3.9 October 2011 community update</td>
<td>20</td>
</tr>
<tr>
<td>3.10 November 2011 information and feedback sessions</td>
<td>20</td>
</tr>
<tr>
<td>3.11 Community and stakeholder evaluation workshop</td>
<td>21</td>
</tr>
<tr>
<td><strong>4 Existing transport situation</strong></td>
<td>22</td>
</tr>
<tr>
<td>4.1 Existing bridge</td>
<td>22</td>
</tr>
<tr>
<td>4.2 Existing road network</td>
<td>24</td>
</tr>
<tr>
<td>4.3 Crash history</td>
<td>29</td>
</tr>
<tr>
<td>4.4 Existing traffic demands</td>
<td>31</td>
</tr>
<tr>
<td>4.5 Population growth and development</td>
<td>35</td>
</tr>
<tr>
<td>4.6 Traffic and transport modelling</td>
<td>38</td>
</tr>
<tr>
<td>4.7 Public bus service</td>
<td>38</td>
</tr>
<tr>
<td>4.8 Pedestrian and cyclists access</td>
<td>40</td>
</tr>
</tbody>
</table>
4.9 Maritime transport

5 Existing environment and constraints
5.1 Landscape and urban character
5.2 Land use and planning
5.3 Social and economic
5.4 Aboriginal heritage
5.5 Non-Aboriginal heritage
5.6 Noise
5.7 Ecology
5.8 Flooding
5.9 Other environmental aspects and constraints

Part 2 - Assessment of preliminary options
6 Preliminary route options
6.1 Corridor 1
6.2 Corridor 2
6.3 Corridor 3
6.4 Corridor 4
6.5 Corridor 5

7 Assessment of preliminary route options
7.1 Assessment methodology
7.2 Assessment results for options in Corridor 1
7.3 Assessment results for options in Corridor 2
7.4 Assessment results for options in Corridor 3
7.5 Assessment results for options in Corridor 4
7.6 Assessment results for options in Corridor 5

Part 3 - Identification of short-list
8 Short-list of route options
8.1 Methodology for short-listing of route options
8.2 Inputs into selection of short-list of route options
8.3 Selection of short-list of route options
8.4 Short-list of route options

9 Next steps
9.1 Short-listing process
Tables

Table 1: Headroom restrictions from railway viaduct in Grafton CBD.
Table 2: Historical annual average daily traffic count data across the Clarence River, Grafton.
Table 3: Historical annual average traffic growth rates across the Clarence River, Grafton.
Table 4: Average travel time and speed between Bent Street/Gwydir Highway and Prince Street/Pound Street.
Table 5: Forecast population growth in Grafton and surrounds.
Table 6: Minimum required clearances for an additional crossing over the Clarence River at Grafton.
Table 7: Existing land use and land use zones.
Table 8: Median property prices 12 months to March 2011.
Table 9: Aboriginal Heritage Information Management Systems database results for a 6 km x 6 km search area centred on the existing Grafton Bridge.
Table 10: Summary of identified non-Aboriginal heritage items.
Table 11: Threatened flora with marginal potential habitat in the Grafton area.
Table 12: Design flood event result summary.
Table 13: Clarence River channel sub surface conditions, adjacent to Grafton Bridge.
Table 14: Clarence River southern river bank sub surface conditions between Susan and Elizabeth Islands.
Table 15: Preliminary route options within the five corridors.
Table 16: Preliminary route options in Corridor 1.
Table 17: Preliminary route options in Corridor 2.
Table 18: Preliminary route options in Corridor 3.
Table 19: Preliminary route options in Corridor 4.
Table 20: Preliminary route options in Corridor 5.
Table 21: Supporting objectives used in the assessment of the preliminary route options.
Table 22: Supporting objectives excluded from the assessment of the preliminary route options.
Table 23: Traffic data sources for strategic model.
Table 24: Assessment results for preliminary route options in Corridor 1.
Table 25: Assessment results for preliminary route options in Corridor 2.
Table 26: Assessment results for preliminary route options in Corridor 3.
Table 27: Assessment results for preliminary route options in Corridor 4.
Table 28: Assessment results for preliminary route options in Corridor 5.
Table 29: Short-list of route options.
Table 30: Basic Bridge and road design criteria.
Table 31: Minimum required clearances for a second crossing over the Clarence River at Grafton.
Table 32: Drainage infrastructure design requirements.
Table 33: August 2011 information and feedback sessions: feedback received.
Figures

Figure 1: Short-list of route options.
Figure 2: Timeline of discussions and studies into an additional crossing of the Clarence River.
Figure 3: Grafton Waterfront Precinct Masterplan (Source: CVC & Clouston Associates 2011).
Figure 4: Pedestrian and cyclist routes in Grafton under the Bike Plan and Pedestrian Access and Mobility Plan (CVC & QED 2008).
Figure 5: Pedestrian and cyclist routes in South Grafton under the Bike Plan and Pedestrian Access and Mobility Plan (CVC & QED 2008).
Figure 6: 13 preliminary route options for an additional crossing displayed in the December 2010 community update.
Figure 7: Grafton Bridge fact sheet and schematic map.
Figure 8: Grafton area existing road network, showing the 25/26 m B-Double routes
Figure 9: Regional road network, showing the 25/26 m B-Double routes.
Figure 10: Crash history in the Grafton area (RMS CrashLink Database 1 July 2004 – 30 June 2009).
Figure 11: Vehicle trip types crossing Grafton Bridge on 19 August 2010 (5 am - 7 pm).
Figure 12: Bridge traffic count results for all vehicles approaches between Thursday 19 August 2010 and Thursday 26 August 2010.
Figure 13: Bridge traffic count results Heavy vehicles (including buses) between Thursday 19 August 2010 and Thursday 26 August 2010.
Figure 14: Day time classified traffic count on the Grafton Bridge (Thursday 19 August to Thursday 26 August 2010, 7 am to 10 pm).
Figure 15: Night time classified traffic count on the Grafton Bridge (Thursday 19 August to Thursday 26 August 2010, 10 pm to 7 am).
Figure 16: Total (24 hour) classified traffic count on the Grafton Bridge (Thursday 19 August to Thursday 26 August 2010).
Figure 17: Clarence South growth areas identified in the Mid North Coast Regional Strategy.
Figure 18: Busways routes in the Grafton area.
Figure 19: Existing pedestrian and cyclist crossings on the Grafton Bridge.
Figure 20: Landscape character types of the Grafton area.
Figure 21: Key views of Grafton Bridge.
Figure 22: Land use zones in the Grafton area (draft Clarence Valley Local Environmental Plan 2010).
Figure 23: Future land uses in the Grafton area as presented in the Mid North Coast Regional Strategy.
Figure 24: Trans Regional Amalgamated Infrastructure Network proposal.
Figure 25: Key community and recreation infrastructure in the Grafton area.
Figure 26: Unemployment rate in the Clarence Valley local government area. Source: Clarence Valley Economic Monitor (Lawrence Consulting June 2010).
Figure 27: Labour force in the Clarence Valley local government area. Source: Lawrence Consulting June 2010.
Figure 28: Potential social and economic constraints in the Grafton area.
Figure 29: Known Aboriginal cultural values in the Grafton area.
Figure 30: Aboriginal archaeological potential in the Grafton area.
Figure 31: Items in the Grafton area listed on the State Heritage Register and the Section 170 Register.
Figure 32: Items in the Grafton area listed on Schedules 1, 2 and 3 of the North Coast Regional Environmental Plan 1988.
Figure 33: Items in the Grafton area listed on Schedule 1 of the Grafton Local Environmental Plan 1988.
Figure 34: Items in the Grafton area listed on the Register of the National Estate and the Commonwealth Heritage List.
Figure 35: Items in the Grafton area classified by the National Trust.
Figure 36: Areas of archaeological sensitivity in the Grafton area.
Figure 37: Non-residential noise sensitive receivers in the Grafton area
Figure 38: Vegetation types in the Grafton area.
Figure 39: Potential ecological constraints in the Grafton area.
Figure 40: Levee system in the Grafton area.
Figure 41: 5-year average recurrence interval event flood extent.
Figure 42: 20-year average recurrence interval event flood extent.
Figure 43: 100-year average recurrence interval event flood extent.
Figure 44: Bedrock geology and quaternary geology for the Grafton area.
Figure 45: Schematic cross section of meandering Clarence river system morphology and ground conditions in the Grafton area.
Figure 46: Acid sulphate soils risk in the Grafton area.
Figure 47: Public utility infrastructure in the Grafton area - water mains greater than 300 mm diameter.
Figure 48: Public utility infrastructure in the Grafton area - sewer mains greater than 300 mm diameter.
Figure 49: Public utility infrastructure in the Grafton area - stormwater.
Figure 50: Telecommunications in the Grafton area - optic fibre cables.
Figure 51: Public utility infrastructure in the Grafton area - electricity.
Figure 52: Preliminary route options and corridors.
Figure 53: Preliminary route options in Corridor 1.
Figure 54: Preliminary route options in Corridor 2.
Figure 55: Preliminary route options in Corridor 3.
Figure 56: Preliminary route options in Corridor 4.
Figure 57: Preliminary route options in Corridor 5.
Figure 58: Preliminary route options assessment methodology.
Figure 59: Short-list of route options.
Figure 60: Process to identify a preferred location for an additional crossing as of January 2012
Figure 61: Strategic locations for an additional crossing of the Clarence River from the Additional crossing of the Clarence River: Feasibility study report (RTA February 2003).
Figure 62: Possible crossing locations investigated as part of the Additional crossing of the Clarence River Grafton: Environmental overview (RTA January 2004).
Figure 63: Route options displayed in April 2004 and examined in the Additional crossing of the Clarence River at Grafton: Corridor evaluation workshop (RTA April 2004).
Figure 64: Study area for the South Grafton traffic study microsimulation model report (RTA February 2009).
Figure 65: Study area for the traffic study for the new crossing of the Clarence River at Grafton: Traffic study report (RTA December 2009).
Figure 66: Preliminary route options investigated in the Additional crossing of the Clarence River at Grafton: Traffic study for preliminary options (RTA, February 2010).
Figure 67: 41 suggestions for an additional crossing of the Clarence River at Grafton as presented in the Main Road 83 Summerland Way Additional Crossing of the Clarence River at Grafton Feasibility Assessment Report, June 2011.
Figure 68: Preliminary route options for further consideration as documented in the Main Road 83 Summerland Way Additional Crossing of the Clarence River at Grafton Feasibility Assessment Report, June 2011.
Figure 69: Typical bridge cross sections.

Appendices

Appendix 1 – Previous Studies
Appendix 2 – Additional crossing design criteria
Appendix 3 – Community feedback
Appendix 4 – Preliminary route options drawings
Appendix 5 – Preliminary route options constraint mapping
Appendix 6 – Community and stakeholder evaluation workshop
Appendix 7 – Community feedback on Preliminary Route Options Report - Parts 1 and 2

Volume 2 – Technical Papers

Landscape and urban character
Social and economic
Aboriginal heritage
Non-Aboriginal heritage
Ecology
Strategic Traffic Assessment
Executive Summary

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

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 the then RTA (now RMS) announced a revised approach to the issue 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, 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. 25 preliminary route options in five corridors were identified for engineering and environmental investigation.

As part of the selection of a recommended preferred location for an additional crossing, RMS, following consultation with community members and other stakeholders, has undertaken a short-listing process that identifies the most suitable route option(s) within each of the five corridors. Six short-listed route options will be taken forward for more detailed engineering and environmental investigation prior to the selection of a recommended preferred option.

The short-listing process to identify the most suitable route option(s) within each of the five corridors is documented in this Preliminary Route Options Report - Final, which comprises two volumes:

- Volume 1 – Main report.
- Volume 2 – Technical papers.

Preliminary Route Options Report, Volume 1 – Main report

Volume 1 of the report has been compiled in the following three parts:

- Part 1 describes the existing environment in the Grafton area and identifies issues and constraints relevant to an additional crossing of the Clarence River in Grafton and surrounds. Part 1 was provided to the community for comment in August 2011.
- Part 2 describes the 25 preliminary route options located within the five strategic corridors and assesses these options against the project objectives. Parts 1 and 2 were provided to the community for comment in October 2011.
- Part 3, which is now provided as part of this Preliminary Route Options Report - Final. Part 3 documents community feedback received and the outcomes of a community and stakeholder workshop held in November 2011. The process to identify the short-list of options to be taken forward for further engineering and environmental investigations and the short-listed options are also described.
Community comments on Part 1 received in August 2011 were incorporated into Preliminary Route Options Report – Parts 1 and 2 where appropriate. Community comments on Parts 1 and 2 received in October and November 2011 have been incorporated into this Preliminary Route Options Report – Final where appropriate.

Preliminary Route Options Report, Volume 2 - Technical papers

Volume 2 of the report was provided to the community for comment with Part 1 Volume 1 in August 2011. Volume 2 contains technical papers that were prepared by specialist sub-consultants in the fields of: landscape and urban character, social and economic issues, Aboriginal heritage, non-Aboriginal heritage and ecology. In October and December 2011 the social and economic technical paper was updated to address feedback received and in November 2011 a technical paper describing the strategic traffic assessment was added.

These technical papers provide additional background information, including a series of constraint maps that show the existing and potential constraints that will be considered when planning for an additional crossing of the Clarence River at Grafton. The papers also discuss issues and constraints that have been identified as part of the future planning and forecast growth of the area.

Short-list of route options

The short-list of route options to be taken forward for further investigation as part of the process of selecting the preferred option for the additional crossing of the Clarence River at Grafton has been identified.

The three key inputs into the selection of the short-list of were:

- The findings of the technical investigations and specialist studies undertaken for the project (Preliminary Route Options Report – Parts 1 and 2).
- Feedback received from the community.
- Outcomes of a community and stakeholder evaluation workshop held in November 2011.

The short-list of options to be taken forward for further investigation is:

- Option E: Cowan Street, South Grafton to Villiers Street, Grafton.
- Option A: New bridge parallel to and immediately upstream of the existing bridge connecting Bent Street, South Grafton and Fitzroy Street, Grafton.
- Option C: Junction of Pacific Highway and Gwydir Highway, South Grafton to Pound Street, Grafton.
- Option 11: Existing Pacific Highway north of South Grafton to Fry Street, Grafton.
- Option 14: Existing Pacific Highway north of South Grafton to North Street, Grafton via Kirchner Street.
- Option 15: Existing Pacific Highway north of South Grafton to Summerland Way north of Grafton, via Kirchner Street.

The short-listed options are shown in Figure 1.

What happens next

Following an announcement on the short list of options, further technical and environmental investigations will be undertaken to provide more detailed information on the relative performance of the options. The investigations will be reported in the Route Options Development Report (RODR).
When completed, the RODR will be displayed for community comment. Community comments received, together with the investigations undertaken and the outcomes of the Value Management Workshop will input into a decision on a recommended preferred option.

Feedback from the display of the recommended preferred option will be considered before a decision is made on the preferred location for an additional crossing of the Clarence River at Grafton.
Figure 1: Short-list of route options.

Main Road 83 Summerland Way
Additional Crossing of the Clarence River at Grafton
### Glossary of terms and abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AADT</strong></td>
<td>Annual average daily traffic.</td>
</tr>
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<td><strong>ABS</strong></td>
<td>Australian Bureau of Statistics.</td>
</tr>
<tr>
<td><strong>AHD</strong></td>
<td>Australian Height Datum, a common national plane of level approximately equivalent to the height above sea level.</td>
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<td><strong>Air draft</strong></td>
<td>The distance from the surface of the water to the highest point on a vessel.</td>
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<td><strong>AHIMS</strong></td>
<td>Aboriginal Heritage Information Management System.</td>
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<td><strong>AM peak</strong></td>
<td>Morning traffic peak period in Grafton, that is, from 7 am to 9 am.</td>
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<td><strong>ANSDB</strong></td>
<td>Australian National Shipwrecks Database.</td>
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<td><strong>ARI</strong></td>
<td>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.</td>
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<td><strong>ANZECC</strong></td>
<td>Australian and New Zealand Environment and Conservation Council.</td>
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<td><strong>ARTC</strong></td>
<td>Australian Rail Track Corporation.</td>
</tr>
</tbody>
</table>
| **Austroads**| Austroads is the association of Australian and New Zealand road transport and traffic authorities. Austroads classifies motor vehicles in 12 classes as follows:  
- Light Vehicles: class 1 (eg sedan, 4WD) and class 2 (eg caravan).  
- Buses: class 3 (2 axle bus) and class 4 (3 axle bus).  
- Heavy Vehicles (rigid): class 3 (2 axle truck), class 4 (3 axle truck) and class 5 (4 axle truck).  
- 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).  
- Heavy Vehicles (B-Double): class 10 (B-Double truck), class 11 (double road train) and class 12 (triple road train). |
<p>| <strong>Bioretention</strong> | Bioretention is the process in which contaminants and sediment are removed from stormwater runoff. It often involves filtering stormwater runoff through a terrestrial aerobic plant, soil and microbe complex to remove pollutants through a variety of physical, chemical and biological processes. |
| <strong>BOM</strong>      | Bureau of Meteorology. |
| <strong>CBD</strong>      | Central business district. |
| <strong>CMA</strong>      | Northern Rivers Catchment Management Authority. |
| <strong>Contributory item</strong> | Contributory items are buildings in Grafton and South Grafton which are considered by the project’s non-Aboriginal heritage specialist to contribute to the significance and character of Grafton and South Grafton urban conservation areas. Contributory items have been identified in this report as areas of non-Aboriginal heritage archaeological sensitivity. |
| <strong>CSIRO</strong>    | Commonwealth Scientific and Industrial Research Organisation. |
| <strong>CVC</strong>      | Clarence Valley Council. |
| <strong>dB</strong>       | Decibel, a logarithmic unit of sound intensity. |
| <strong>dB(A)</strong>    | A-weighted sound pressure level in decibels. The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. |
| <strong>DET</strong>      | NSW Department of Education and Training. |
| <strong>DMR</strong>      | Former Department of Main Roads (now NSW Department of Transport). |</p>
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<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIC</td>
<td>Rail Infrastructure Corporation.</td>
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<td>RL</td>
<td>Reduced Level</td>
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<td>RMS</td>
<td>NSW Roads and Maritime Services (formerly known as RTA: Roads and Traffic Authority).</td>
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<tr>
<td>Scour</td>
<td>Removal of soil or fill material by the river flow. The term is frequently used to describe storm-induced, localised conical erosion around bridge pilings and other foundation supports where the obstruction of flow increases turbulence.</td>
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<td>SEPP</td>
<td>State Environmental Planning Policy.</td>
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<tr>
<td>SES</td>
<td>State Emergency Services.</td>
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<tr>
<td>Strategic traffic model</td>
<td>A computer model used to analyse the overall road network performance of a suburb, town or region.</td>
</tr>
<tr>
<td>TRAIN</td>
<td>Trans Regional Amalgamated Infrastructure Network</td>
</tr>
<tr>
<td>Vpd</td>
<td>Vehicles per day.</td>
</tr>
<tr>
<td>VHT</td>
<td>Vehicle hours travelled.</td>
</tr>
<tr>
<td>VKT</td>
<td>Vehicle kilometres travelled.</td>
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1 Introduction

1.1 Background

The existing Grafton Bridge provides road access between the residential and commercial areas of Grafton and South Grafton. It is part of Main Road 83 Summerland Way, a link in the State road network which provides a connection between the Pacific Highway, South Grafton, the Bruxner Highway at Casino and the Mount Lindesay Highway near the NSW and Queensland border. Since the early 1970s there have been various discussions and studies into an additional crossing of the Clarence River near Grafton. A number of these studies have been carried out during the past ten 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 bridge opened in 1932 is shown in Figure 2 below.

Figure 2: Timeline of discussions and studies into an additional crossing of the Clarence River.

In December 2010, RMS outlined a revised consultation process to identify a preferred location for the additional crossing. The December 2010 community update identified 13 preliminary route options which included the additional options suggested by the community following the February 2010 display. The December 2010 community update also included a community postal survey regarding the additional crossing. From the responses to the postal survey, a further 28 new route suggestions were identified. The addition of these 28 community suggestions brought the total number of suggestions and preliminary options for an additional crossing location to 41. These are referred to as the 41 suggestions in this report.

In April 2011, RMS conducted a feasibility assessment to identify those suggestions that were not feasible and did not warrant further consideration and investigation. The feasibility assessment identified 25 preliminary route options within five corridors for further engineering and environmental investigation. This is documented in the 'Feasibility Assessment Report' (RTA, June 2011).
Between August 2011 and January 2012 the *Preliminary Route Options Report* was released in the following three parts:

- Part 1, which was provided to the community for comment in August 2011. Part 1 describes the existing environment in the Grafton area and identifies issues and constraints relevant to an additional crossing of the Clarence River in Grafton and surrounds.
- Part 2, which describes the 25 preliminary route options located within the five strategic corridors and assesses these options against the project objectives. Parts 1 and 2 were provided to the community for comment in October 2011.
- Part 3, which is now provided as part of this *Preliminary Route Options Report - Final*. Part 3 documents the short-listing process and identifies the short-listed options to be taken forward for further engineering and environmental investigations.

In January 2012, RMS announced a short-list of route options as shown in Figure 1. The short-listing process identified the best route option(s) within each of the five corridors and is documented in Chapter 1 of the *Preliminary Route Options Report – Final* (this report). These short-listed route options will be taken forward for more detailed engineering and environmental investigation prior to the selection of a recommended preferred option.

RMS will now work with the community to identify a preferred option for an additional crossing of the Clarence River from the short-list of route options as shown in Figure 1.

### 1.2 Purpose of this report

The purpose of the *Preliminary Route Options Report* is to:

- Describe the existing environment in the Grafton area and identify issues and constraints relevant to an additional crossing of the Clarence River in Grafton and surrounds.
- Describe the 25 preliminary route options located within the five strategic corridors and assess these options against the project objectives.
- Document the short-listing process and identify the short-listed options to be taken forward for further engineering and environmental investigations.
- Outline the next steps for identifying the preferred location of an additional crossing of the Clarence River at Grafton.

### 1.3 Structure of this report

The *Preliminary Route Options Report* comprises two volumes:

- Volume 1 – Main report, and
- Volume 2 – Technical papers

**Preliminary Route Options Report, Volume 1 – Main report**

Volume 1 of the report has been released in the following three parts:

- Part 1, which forms Chapters 2 to 5 of this report, was provided to the community for comment in August 2011. Part 1 was developed from desktop studies (ie review and analysis of existing published information such as reports, mapping, government policy and planning documents) and site visits undertaken during 2010 and 2011. Part 1 builds upon previous investigations
into an additional crossing of the Clarence River at Grafton undertaken over the past 10 years, including the 2003-2004 investigations and Value Management process. Part 1 of this report:

- Provides information to the community on the development of the investigations to date.
- Outlines the strategic context and reconfirms the need, purpose and objectives of an additional crossing of the Clarence River at Grafton.
- Describes the community involvement activities carried out for the project.
- Describes the existing transport situation and identifies future transport needs for the Grafton and South Grafton.
- Provides an overview of the existing environment, issues and constraints associated with an additional crossing, including traffic and transport, urban character, landscape, land use, social and economic issues, Aboriginal heritage, non-Aboriginal heritage, noise, ecology and flooding.

- Part 2, which forms Chapters 6 and 7 of this report and was provided to the community for comment in October 2011:
  - Describes the 25 preliminary route options located within the five strategic corridors.
  - Assesses these options against the project objectives.

- Part 3, which is now provided for community comment and forms Chapter 8 of this report:
  - Documents the short-listing process and identifies the short-listed options to be taken forward for further engineering and environmental investigations.
  - Outlines the next steps for identifying the preferred location of an additional crossing of the Clarence River at Grafton.

Community comments on Part 1 received in August 2011 were incorporated into Preliminary Route Options Report – Parts 1 and 2 where appropriate. Community comments on Parts 1 and 2 received in October and November 2011 have been incorporated into this Preliminary Route Options Report – Final where appropriate.

**Preliminary Route Options Report, Volume 2 - Technical papers**

Volume 2 of the report was provided to the community for comment in August 2011. Volume 2 contains technical papers that were prepared by specialist sub-consultants in the fields of: landscape and urban character, social and economic issues, Aboriginal heritage, non-Aboriginal heritage and ecology. In October and December 2011 the social and economic technical paper was updated to address feedback received and in November 2011 a technical paper describing the strategic traffic assessment was added.

These technical papers provide additional background information, including a series of constraint maps that show the existing and potential constraints that will be considered when planning for an additional crossing of the Clarence River at Grafton. The papers also discuss issues and constraints that have been identified as part of the future planning and forecast growth of the area.

**1.4 Assumptions and limitations**

This report is intended to provide information on the existing environment, issues and constraints related to the identification of a location for an additional crossing of the Clarence River at Grafton and assess the 25 preliminary route options against the issues and constraints identified.
Constraints mapping presented in this report was used to aid the evaluation and short-listing of preliminary route options and to facilitate community input into the process.

This report has been developed from desktop studies (ie review and analysis of existing published information such as reports, mapping, government policy and planning documents) and site visits during 2010 and 2011 as well as additional traffic and flooding investigations. The 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 2003-2004 investigations and Value Management process. No warranty as to accuracy or completeness of this information is given and no responsibility is accepted by RMS for any loss or damage arising from reliance on the information provided.

As the process for identifying a recommended preferred location for the additional crossing progresses, detailed investigations, additional field work and modelling will be carried out to complement the work undertaken to date and further refine the identified constraints within the Grafton area.
2 Project strategic context, need and objectives

This chapter provides an overview of the government policy and strategy documents that are relevant to an additional crossing of the Clarence River at Grafton. It also identifies the need for and objectives to be achieved by the additional crossing. A detailed review of previous investigations carried out for the project over the past 10 years is included in Appendix 1.

2.1 Strategic context

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

- **NSW 2021: A plan to make NSW number one** (NSW Government 2011).
- **Mid North Coast Regional Strategy** (DP&I 2009).
- **Far North Coast Regional Strategy** (DP&I 2006).
- **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 & Clouston Associates 1999).
- **Bike Plan and Pedestrian Access and Mobility Plan** (CVC & QED 2008).

These strategic documents are discussed in the following chapters.

2.1.1 NSW 2021: A plan to make NSW number one (Updated December 2011)

The *NSW 2021: A plan to make NSW number one* (NSW Government 2011) is a 10 year plan to rebuild the NSW economy, return quality services, renovate infrastructure, restore accountability to government, and strengthen local environment and communities. The Plan sets a 20 year State Infrastructure Strategy (currently being developed) with funded five year plans that ensure infrastructure is planned and delivered according to strategic economic and community needs.

The *NSW 2021: A plan to make NSW number one* includes the following goals relevant to an additional crossing:

- Improve road safety.
- Increase investment in regional infrastructure.
- Improve quality of urban and rural State roads.

Providing an additional river crossing is consistent with the priorities of the *NSW 2021 A plan to make NSW number one*, as key objectives of the additional crossing are to improve traffic efficiency, enhance road safety for all road users over the length of the project, and support regional and local economic development.
2.1.2 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 (forecast population growth is discussed further in Chapter 4.5).

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 sub region. 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’.

An additional crossing of the Clarence River at Grafton would be consistent with the Mid North Coast Regional Strategy as it would enhance the ability of Grafton to meet its functions as a major regional centre.

2.1.3 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 inter-state road and rail networks.

An additional crossing of the Clarence River at Grafton acknowledges the Far North Coast Regional Strategy and the towns of Casino and Kyogle as settlements connected to Grafton via the Summerland Way.

2.1.4 Northern Rivers Regional Plan 2011 (Added December 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 strategy’s 2020 vision for the Northern Rivers region is:

A healthy, prosperous and sustainable future for the communities of the Northern Rivers region.

One of the priority issues identified in the strategy is transport and the need to increase investment into transport infrastructure to enhance economic development. An additional crossing of the Clarence River at Grafton is consistent with the strategy vision and would enhance economic development in the Grafton, South Grafton and surrounding areas.

2.1.5 Clarence Valley Settlement Strategy

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

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.
An additional crossing of the Clarence River in Grafton is consistent with the strategy as it would respond to the traffic demands of the existing population and forecasted growth areas of Grafton and South Grafton while alleviating the traffic pressure over the existing bridge.

2.1.6 Clarence River Way Masterplan

The *Clarence River Way Masterplan 1999* (CVC & Clouston Associates 1999) is a tourism and infrastructure investment program that aims 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:

- Re-orient the city to the river, including both Grafton and South Grafton.
- Simplify decision-making and create a sense of arrival, gateway statement and enhance first impressions of Grafton from the Pacific Highway.
- 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 gateway arrival first impressions.
- 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 land holders 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 a potential for a marina integrated with the redevelopment of the Kemp Street bowling club and a potential for a jetty / pontoon immediately downstream of the existing bridge in Grafton.

The process for the identification of a preferred location for an additional crossing will consider the actions identified in the *Clarence River Way Masterplan*.

2.1.7 Grafton Waterfront Precinct Masterplan

The *Grafton Waterfront Precinct Masterplan* (CVC & Clouston Associates 2011) proposes a revitalisation program for the river edge area between Queen Street and the Grafton Bridge (Figure 3). 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 *Grafton Waterfront Precinct Masterplan* will be considered while developing a preferred location for an additional crossing.
Figure 3: Grafton Waterfront Precinct Masterplan (Source: CVC & Clouston Associates 2011).
2.1.8 Bike Plan and Pedestrian Access and Mobility Plan

Clarence Valley Council’s *Bike Plan and Pedestrian Access and Mobility Plan* (CVC & QED 2008) is a comprehensive strategic approach to identifying a cycling and pedestrian network. The plan 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 including trips, motor vehicles, bicycles and other wheeled forms of transport.
- Improve connectivity with other transport modes primarily 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).

Proposed pedestrian and cyclist routes under the plan are presented in Figure 4 and Figure 5. An additional crossing of the Clarence River at Grafton has the potential to complement the Bike Plan and Pedestrian Access and Mobility Plan by providing an additional pedestrian and cyclist connection over the Clarence River.
Figure 4: Pedestrian and cyclist routes in Grafton under the *Bike Plan and Pedestrian Access and Mobility Plan* (CVC & QED 2008).
Figure 5: Pedestrian and cyclist routes in South Grafton under the Bike Plan and Pedestrian Access and Mobility Plan (CVC & QED 2008).
2.1.9 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.

An additional river crossing is consistent with the South Grafton Heights Precinct Strategy as it has the potential to provide for additional transport infrastructure over the Clarence River that would meet the future transport demands generated by this development.

2.1.10 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 consisted of an assessment of two alternative inland routes and compared 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 significant 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 was 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 did not identify the Summerland Way as the preferred transport corridor, it remains a State road. The additional crossing of the Clarence River 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.

2.2 The need for an additional crossing

Investigations into the existing traffic situation in the Grafton area show congestion and traffic delays over the existing bridge, in particular during morning and afternoon peak hours. Traffic studies presented in this report show that the majority of traffic that causes congestion and traffic delays is local traffic. This situation is discussed in detail in Chapter 4.
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 results in a reduced level of service on the existing bridge.

The need for an additional crossing of the Clarence River at Grafton is largely defined by:

- Existing traffic congestion associated with the existing bridge and the resultant flow affecting the Grafton community. This is discussed in detail in Chapter 4.
- The growth and development in the Grafton area. This is discussed in Chapters 2.1.3, 2.1.9 and 4.5.
- The geometry of the existing bridge and resultant traffic constraints and safety issues. This is discussed in detail in Chapters 4.3 and 4.1.2.

At this point of the project planning stage RMS aims to identify and preserve a route for an additional crossing that achieves the project objectives.

### 2.3 Project purpose and objectives

In response to community feedback, the project purpose and objectives have been reviewed. The project objectives remain the objectives displayed in the December 2010 community update (Refer to Chapter 3.1).

**Project purpose**

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

**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.

**Supporting objectives**

To assist in achieving these objectives, the following supporting objectives have been developed. The supporting objective “provide an aesthetically pleasing structure that fits sensitively into the built, natural and community context” has been amended to “provide a project that fits sensitively into the built, natural and community context” to better reflect the needs of the project.

**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 1 in 100-year flood event, and for the approach roads for a 1 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.
3 Community involvement and feedback

This chapter documents the community involvement and feedback activities conducted since the revised consultation process was announced in December 2010. Community involvement activities are part of a comprehensive Community Liaison Plan prepared by RMS. The plan describes how the project team engages with the community to assist with the identification of a preferred option for the crossing of the Clarence River at Grafton.

Recent community involvement and feedback activities include:

- December 2010 community update and associated staffed displays.
- Community surveys (postal, telephone and business surveys).
- March 2011 community forums.
- June 2011 community update and forums.
- August 2011 Preliminary Route Options Report Part 1, for comment.
- August 2011 information and feedback sessions.
- October 2011 Preliminary Route Options Report Parts 1 and 2, for comment.
- October 2011 community update.
- November 2011 information and feedback sessions.
- November 2011 community and stakeholder evaluation workshop.

Community involvement activities are discussed in the following chapters while consultation with the Aboriginal community is discussed in Chapter 5.4.1.

3.1 December 2010 community update and staffed displays

In December 2010, RMS announced a revised approach to engage more effectively with the community and stakeholders to identify a preferred location for an additional crossing. The December 2010 community update identified 13 preliminary route options which included options previously suggested by the community. These are presented in Figure 6.

The December 2010 community update also included a community postal survey which is discussed further in Chapter 3.2.1.

Staffed displays were conducted at Grafton Shopping World and the South Grafton Bi-Lo complex on 9 and 16 December 2010 and 3 February 2011 to promote the community update and postal survey.
Figure 6: 13 preliminary route options for an additional crossing displayed in the December 2010 community update.
3.2 Community and business surveys

Three community surveys were undertaken to gauge the views of local residents and businesses regarding the additional crossing of the Clarence River at Grafton:

- Postal survey: 6 December 2010 to 8 March.
- Telephone survey: 14 to 21 March 2011.

3.2.1 Postal survey: 6 December 2010 to 8 March 2011

The December 2010 community update included a community postal survey which asked the community for their feedback about the issues that need to be considered when planning for an additional crossing of the Clarence River. The survey invited the community to identify other locations for an additional crossing that they would like to have considered.

A total of 437 responses to the postal survey were received between 6 December 2010 and 8 March 2011. Responses were focused on the key issues of traffic congestion and heavy vehicles. The community expressed a desire to have sensitive social, cultural and environmental areas considered when planning the additional river crossing. Bypassing the Grafton CBD and/or residential areas were also considered ways of reducing the impact on the local community, with some respondents suggesting a new bridge away from Grafton altogether. Safety for all road users was also raised as a concern. Following recent flooding, there was a heightened awareness of the potential impacts of locating the additional crossing in a flood-prone area.

70 respondents provided suggestions for the location of an additional crossing. From these, a total of 28 additional crossing suggestions were identified. This brought the total of suggested locations for an additional crossing to 41. These are presented in Figure 67.

The postal survey results are documented in the December 2010 to March 2011 Feedback Report (RTA, April 2011) which is available on the project website.

3.2.2 Telephone survey: 14 to 21 March 2011

514 randomly selected residents from the Clarence Valley participated in a telephone survey conducted by an independent market research company engaged by RMS. The survey was designed to gain community feedback on issues surrounding the planning for an additional crossing of the Clarence River at Grafton. Five regional quotas were applied to ensure adequate representation across different areas of Grafton, South Grafton and surrounding districts.

Specific survey objectives included:

- Quantifying resident attitudes towards the many issues previously identified as affecting the location of an additional crossing.
- Measuring support for different route corridors.
- Understanding possible changes to traffic use of the existing Grafton Bridge depending on preferred locations of a new bridge.

96 per cent of respondents agreed that there should be an additional crossing of the Clarence River at Grafton. 69 per cent of respondents had a preference as to where an additional crossing should be located.
The survey findings indicate that of the 69 per cent that responded to this question, the majority (58 per cent) of residents are seeking an additional crossing that is downstream of the existing bridge and crosses the Clarence River at or north of North Street in Grafton. However, based on identified likely future travel habits, the data suggests that the majority of residents would continue to use the existing bridge should an additional crossing be located at either of these preferred locations.

The telephone survey results are documented in the *Telephone survey of Clarence Valley residents Report* (RTA, May 2011) which is available on the project website.

### 3.2.3 Business survey: 14 April to 3 May 2011

An online survey of local businesses was assisted by the Grafton Chamber of Commerce and Industry. Businesses not registered with the Chamber were also invited to participate. The business survey was designed to identify business and employer-related issues surrounding the existing Grafton Bridge, and understand the business community’s views on an additional crossing of the Clarence River.

104 completed surveys were received. 19 per cent of respondents believed that the congestion and delays on the Grafton Bridge seriously affected their business, with a further 52 per cent saying it affected their business “but not too badly”.

The business survey results indicated strong business support for an additional crossing of the Clarence River at Grafton. All five corridor options shown in Figure 68 are deemed “net beneficial” by respondents. However, there is some difference in opinion as to the location of an additional crossing, from nearby the existing bridge to the downstream option linking the Pacific Highway to North Street.

The business survey results are documented in the *Online Business Survey Report* (RTA, June 2011) which is available on the project website.

### 3.3 Community forums: March 2011

Afternoon and evening community forums were conducted by RMS on 3 and 16 March 2011 at the Grafton Community Centre. These are discussed in detail in the following chapters.

#### 3.3.1 Community forums: 3 March 2011

The 3 March 2011 afternoon and evening community forums were attended by about 110 people and discussed the following topics:

- Community feedback from the postal survey (refer to Chapter 3.2.1).
- Three potential methodologies to short-list suggestions displayed in the December 2010 community update and suggestions from the postal survey (ie 41 suggestions presented in Figure 67).
- Development and delivery of the telephone survey (refer to Chapter 3.2.2).

#### 3.3.2 Community forums: 16 March 2011

The 16 March 2011 afternoon and evening community forums were attended by about 80 people and the following topics were discussed:

- Traffic, including the heavy vehicle traffic survey (refer to Appendix A1.9).
- Project objectives (refer to Chapter 2.3).
• Chosen methodology to short-list suggestions displayed in the December 2010 community update and suggestions from the postal survey (i.e., 41 suggestions presented in Figure 67).

RMS discussed at the forums the chosen methodology for the short-listing of the 41 suggestions and the identification of a recommended preferred option. RMS also advised that an initial feasibility assessment of the 41 suggestions would be undertaken to identify those options that were not feasible and did not warrant further consideration and investigation.

3.4 June 2011 community update

In June 2011 RMS released a community update advising that of the 41 suggestions, 25 preliminary route options within five corridors will go forward for further engineering and environmental investigations (see Figure 68).

The June 2011 community update also presented to the community the adopted purpose and objectives for an additional crossing of the Clarence River at Grafton. The project objectives remain the objectives displayed in the December 2010 community update. Supporting objectives have also been developed to assist in achieving the project objectives. The June 2011 community update invited the community to provide feedback on the draft supporting objectives. The project purpose, objectives and supporting objectives can be found in Chapter 2.3.

The results of the three community surveys were also presented in the June 2011 community update, as discussed above in Chapter 3.2. The June 2011 community update is available on the project website.

3.5 Community forums: June 2011

Afternoon and evening community forums were conducted by RMS on 29 and 30 June 2011 at the Grafton Community Centre (evening session) and the South Grafton District Ex-Servicemens Club (afternoon session) respectively.

The forums presented to the community:
• The results of the postal survey, telephone survey and business survey.
• The adopted project purpose and objectives. Feedback on the draft supporting objectives was invited.
• The outcomes of the initial feasibility assessment.
• A copy of the presentation made at the community forums is available on the project website.

3.6 Preliminary Route Options Report – Part 1: August 2011

In August 2011 RMS released the Preliminary Route Options Report - Part 1, the first step in the short-listing process identifying the objectives, strategic context and need for an additional crossing. The report describes the existing environment in the Grafton and South Grafton area and identifies issues and constraints relevant to an additional crossing of Clarence River in Grafton.

The report builds upon previous investigations into an additional crossing of the Clarence River at Grafton that have been undertaken over the past 10 years, including the 2003-2004 investigations and Value Management process. Part 1 does not assess the 25 preliminary route options displayed in June 2011.

The community was invited to comment on the constraints outlined in the report between 9 August 2011 and 30 August 2011.
3.7 August 2011 information and feedback sessions

Following the release of the Preliminary Route Options Report – Part 1, RMS held a series of information and feedback sessions over two days:

- Monday 22 August 2011: from 2 pm to 4 pm and from 6 pm to 8 pm at the Grafton Community Centre.
- Tuesday 23 August 2011: from 10 am to 12 pm at the South Grafton District Ex-Servicemen’s Club.

The feedback sessions provided the opportunity to the Grafton community to talk one-on-one with the project team and the technical specialists about the issues and constraints raised in the Preliminary Route Options Report - Part 1, regarding an additional crossing.

Feedback received on the Preliminary Route Options Report – Part 1 is summarised in Appendix 3. Where relevant, chapters of the Preliminary Route Options Report – Part 1 incorporated in this report have been amended to address community feedback received.

3.8 Preliminary Route Options Report – Parts 1 and 2: October 2011

In October 2011 RMS released the Preliminary Route Options Report – Parts 1 and 2, the second step in the short-listing process. The report builds on the contents of the Preliminary Route Options Report - Part 1. This report provides a detailed description of the 25 preliminary route options and assesses these preliminary route options within five strategic corridors against issues and constraints identified in Grafton and surrounds.

The community was invited to comment on the Preliminary Route Options Report - Parts 1 and 2 between 27 October 2011 and 22 November 2011. Feedback was received on the report until 30 November and is summarised in Appendix 7. Where relevant, chapters of the Preliminary Route Options Report – Parts 1 and 2 have been amended to address community feedback received and updated in this Preliminary Route Options Report - Final.

3.9 October 2011 community update

In October 2011 RMS released a community update advising the release of the Preliminary Route Options Report – Parts 1 and 2.

The October 2011 community update invited community members to attend the November 2011 information and feedback session (See Chapter 3.10) and to nominate to participate in the November 2011 evaluation workshop (See Chapter 3.11).

The community update also invited comment on the Preliminary Route Options Report – Parts 1 and 2.

3.10 November 2011 information and feedback sessions

Following the release of the Preliminary Route Options Report – Parts 1 and 2, RMS held a series of information and feedback sessions over two days:

- Monday 14 November 2011: from 2 pm to 4 pm and from 6 pm to 8 pm at the Grafton Community Centre.
- Tuesday 15 November 2011: from 10 am to 12 pm at the Grafton Community Centre.
The feedback sessions were informal drop-in sessions where the community were able to talk one-on-one with the project team about the contents of the Preliminary Route Options Report – Parts 1 and 2, and other issues regarding an additional crossing.

3.11 Community and stakeholder evaluation workshop

A two day community and stakeholder evaluation workshop was held on Friday 25 November 2011 from 9 am to 4 pm and Saturday 26 November 2011 from 9 am to 3 pm at the Grafton Community Centre. The purpose of the two day workshop was to gain a shared understanding of which preliminary options within each corridor provide the best balance across social, environmental, economic, engineering and cost issues.

The workshop participants, methodology and outcomes are documented in Appendix 6.

The outcome of the November 2011 community and stakeholder evaluation workshop is one of the three inputs for identifying a short-list of route options along with the findings of the technical investigations and specialist studies and community feedback. Refer to Chapter 8 for more details.
4 Existing transport situation

This chapter describes the regional and local transport framework surrounding the Grafton area.

4.1 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. The design included a moveable span to allow clearance for river navigation. In 1922, when design was well advanced, the Minister for Works requested that the design be amended to include vehicular traffic in addition to the railway and pedestrian traffic. The bridge was completed and opened to traffic in 1932 (RTA 2004). A fact sheet of the Grafton Bridge is presented in Figure 7.
Grafton Bridge
Owner: Australian Rail Track Corporation (ARTC).
Construction date: 1932
Construction cost (1932 $): $827,346
Bridge type: Steel double deck.
Deck arrangements: two-way railway lanes and two pedestrian/cyclist lanes on the lower deck and two-way road lanes on the upper deck.
Bridge length: 438 metres
Bridge width: 8.9 metres
Number of spans: 8
Spans types:
  2 x Riveted Spans,
  5 x 240 feet (73.2 metres) Trusses,
  1 x 84 feet (25.6 metres) Bascule
Number of piers: 7
Pier type: Concrete. Foundations on solid rock at depths between 9 to 23 metres below high water level.
Abutment: Concrete
4.1.1 Bridge maintenance

Inspections, maintenance, repairs and rehabilitation of the existing bridge are carried out by Australian Rail Track Corporation Ltd (ARTC) and RMS via a partnership agreement signed in August 2010. This agreement is scheduled to be reviewed in 2016. The bridge inspections program can be summarised as follows:

- Visual inspections: every two years.
- Engineering inspections: every six years.
- Approach spans inspections: every six years.
- Underwater dive inspection: every four years.

Bridge structure maintenance work is carried out by ARTC, and the road deck, road surface, approach spans and the footway maintenance is carried out by RMS.

Both RMS and ARTC agreed the scope and methodology for maintenance, repairs and rehabilitation works for the bridge.

4.1.2 Bridge traffic constraints

Traffic operations on the existing bridge area are constrained due to:

- Kinks at the southern and northern ends of the bridge. The bridge approaches are deficient in horizontal alignment and cross section. The narrow bridge width with minimal shoulders means that heavy vehicles using the bridge are required to cross the centreline to negotiate the kinks. The location of the kinks is shown in Figure 7.

- Bottleneck effect. Between Riverside Drive in South Grafton and Clarence Street in Grafton, the traffic carrying capacity of the bridge is limited by a single lane running each way. A “bottleneck” effect is created when the two traffic lanes approaching the bridge (Fitzroy Street southbound and Bent Street northbound) merge into a single lane.

These constraints contribute to the congestion during peak periods, particularly in the AM peak (between 7 am and 10 am) period. Existing traffic congestion over the bridge is discussed in further detail in Chapter 4.4.

4.2 Existing road network

The existing road network in the Grafton area is presented in Figure 8 which also shows the designated B-Double routes through Grafton.

The regional road network is shown in Figure 9. This map includes the RMS 25/26 m B-Double vehicle route. These vehicles are only permitted on the Summerland Way as far north as Kyogle, 31 km north of Casino.

B-Doubles with an overall length not greater than 19 m are generally permitted to travel on all NSW roads but B-Doubles longer than 19 m are restricted to the approved road train routes in western NSW and to the NSW-wide network of B-Double routes, including those routes shown in Figure 9.
Figure 8: Grafton area existing road network, showing the 25/26 m B-Double routes

Legend:
- 25/26 m long B-Double routes
- Rail
- Major roads
- Minor roads
- Streams / Creeks
- River

25/26 m long B-Double trucks are not permitted on Grafton Bridge 7.30 am to 9.30 am and 3 pm to 6 pm Monday to Friday.
Figure 9: Regional road network, showing the 25/26 m B-Double routes.
(Revised December 2011)
4.2.1 State roads

State controlled roads in the Grafton area include the Pacific Highway, the Summerland Way and the Gwydir Highway.

Pacific Highway

The Pacific Highway is the major coastal road transport route between Sydney and Brisbane. At a regional level, the Pacific Highway connects South Grafton with Coffs Harbour and Woolgoolga to the south, and Woodburn and Ballina to the north. The Pacific Highway enters the Grafton city area from the south at South Grafton, connecting to various local streets and the Gwydir Highway on the east side of South Grafton. The highway leaves South Grafton in a north-east direction following the Clarence River to the town of Maclean.

The Pacific Highway is currently being upgraded to dual carriageway standard from Sydney to the NSW border with funding from both the NSW and Commonwealth governments. The RMS has announced the preferred route for the Pacific Highway upgrade in vicinity of Grafton. The preferred route which passes between Glenugie, east Tucabia and Tyndale is shown in. The new corridor will create a Grafton bypass with interchanges located at Glenugie to the south and Tyndale to the north. A 7 km component of the Wells Crossing to Iluka Road section of the Pacific Highway upgrade is currently under construction at Glenugie.

Gwydir Highway

The Gwydir Highway, a 567 km long State Road (Highway No 12), traverses the New England region from South Grafton to the inland areas of Glen Innes, Inverell, Warralda, Moree and Walgett. It crosses the New England tablelands and western plains and connects four interstate highways (Pacific, New England, Newell and Castlereagh). It is the only east-west B-Double truck route in the NSW northern region.

Summerland Way

The Summerland Way, a 199 km long north-south State Road (Route No 83) runs from the Mount Lindesay Highway near Woodenbong in the vicinity of the Queensland border to Grafton. It provides an inland link between southern Queensland, and the Richmond River and Clarence River Valleys in northern NSW. The Summerland Way passes through the towns of Casino and Kyogle and connects South Grafton and Grafton via the existing bridge.

The route was first constructed between Mt Lindesay Highway and Casino in 1935 as a developmental road, opening up better road access to the farming and agricultural land near the border ranges. During World War II, the section between Grafton and Casino was constructed as a flood-free defence route.

Although the route is designated for 25/26 m B-Doubles, the Summerland Way does not currently comply with RMS requirements for vertical clearance in Grafton. As shown in Table 1, headroom restrictions resulting from the existing elevated railway line through the centre of Grafton mean there are only nine locations where traffic can pass between central Grafton and the areas to the north.

At present, signage directs high vehicles along Villiers Street (4.6 m) rather than the designated MR83 route along Prince Street (4.0 m), a council initiative based on the greater clearance available at Villiers Street. Nevertheless, the available clearance at 4.6 m meets RMS minimum requirements only where a convenient alternative route with the desirable 5.3 m clearance is
available and signposted. Hence, the Summerland Way does not comply at present with RMS requirements for vertical clearance.

Table 1: Headroom restrictions from railway viaduct in Grafton CBD.

<table>
<thead>
<tr>
<th>Street in Grafton</th>
<th>Signposted clearance available (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pound Street</td>
<td>3.6 m</td>
</tr>
<tr>
<td>Mary Street</td>
<td>5.0 m</td>
</tr>
<tr>
<td>Queen Street</td>
<td>4.0 m</td>
</tr>
<tr>
<td>Prince Street</td>
<td>4.0 m</td>
</tr>
<tr>
<td>Duke Street</td>
<td>5.0 m</td>
</tr>
<tr>
<td>Villiers Street</td>
<td>4.6 m</td>
</tr>
<tr>
<td>Clarence Street</td>
<td>3.2 m</td>
</tr>
<tr>
<td>Pound Street</td>
<td>4.0 m</td>
</tr>
<tr>
<td>Kent Street</td>
<td>4.0 m</td>
</tr>
</tbody>
</table>

4.2.2 Regional roads

Regional roads that connect Grafton and South Grafton with other towns and villages within the region are:

- Lawrence Road, connecting Grafton with Lawrence and Maclean (to the north-east).
- Armidale Road, connecting South Grafton with the villages of Coutts Crossing and Ebor (to the south) and the Northern Tablelands at Armidale.

4.2.3 Local road network

Fitzroy Street

Fitzroy Street (part of Summerland Way) links the existing bridge with Grafton’s CBD. It is where most of the highway related businesses in central Grafton are located and the main access road to Grafton Shopping World. Fitzroy Street is a 50 km/h street with no traffic signals, and two lanes in each direction between Clarence Street and Duke Street. It has conventional roundabouts at the main intersections and designated pedestrian crossings at selected locations.

Bent Street

Bent Street (part of Summerland Way) is where most of the highway-related businesses are located in South Grafton. It connects Grafton via the existing bridge with South Grafton, Armidale Road and the Gwydir Highway.

Other streets

Other main streets within the Grafton area local road network are:

- Prince Street in Grafton; functions as Grafton’s main street in the CBD and is also part of the Summerland Way but not part of the designated heavy vehicle route.
- Victoria Street in Grafton; where the majority of the town’s administrative and institutional activities are located.
- Skinner Street in South Grafton; functions as South Grafton’s main street in the CBD.
- Villiers Street and Dobie Street in Grafton; form part of the designated heavy vehicle route for vehicles that travel from/to the Summerland Way, north of Grafton.
4.3 Crash history

RMS' CrashLink database provided crash data for the Grafton area for the five year period from 1 July 2004 to 30 June 2009. The data covers the area shown in Figure 10 and includes crashes that:

- Were reported to the Police.
- Occurred on a road open to the public.
- Involved at least one moving road vehicle.
- Resulted in a fatality, an injury, or a vehicle being towed away.

There may have been other minor incidents during this period; however, these are not included in RMS’ CrashLink database as they may not have been reported.

The crash statistics revealed a total of 450 crashes within the Grafton area between 1 July 2004 and 30 June 2009. During this period, six crashes resulted in fatalities and 201 resulted in injuries. Three of the fatal crashes occurred on the Pacific Highway and three in Grafton. Of the three fatalities in Grafton, one was a pedal cyclist and the other two were vehicle passengers. Most crashes occurred on the roads carrying the greatest volumes of traffic.

There were a number of sections of the existing network where crashes appeared to be occurring most frequently. Five of the non-fatal crashes on the existing bridge were around the southern kink while another five were at the northern kink. All crashes at the northern kink were rear end collisions while at the southern kink three were head-on and two were rear end crashes.

The locations of the crashes recorded in CrashLink for key sections of the road network within the Grafton area are presented in Figure 10.
Figure 10: Crash history in the Grafton area (RMS CrashLink Database 1 July 2004 – 30 June 2009).
4.4 Existing traffic demands

Existing traffic demands were investigated by GTA consultants and documented in Additional Crossing of the Clarence River at Grafton: Heavy Vehicle Traffic Study, March 2011 which is available on the project website. The investigations undertaken by GTA consultants to determine traffic demands in the Grafton area were:

- Origin-destination survey.
- Automated classified tube counts.
- Existing traffic movement.
- Past traffic growth.

These investigations are summarised in the following chapters.

4.4.1 Origin-destination survey

The origin-destination survey provides a snapshot of traffic patterns in Grafton including the trips made across the Grafton Bridge. The survey was undertaken between 5 am and 7 pm on Thursday 19 August 2010 using video camera technology.

Vehicles crossing the Grafton Bridge were classified into three trip categories:

- External to external (also known as “through trips”) – Trips that originate and terminate outside Grafton and South Grafton. For example, an external to external trip is a vehicle that travels from the Gwydir Highway, west of South Grafton, crosses the Grafton Bridge, and then travels beyond Junction Hill.
- External to internal and internal to external – Trips that originate outside Grafton or South Grafton and terminate within Grafton or South Grafton and vice versa. For example, an external to internal trip is a vehicle that travels from north of Junction Hill, crosses the Grafton Bridge and then travels to a destination in the South Grafton shopping district.
- Internal to internal – Trips that originate in Grafton and terminate in South Grafton and vice versa. For example, an internal to internal trip is a vehicle that begins its trip in the South Grafton shopping district, crosses the Grafton Bridge and travels to a destination in Prince Street, Grafton.

Any trip which has stopped for more than 30 minutes has been recorded as two separate trips.

A total of 26,554 vehicles crossed the Grafton Bridge (both directions) during the survey period. Of these trips, 1,388 vehicles (5.2 per cent of total) were heavy vehicles (rigid, articulated and buses).

Figure 11 shows the percentage of vehicle trip types crossing the Grafton Bridge.

The survey results for all vehicle types showed that 3 per cent of the trips are through trips (external to external) that originate and terminate outside Grafton and South Grafton. The majority of trips (97 per cent) crossing the bridge have an origin and/or destination within Grafton or South Grafton.

The survey results for heavy vehicles showed that 12 per cent of heavy vehicles are making through trips that do not have an origin or destination within Grafton or South Grafton. The majority of heavy vehicles (88 per cent) crossing the Grafton Bridge have an origin and/or destination within Grafton or South Grafton.
The survey confirms the findings of previous origin-destination surveys carried out for an additional crossing of the Clarence River at Grafton which also found that only a small percentage of vehicles using the bridge are through traffic. The survey results indicate that most traffic crossing the bridge is local traffic. 97 per cent of all trips started or ended in Grafton or South Grafton while 88 per cent of heavy vehicle trips started or ended in Grafton or South Grafton.

<table>
<thead>
<tr>
<th>All vehicles</th>
<th>Heavy vehicles (including buses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3% External to external</td>
<td>12% External to external</td>
</tr>
<tr>
<td>39% External to internal</td>
<td>47% External to internal</td>
</tr>
<tr>
<td>58% Internal to internal</td>
<td>41% Internal to internal</td>
</tr>
</tbody>
</table>

Figure 11: Vehicle trip types crossing Grafton Bridge on 19 August 2010 (5 am - 7 pm).

### 4.4.2 Automated classified tube counts on existing bridge

Historical RMS traffic data recorded for a number of years at the existing bridge is presented in Table 2. This information was used to estimate the growth in traffic using the bridge presented in Table 3. The traffic volumes in this table are expressed as annual average daily traffic (AADT) and therefore take into account weekday and seasonal variations including holiday peaks. For this reason AADT flows can be higher or lower than measured flows on a particular day.

| Annual average daily traffic count data across the Clarence River, Grafton. |
|--------------------------------------------------|------------------|------------------|
| 1990 | 2004 | 2009 |
| 20,548 | 23,641 | 24,193 |

Table 2: Historical annual average daily traffic count data across the Clarence River, Grafton.

| Average annual growth rates across the Clarence River, Grafton. |
|--------------------------------------------------|------------------|------------------|------------------|
| 205 | 118 | 218 |
| 1.0 | 0.5 | 0.9 |

Historical traffic counts show that traffic volumes across the bridge have had an average annual growth of 0.9 per cent per annum between 1990 and 2009. Traffic growth on the bridge was 0.5 per cent per annum for the five year period between 2004 and 2009.

As part of the *Heavy Vehicle Traffic Study* report (GTA, March 2011) additional traffic data was collected using tube counters. Automated tube counts are automatic devices widely used to count traffic flows continuously 24 hours a day and seven days a week. Tube counters were placed on the bridge approaches between Thursday 19 August 2010 and Thursday 26 August 2010.

The traffic counted by the tubes is presented in Figure 12 and Figure 13. The survey also found that the weekday average volume across the Clarence River during the period of measurement was approximately 27,578 vehicles per day.

The bridge traffic count results shown in Figure 12 for all vehicle types indicate that in the AM peak (between 7 am and 10 am) period most traffic is northbound into Grafton. During the PM peak
(between 4 pm and 7 pm) period, the traffic flow is more even in both directions but the predominant traffic flow is southbound.

The bridge traffic count results for heavy vehicles (Figure 13) shows 186 heavy vehicles (5 per cent of total traffic) crossed the bridge during the AM peak periods while 472 heavy vehicles (10 per cent of total traffic) crossed the bridge during the PM peak periods. The number of heavy vehicles crossing the bridge during peak hours is influenced by the ban on B-Doubles greater than 25 m length using the Grafton Bridge between 7.30 am and 9.30 am and between 3 pm and 6 pm. This ban has been enforced as a traffic management measure to alleviate the congestion during peak hours. The weekday average heavy vehicle volume across the Grafton Bridge is approximately 1,408.

All vehicles

<table>
<thead>
<tr>
<th></th>
<th>Peak hour periods weekday average</th>
<th>Daily (24 hour) weekday average (combined)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 hr AM Peak Average (7-9am)</td>
<td>2 hr PM Peak Average (3-5pm)</td>
</tr>
<tr>
<td></td>
<td>Northbound</td>
<td>Southbound</td>
</tr>
<tr>
<td></td>
<td>2,309</td>
<td>1,448</td>
</tr>
</tbody>
</table>

Figure 12: Bridge traffic count results for all vehicles approaches between Thursday 19 August 2010 and Thursday 26 August 2010.

Heavy vehicles (including buses)¹

<table>
<thead>
<tr>
<th></th>
<th>Peak hour periods weekday average</th>
<th>Daily (24 hour) weekday average (combined)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 hr AM Peak Average (7-9am)</td>
<td>2 hr PM Peak Average (3-5pm)</td>
</tr>
<tr>
<td></td>
<td>Northbound</td>
<td>Southbound</td>
</tr>
<tr>
<td></td>
<td>118</td>
<td>66</td>
</tr>
</tbody>
</table>

Figure 13: Bridge traffic count results Heavy vehicles (including buses) between Thursday 19 August 2010 and Thursday 26 August 2010.

Figure 14 and Figure 15 present the daily traffic volumes over the Grafton Bridge for day time (7 am to 10 pm) and night-time (10 pm to 7 am) split into three vehicle categories:

- Light vehicles.
- Bus and rigid trucks.
- Articulated and B-Double trucks.

¹At the time this report was finalised (January 2012), there was a ban on B-Doubles greater than 25 m length using the Grafton Bridge between 7.30 am and 9.30 am and between 3 pm and 6 pm.
The above categories were selected in accordance with the Austroads vehicle classification which is shown in the Glossary of Terms and Abbreviations of this report. For the period surveyed, the graphs show that:

- The majority of vehicles (both light and heavy) use the bridge during the day.
- Friday provides the highest day traffic volumes for all trips across the bridge.
- Saturday bridge traffic volumes for light vehicles are marginally less than on a weekday, however, Sunday traffic volumes are the lowest.

![Figure 14: Day time classified traffic count on the Grafton Bridge (Thursday 19 August to Thursday 26 August 2010, 7 am to 10 pm).](image1)

![Figure 15: Night time classified traffic count on the Grafton Bridge (Thursday 19 August to Thursday 26 August 2010, 10 pm to 7 am).](image2)

Note: the night time traffic counts for a given date are the sum of the 10 pm to midnight counts plus the midnight to 7 am counts.
4.4.3 Travel time surveys during peak periods

A travel time survey was conducted between Bent Street/Gwydir Highway and Prince Street/Pound Street intersections (a route of about 2.6 km length) during the AM peak (between 7 am and 10 am) and PM peak (between 4 pm and 7 pm) periods between 3 and 7 November 2008 and on 12 May 2009. This survey is documented in the Traffic Study Report (RTA December 2009) available on the RMS website. The average travel time vehicles spent travelling between these two points in AM and PM peak periods is presented in the following table.

Table 4: Average travel time and speed between Bent Street/Gwydir Highway and Prince Street/Pound Street.

<table>
<thead>
<tr>
<th>Direction</th>
<th>AM peak period</th>
<th>PM peak period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7-8 am</td>
<td>8-9 am</td>
</tr>
<tr>
<td></td>
<td>Average travel time (minutes)</td>
<td>Average Speed (km/h)</td>
</tr>
<tr>
<td>Southbound</td>
<td>4.7</td>
<td>33.2</td>
</tr>
<tr>
<td>Northbound</td>
<td>9.1</td>
<td>17.1</td>
</tr>
</tbody>
</table>

The table shows that overall, travel times are particularly higher travelling northbound (ie from South Grafton to Grafton) during the AM peak period. In the PM peak, travel times are more even in both directions.

4.5 Population growth and development

Population forecasts for Grafton and surrounds have been developed by Clarence Valley Council and the Department of Planning and Infrastructure. These forecasts are based on land capacity and are shown in Table 5. They are consistent with the forecasts identified in the Mid North Coast Regional Strategy (discussed in Chapter 2.1.2 above). These population figures have been used in
the strategic traffic model prepared specifically for the assessment of the 25 preliminary route options (Refer to Chapter 7.1.3.1).

Table 5: Forecast population growth in Grafton and surrounds.

<table>
<thead>
<tr>
<th>Location</th>
<th>2010</th>
<th>2021</th>
<th>2031</th>
<th>2041</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grafton</td>
<td>10,761</td>
<td>11,255</td>
<td>11,255</td>
<td>11,255</td>
</tr>
<tr>
<td>Junction Hill</td>
<td>1,015</td>
<td>2,250</td>
<td>3,455</td>
<td>3,455</td>
</tr>
<tr>
<td>South Grafton</td>
<td>6,065</td>
<td>6,806</td>
<td>7,601</td>
<td>7,601</td>
</tr>
<tr>
<td>Clarenza</td>
<td>684</td>
<td>1,610</td>
<td>2,514</td>
<td>5,418</td>
</tr>
<tr>
<td>Total</td>
<td>18,525</td>
<td>21,921</td>
<td>24,825</td>
<td>27,729</td>
</tr>
<tr>
<td><strong>Other areas</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Townsend, Maclean, James Creek,</td>
<td>4,800</td>
<td>6,800</td>
<td>8,800</td>
<td>8,800</td>
</tr>
<tr>
<td>Gilmarrad</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coutts Crossing</td>
<td>613</td>
<td>786</td>
<td>955</td>
<td>955</td>
</tr>
<tr>
<td>Waterview Heights</td>
<td>769</td>
<td>1,974</td>
<td>3,150</td>
<td>3,150</td>
</tr>
<tr>
<td><strong>Total other areas (including</strong></td>
<td><strong>6,182</strong></td>
<td><strong>9,560</strong></td>
<td><strong>12,905</strong></td>
<td><strong>12,905</strong></td>
</tr>
<tr>
<td><strong>Yamba and Iluka)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: CVC 2011.
Note: CVC advised projections up to year 2031. The 2041 projections are extrapolations based on the trends up to year 2031.

Table 5 indicates that population growth in the Grafton area (Grafton, Junction Hill, South Grafton and Clarenza) is expected to occur at a rate of approximately 1.6 per cent per annum for the 31 year period from 2010. Growth to year 2021 is expected to occur in Grafton, Junction Hill, South Grafton and Clarenza. Growth between years 2021 and 2031 is expected to be concentrated in Junction Hill, South Grafton and Clarenza. Between years 2031 and 2041 the majority of growth will occur in Clarenza.

Population in other areas outside Grafton (ie Townsend, Maclean, Coutts Crossing and Waterview Heights) is expected to grow at a rate of approximately 3.1 per cent per annum over the 21 year period to 2031.

Growth areas in the Grafton area identified in the *Mid North Coast Regional Strategy* are shown in Figure 17.

While some infill development will occur in the Grafton area, lower occupancy rates are likely to result in minimal change to population levels outside the growth areas.
Figure 17: Clarence South growth areas identified in the Mid North Coast Regional Strategy.
4.6 Traffic and transport modelling

The 25 preliminary route options described in Chapter 6 have been modelled to determine their strategic performance and have been assessed using specific criteria based on the project objectives for input into the short-listing process (Refer to Chapter 7.1.3.1).

Once a short-list of route options has been identified, microsimulation (Paramics) modelling will be used to assess the operation of the network for the short-listed options. The microsimulation model is a more detailed investigation and will assess the performance of the network at a vehicle by vehicle level determining the infrastructure requirements for each of the short-listed options.

4.7 Public bus service

Busways is the main public bus operator in Grafton providing regular services to Grafton and South Grafton and the towns and villages of Ulmarra, Maclean, Yamba, Iluka, Copmanhurst and Jackadgery. Routes covering Grafton and South Grafton are presented in Figure 18.

The Grafton Heavy Vehicle Traffic Study (GTA March 2011) reports that Busways operates from 5.30 am to 8.30 pm Monday to Friday and from 7.30 am to 3.30 pm on Saturdays. Its fleet moves approximately 2,500 students each morning and about 2,000 general passengers per day. Planning for an additional crossing will need to consider public and school bus services operating in the Grafton area.

Coach companies providing services to Grafton include:

- Greyhound: It provides coach services from South Grafton to Sydney stopping at major towns such as Coffs Harbour, Kempsey, Port Macquarie, Taree and Newcastle. Greyhound also provides coach services to Brisbane stopping at Ballina, Byron Bay and the Gold Coast.
- Country Transport: It provides coach services to Lismore, Copmanhurst, Coffs Harbour, Moree, Byron Bay, Sydney and Brisbane.
Figure 18: Busways routes in the Grafton area.
4.8 Pedestrian and cyclists access

Dedicated shared bicycle and pedestrian paths are provided on either side of the existing bridge at the rail line level (lower deck) (Figure 19). These paths are provided with railings for pedestrian and cyclist safety. No dedicated pedestrian or bicycle paths are provided at the vehicular level (bridge upper deck).

![Upstream side of the bridge](image1.jpg) ![Downstream side of the bridge](image2.jpg)

Figure 19: Existing pedestrian and cyclist crossings on the Grafton Bridge.

The pedestrian and cyclist network in the Grafton area is shown in Figure 4 and Figure 5.

4.9 Maritime transport

This chapter discusses existing and future maritime traffic on the Clarence River at Grafton.

4.9.1 Existing maritime traffic

Arup has undertaken a preliminary desktop review of the existing maritime traffic conditions on the Clarence River in the Grafton area. The Clarence River is the largest river on the east coast of NSW and is considered by NSW Maritime (now part of RMS) to be a medium river upstream of Grafton and a major river downstream of Grafton. Existing traffic on the Clarence River at Grafton includes a range of commercial and recreational vessels. Ferries and fishing trawlers also operate downstream of Grafton.

The largest vessel working on the river near Grafton is a barge, operated by Boral, with an air draft of seven metres (air draft is the distance from the surface of the water to the highest point on a vessel). The Boral barge transits the river four times per day, six days a week.

There are a number of line moorings and a yacht club downstream of the existing Grafton Bridge. The rowing club and sailing club are located upstream of the bridge, both on the inner bend (northern riverbank) of the river.

Recreational maritime traffic is also generated from major water events such as:

- The Rowathon between Iluka and Grafton.
- The Head of the River Regatta and the Grafton Rowing Club Regatta.
- The bridge to bridge water ski race.
- The Monster Energy Pro Wakeboard Show.
• Yacht and Sailing club races.
• Cruising yachts, particularly for the annual Jacaranda Festival in November.

Details on these events are presented in Chapter 5.3.1.

NSW Maritime (now part of RMS) has advised that an additional crossing over the Clarence River at Grafton requires the following minimum clearances:

Table 6: Minimum required clearances for an additional crossing over the Clarence River at Grafton.

<table>
<thead>
<tr>
<th>Location</th>
<th>Minimum clearance (metres above Mean High Water Springs (MHWS))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream (west) of existing bridge</td>
<td>Vertical clearance 9.1</td>
</tr>
<tr>
<td></td>
<td>Horizontal clearance 35</td>
</tr>
<tr>
<td>Downstream (east) of existing bridge</td>
<td>Vertical clearance 9.1</td>
</tr>
<tr>
<td>(between existing bridge and Pound</td>
<td>Horizontal clearance 60 metres or 2 spans of 35 metres</td>
</tr>
<tr>
<td>Street)</td>
<td></td>
</tr>
<tr>
<td>Downstream (east) of Pound Street</td>
<td>Vertical clearance 15</td>
</tr>
<tr>
<td></td>
<td>Horizontal clearance 60 metres or 2 spans of 35 metres</td>
</tr>
</tbody>
</table>

The vertical clearance to the soffit of the existing bridge above Mean High Water Springs is approximately 7.9 m. The vertical clearance requirements stated above indicate that the soffit level of an additional bridge will be required to be higher than the soffit of the existing bridge lower rail deck.

4.9.2 Future maritime development

As discussed in Chapter 2.1.6 and Chapter 2.1.7, the Clarence River Way Masterplan and Grafton Waterfront Precinct Plan give guidance on how the Clarence River and its foreshore areas should be developed. These documents envisage that Grafton would be repositioned as a “River City”. Therefore the feasibility of establishing a river taxi, ferry service, cruise and/or paddle steamer tours, historic timber boats, boat building facilities and boat hire are all currently under consideration.

It is therefore possible that vessel movements at Grafton will increase in the future. In addition, tour boats may increase in dimensions, but will be limited in air draft due to the existing bridge constraint and NSW Maritime (now part of RMS) advised clearances as presented in Table 6.

An additional crossing of the Clarence River could potentially impact the adopted Clarence Valley Council Grafton Waterfront Precinct Plan by introducing a new height restriction over the Clarence River downstream of the existing Grafton Bridge, which may restrict tall sail boats wishing to moor at the existing facilities at the end of Pound Street in Grafton.

Consultation with Clarence Valley Council and NSW Maritime (now part of RMS) will continue in regards to additional crossing location and maritime clearance for the assessment of the short-list of options.
5 Existing environment and constraints

An overview of the existing environmental, social and engineering constraints is provided in the following chapters. More detailed information is provided in the technical papers in Volume 2 of this report.

The mapping and reporting of environmental, social and engineering constraints provides an understanding of the existing characteristics of the Grafton area and will assist in the identification of a short-list of route options.

The methodology for identifying existing conditions included a review of:

- Existing published maps (for example topographical and soil maps) and reports (for example, Clarence Valley Council reports).
- Previous reports and studies commissioned by RMS before July 2011. These studies are referenced throughout this chapter.
- Aerial photography.
- Technical databases (for example non-Aboriginal heritage databases).
- Various technical and academic papers.
- Commonwealth and NSW legislation and environmental planning instruments (for example Clarence Valley Council’s Local Environmental Plan).

In addition, the following activities were undertaken as appropriate:

- Site walkover surveys.
- Community consultation.
- Agency and stakeholder consultation.

5.1 Landscape and urban character

This chapter summarises the landscape and urban character of the Grafton area. A detailed description is provided in the Technical Paper - Landscape and Urban Character found in Volume 2 of this report.

5.1.1 Existing environment

Urban form

The two original urban settlements of Grafton and South Grafton are located on either side of the Clarence River, on the floodplain immediately adjacent to the river. The two towns were laid out with a regular square grid pattern of streets. Although the proportions of the Grafton and South Grafton grids are essentially identical, their orientations differ slightly.

North of the river, the grid is a defining characteristic of the urban experience. With few exceptions, the urban area of Grafton conforms to the historical grid. South of the river, the historical grid is much less prevalent. Only the older parts of South Grafton, those areas closest to the river, are laid out on the original grid.
Town centres

North of the river, Grafton has a clearly defined urban core with the primary commercial activities centred along the traditional main street of Prince Street. Running perpendicular to Prince Street, Victoria Street is Grafton’s civic street, where much of the town’s administrative and institutional activities are concentrated. Highway-related businesses are located along Fitzroy Street, which also runs perpendicular to Prince Street to bring traffic (and hence passing trade) off the bridge in to the main commercial street. While the recently developed Grafton Shopping World, located on Fitzroy Street, has shifted some of the commercial and retail focus away from the ‘main street’ environment (Prince Street) to an internalised shopping mall, its close proximity to Prince Street has helped to keep the town centre intact.

South of the river, South Grafton also has Skinner Street as a historical main street. Like Prince Street north of the river, Skinner Street provides a strong, direct, connection to the river and public open spaces along the foreshore. However, in contrast to the cohesive town centre north of the river, South Grafton’s town centre has been fractured by successive developments that have eroded the commercial and to a certain extent, civic relevance of the historical main street. The siting of the current bridge crossing outside of town had the effect of disconnecting South Grafton’s main street from the regional transport network. This is likely to have contributed, at least in part, to the gradual decline of South Grafton’s town centre.

Existing landscape character

There are a number of distinct landscape character types in Grafton, each distinguished by a particular combination of land use, topography and built form. The relationship between these landscape character types is an important aspect of the urban experience of the town.

The primary landscape character types in Grafton are shown in Figure 20 and can be summarised as follows:

- The two town centres of Grafton and South Grafton, which form the civic and commercial urban cores on either side of the river.
- The established residential areas immediately connected to the town centres, with housing stock of varying ages.
- Newly developing residential areas on the outskirts of town, and the Clarenza Urban Release Area (as defined by Clarence Valley Council’s Draft Local Environmental Plan 2010).
- Industrial areas, generally situated along primary regional transport routes and on the outskirts of town.
- The rural hinterland, consisting of low-lying river floodplain and rolling hills, with intermittent buildings in the landscape.
- Elizabeth Island and Susan Island, two large undeveloped islands in the river, which are significant landmarks for the town.
- The Clarence River itself.
Figure 20: Landscape character types of the Grafton area.
The visual setting of the existing bridge

Views to Grafton Bridge

The visual relationship between Grafton and the Clarence River is fundamental to the urban experience of the town. As the dominant visual feature on the river, the Grafton Bridge is a key urban landmark that contributes significantly to the identity of the town. There are two primary types of views to the bridge:

- Proximate views from the riverfront public spaces at Grafton and South Grafton.
- Long range views from elevated vantage points throughout the district, primarily east of the river.

Key views of the Grafton Bridge are presented in Figure 21.

Views from the Grafton Bridge

The views of the town from the Grafton Bridge are also an important component of the urban experience of Grafton, providing a strong visual sense of the relationship between the town and the river. The best views from the bridge are from the two pedestrian and cyclist paths, located at the rail deck level on either side of the bridge.

The views from the train are partially screened by the bridge’s steel truss, and the motorists’ views from the road deck level are partially obscured by the bridge parapet.
Figure 21: Key views of Grafton Bridge.
5.1.2 Landscape and urban design constraints

The Technical Paper – Landscape and Urban Character found in Volume 2 of this Report identifies key landscape and urban design constraints that are likely to affect, or be affected by, the location of a new crossing and its approach roads in Grafton and South Grafton. These constraints are listed below and are categorised into city wide constraints (affecting the Grafton and South Grafton areas) and constraints that are relevant to the Clarence River, Grafton and South Grafton.

City wide constraints

- Topography and flooding.
- Major commercial activity on both sides of the river resulting in dispersed urban activity and generation of significant vehicular traffic across the existing Grafton Bridge.
- Pedestrian and cyclist connectivity.
- Historical urban fabric.

Constraints relevant to the Clarence River

- Visual relationship between the new bridge and the existing bridge.
- Position of the new bridge in relation to the existing bridge.
- Potential impact on the recreational amenity of the Clarence River.

Constraints relevant to Grafton

- The need for elevated infrastructure.
- Relationship between the new approach road and the local street grid.

Constraints relevant to South Grafton

- Location of the approach road.
- Utilisation of Bent Street.
- Approach road to the east of Bent Street.
- Approach road to the west of Bent Street.

5.2 Land use and planning

5.2.1 Existing land use and land use zones

The Grafton area contains a variety of land uses that are typical of a major regional centre. Existing land uses comprise businesses, industrial, residential, rural, recreation and land for infrastructure and utilities.

Land use zones for this report are based on the draft Clarence Valley Local Environmental Plan (LEP) 2010¹ land use zoning map. The draft Clarence Valley Local Environmental Plan LEP 2010 consolidates the five previous LEPs in the valley (including the Grafton City LEP 1988), as well as part of the Richmond Valley LEP. Existing land uses and land use zones in the Grafton area are presented in Figure 22 and Table 7.

¹ The Clarence Valley Local Environmental Plan 2011 was gazetted on 23 December 2011
Figure 22: Land use zones in the Grafton area (draft Clarence Valley Local Environmental Plan 2010).
### Table 7: Existing land use and land use zones.

<table>
<thead>
<tr>
<th>Land use</th>
<th>Description</th>
<th>LEP land use zone</th>
</tr>
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</table>
| Business       | Business areas are located along Pound, Fitzroy, Victoria and Prince streets in Grafton and include the Victoria Street “government precinct”. Business areas in South Grafton are located along the Gwydir Highway and Bent, Skinner and New streets.                                                                                           | B1 Neighbourhood Centre  
B3 Commercial Core  
B5 Business Development | |
| Industrial     | Industrial land uses are mostly located in South Grafton along the existing Railway corridor between Tyson Street and the Pacific Highway and at Cowan Street and Four Mile Lane. Industrial land uses in Grafton are clustered along the existing railway corridor and one at North Street fronting Alumy Creek (Grafton Brewing Company Pty Ltd site).          | IN1 General Industrial | |
| Residential    | Residential land uses in the Grafton area are predominantly low density areas. Residential properties are generally in the form of single houses on large residential lots with only a small number of flats and units.                                                                                                         | R2 Low Density  
R3 Medium Density  
R5 Large Lot Residential | |
| Rural          | Rural land uses surround residential areas in Grafton and South Grafton (eg cattle grazing and agricultural crops).                                                                                                                                                                                                                     | U1 Primary Production  
RU2 Rural Landscape | |
| Recreation     | Land uses in Grafton comprise foreshore areas along the Clarence River and four main parks: See Park on Pound Street, Westward Park on Bacon Street, Fisher Park on Prince Street and Corcoran Park on Kirchner Street. See Park and Westward Park are considered to be urban open spaces, while Corcoran Park is an extensive riverside park with picnic and boating facilities. Other recreation areas include the Grafton racecourse and golf course located on Powell Street.  
Elizabeth Island and Susan Island are zoned for public recreation. The south-east section of Susan Island (approximately 70 hectares) and Elizabeth Island are Crown Reserves administered by the Susan and Elizabeth Islands Recreation Trust.  
Recreation areas in South Grafton include Alex Bell Park on Riverside Drive, Earl Page Park on Bridge Lane, McKittrick Park on Blight Street, Silver Jubilee Park on Bent Street, Grafton District Golf Club on Bent Street and playing fields on Ryan Street.  
Alipou Creek and the Clarence River are also used as recreational waterways. | RE1 Public Recreation  
RE2 Private Recreation  
W2 Recreational waterway | |
| National park  | The north-west section of Susan Island (approximately 18 hectares) is reserved as a nature reserve under the *National parks and Wildlife Act 1974*.                                                                                                                                                             | E1 National Parks and Nature Reserves | |
| Infrastructure and utilities | These are land uses for public and community infrastructure which include the Grafton sewage treatment plant, educational establishments, Grafton cemetery, Grafton hospital, road and rail corridors and places of worship.                                                                                   | SP2 Infrastructure  
SP3 Tourist | |

#### 5.2.2 Future land uses and development

**Grafton area**

Future land uses in the Grafton area are presented in Figure 23. These have been identified in the *Mid North Coast Regional Strategy* (DP&I 2009) and correspond to future new residential and employment land release areas as follows:

- New residential areas at Junction Hill, Clarenza and South Grafton.
- New employment areas at the Grafton airport, South Clarenza, South Grafton east and north Junction Hill.
Clarence Valley Council and the Department of Planning and Infrastructure have developed future population growth forecasts for Grafton, South Grafton, Junction Hill, and Clarenza. These forecasts are presented in Chapter 4.5.

Another land use relevant to an additional crossing is the approved Health Services Facility located at 2 Clarence Street, Grafton. The facility will provide medical and other health services to the Grafton and South Grafton residents. The approved development application provides 56 car spaces as part of the proposal.

Commercial, business and industrial land uses (ie land use zones B1, B3, B5 and IN1) are considered to be highly compatible with a route for an additional crossing as these areas are a destination for many road users.

An additional crossing would potentially create land use compatibility issues with Grafton and South Grafton residential areas (ie land use zones RE1, RE2 and RE3), which are characterised for being generally quiet, low traffic areas. A new crossing in these areas would potentially change their long-term residential character. Land use compatibility issues would also occur at Susan Island Nature Reserve (ie land use zone E1) due to its protected status and at the approved Health Services Facility site at 2 Clarence Street, Grafton.
Figure 23: Future land uses in the Grafton area as presented in the *Mid North Coast Regional Strategy*.
Outside Grafton area

Land use planning and future development outside the Grafton area and in proximity to the Summerland Way is also being considered for the selection of a preferred location for an additional crossing of the Clarence River at Grafton. Information on land use planning and future known development along the Summerland Way was sourced from discussions and email correspondence between RMS and Kyogle and Richmond Valley Councils in July 2011 and complemented by desktop research.

Kyogle area

The draft Kyogle Local Environmental Plan 2011 identifies an industrial area adjacent to the Summerland Way on the southern side of Kyogle and two residential areas off Runnymede Road and Collins Creek Road. These areas are zoned for their respective purposes but are yet to realise their development potential.

Kyogle Council has advised that there is a ‘Regionally Significant Extractive Resource’ development application currently being assessed by the Northern Region Joint Regional Planning Panel under the Environmental Planning and Assessment Act 1979. The proposal is located at Cedar Point and would access the Summerland Way via Edenville Road and Omagh Road. Council also reports local vehicle movements associated with Kyogle CBD on the Summerland Way are anticipated to shift from their current focal point at the southern end of the CBD to the northern end of the CBD to coincide with the proposed relocation of the IGA Supermarket.

Richmond Valley area

The draft Richmond Valley Local Environmental Plan 2010 identifies future urban release and employment areas in Casino. Richmond Valley Council reports residential growth is expected to occur in the Gays Hill Estate located off Bruxner Highway, west Casino. Also, 60 ha of industrial land has been released on Reynolds Road, north Casino.

Another future known development to note is the approved ‘Summerdowns’ rail freight terminal on Reynolds Road, north Casino. The project was approved in December 2010 by the Northern Region Joint Regional Planning Panel under the Environmental Planning and Assessment Act 1979. The approved terminal would load around 250,000 tonnes of additional rail freight rising to up to 1,000,000 tonnes of rail freight over a five to ten year period. Whilst the terminal may contribute to a local increase in short haul road traffic it will remove in the short term around 10,000 and long term around 40,000 long haul heavy vehicle trips per annum from roads in the Northern River’s region. The traffic impact assessment report for the project (Plateway July 2010) states that the approved rail freight terminal:

- Will connect to the Summerland Way via Reynolds Road.
- Will cause an increase in truck movements in the roads in the immediate vicinity of the terminal, but a decrease in truck movements elsewhere in the region, including through the Casino CBD.
- Will reduce the number of heavy vehicle movements along the Summerland Way south of Casino at one, three and five years after opening.

Trans Regional Amalgamated Infrastructure Network (TRAIN)

The Trans Regional Amalgamated Infrastructure Network proposal is for a network of road, rail and water infrastructure servicing the Great South West, an area covering approximately 197,710 ha of regional Australia. The proposal crosses NSW and Queensland and 13 Local Government Areas.
including Coffs Harbour, Clarence Valley, Richmond Valley and Kyogle Councils as shown in Figure 24.

The Trans Regional Amalgamated Infrastructure Network proposal is one of 59 projects submitted to Infrastructure Australia for consideration and assessment. 47 of these projects, not including the proposal, have been included in Infrastructure Australia’s Infrastructure Priority List in the Communicating the Imperative for Action report to the Council of Australian Governments (Infrastructure Australia June 2011). Six of the projects on the priority list (including the upgrade of the Pacific Highway) have been identified as ‘Ready to Proceed’ projects while an additional seven projects have been recommended for project development funding.
Figure 24: Trans Regional Amalgamated Infrastructure Network proposal.

5.3 **Social and economic**

This chapter presents the existing social and economic conditions in the Grafton area and identifies social and economic constraints relevant to the proposed additional crossing. The detailed social and economic report is found in *Volume 2 -Technical Paper: Social and Economic*.

5.3.1 **Social**

**Population characteristics**

Grafton lies in the Australian Bureau of Statistics (ABS) Grafton statistical local area. The profile of the existing social environment is based primarily on data from the Australian Bureau of Statistics Census of Population and Housing 2006. Key demographic characteristics of the Grafton statistical local area (comprising Grafton, South Grafton and Junction Hill but excluding Clarenza) relevant to an additional crossing of the Clarence River at Grafton are:

- In 2006, the Grafton statistical local area had a population of 17,501 people. The population of Grafton was 9,956 and South Grafton was 5,931 people.
- Grafton has an ageing population structure. Due to this, it has a high number of single person households. It also has a smaller proportion of young adults (although proportionally more than the local government area).
- Sixty-six per cent of the 8,484 households in Grafton statistical local area are occupied by one to two people and 25 per cent by three to four people.

**Population growth**

The Clarence Valley local government area has recently been undergoing a period of significant growth and development along its coastal towns fuelled by a combination of lifestyle options, affordable residential and industrial land, comparatively lower operational costs, higher yields and a growing population.

As indicated in the *Mid North Coast Regional Strategy* (refer to Chapter 4.5, Figure 17 and Table 5), based on land capacity, population growth in the Grafton area (ie Grafton, South Grafton, Junction Hill and Clarenza) is expected to occur at a rate of approximately 1.6 per cent per annum period between 2010 and 2040. Other areas outside Grafton (ie Townsend, Maclean, Coutts Crossing and Waterview Heights) are expected to grow at a rate of approximately 2.1 per cent per annum over the same period.

**Car ownership and public transport usage**

The ABS 2006 Census shows that most of the 8,484 households in the Grafton statistical local area (81.5 per cent) owned at least one motor vehicle. Public transport usage rates are very low (for example, less than one per cent of the working population catch a bus to work). Higher rates of public transport use correlate with more disadvantaged areas of Grafton.

Approximately 10 per cent of residents walk or cycle to work which, whilst substantially less than the NSW average, is slightly higher than the Mid North Coast average.

**Housing**

Grafton is generally characterised by low density, detached housing, particularly near the riverfront. Higher densities are located in South Grafton in the public housing area and in the northern outskirts of Grafton near the hospital.
Out of Grafton, South Grafton and Junction Hill, Grafton has the highest proportion of households renting their dwellings.

The Australia Bureau of Statistics 2006 Census found higher densities of public housing concentrated in the area bounded by North Street, Arthur Street, Turf Street and Alice Street in Grafton.

In South Grafton, higher densities of public housing were found to be concentrated and in the areas bounded by Tyson Street, Maxwell Avenue, Armidale Road and Bent Street, and Blanch Parade, Bible Avenue, Bent Street, and Rushforth Road.

**Community events and recreation infrastructure**

Community events held at Grafton on a regular basis include (Revised December 2011):

- Clocktower Gallery Markets: Corner Spring Street and Pacific Highway, South Grafton every first Saturday of the month.
- Weekly Farmers and Growers Market at Market Square, Grafton every Thursday.
- Grafton Car Market: Enterprise Park, Armidale Road, South Grafton (opposite abattoirs), every Saturday.
- The Grafton Showground Markets: Prince Street, Grafton every third Saturday of the month.
- Winter Solstice Market: Grafton Regional Gallery (158 Fitzroy Street, Grafton). Annual event held in a Sunday in June.
- July Racing Carnival: annual event held at the Clarence River Jockey Club.
- Jacaranda Festival Markets: CBD Streets, King and Fitzroy streets. Annual event held every November.
- TAFE Market: Corner of Clarence Street and Pound Street, Grafton. Annual event held every November.
- The Head of the River Regatta and the Grafton Rowing Club Regatta. Both events are celebrated in December and are run by the Grafton sailing club.
- Rowathon along the Clarence River between Iluka and Grafton. This event runs in June-July each year and is organised by the Grafton Rowing Club.
- The Grafton bridge to bridge water ski race celebrated around October.
- Monster Energy Pro Wakeboard Show held once a year.
- Grafton Agricultural Show: Villiers Street, Grafton. Annual event held every May.
- Grafton Truck Show: the Showground, Prince Street, Grafton. Annual event held every June.
- North Coast Open Tennis Championships: Fisher Park complex. Annual event held every June.
- Gate to Plate: the Showground, Prince Street, Grafton. Annual event held every September.
- Jacaranda procession: Prince Street to Arthur Street. Annual event held every October/November.

A large number of community and recreation facilities in the Grafton area are located near and along the length of the Clarence River or the Summerland Way. These facilities are identified in Figure 25. The following facilities are of note (Revised December 2011):

- Gummyaney Aboriginal Pre-school (30 Pound Street, Grafton). A relatively new custom built preschool managed by the Gummyaney Aboriginal Corporation. Operating five days a week (half day on Friday), it accepts 28 Aboriginal and Torres Strait Islander children per day.
- Grafton Aged Care Home (Bent Street, South Grafton). A nursing home with 81 high care places (two booked respite and 13 secure dementia). No other forms of care are provided. The adjacent Earle Page Park was fenced following an application to council to facilitate its use by the nursing homes’ dementia patients.

- Caringa Enterprises/Support Services (Corner of Wharf and Through Streets, South Grafton). A disability service provider to the Clarence Valley. It is understood that this building is used for administration and client meetings rather than the delivery of programs.

- Grafton Community College (Bent St, several buildings). A not-for-profit community organisation providing adult education and training to around 2,000 students each year.

- Grafton’s tourist information centre. The tourist information centre and adjacent supportive fast food businesses are important to the development of the tourism industry. The tourist information centre is a key mechanism to increase tourism yield.

- Grafton TAFE. The TAFE attracts students from a wide area to courses in areas such as music, hospitality, nursing and information technology. The campus has a specialised arts and media facility, an integrated trades building (delivering courses for engineering and transport industry trades) and a learner support centre for students from Southern Cross University.

- The Clarence River Sailing Club (located in Salty Seller Reserve, off Fitzroy Street, Grafton). The sailing club generally utilises the reach of the river directly in front of their club house/boat shed.

- Grafton Yacht Club. Located at the end of North St, Grafton. It hosts racing and social weekend events throughout the year.

- The Grafton Rowing Club. The rowing club course extends from the clubhouse (located within Memorial Park, off Prince Street, Grafton) for two kilometres upstream, towards the opposite end of Susan Island. It is noted that an equivalent course may not be available elsewhere along navigable reaches of the river near Grafton.

- Boat mooring near Pound St, Grafton. This mooring is used by some cruising sailors to moor for the Grafton Jacaranda Festival.

- Corcoran Park. Operation of power boats and water skiing on the Clarence River is based on boat ramps located at Corcoran Park and other locations.

- Fisher Park: The park includes grass sports fields, a hockey pitch, an oval, a skatepark, tennis courts, a pavilion, a playground and a barbeque area.
Figure 25: Key community and recreation infrastructure in the Grafton area.
(Revised December 2011)
5.3.2 Economic

Economic information is available for the whole Clarence Valley Council local government area and has been sourced from the *Clarence Valley Economic Monitor* (Lawrence Consulting June 2010).

Business activity

The *Clarence Valley Economic Monitor* reports business activity for the year 2006-07. This information can be summarised as follows:

- Small businesses (ie with a workforce less than 20) accounted for 96.3 per cent of the total number of businesses in the local government area, while medium-sized businesses (ie 20-199 employees) accounted for 3.6 per cent and large businesses (ie businesses greater than 200 employees) accounted for 0.1 per cent of the total businesses in the local government area.

- The mining, electricity, gas and water supply; communication services; education; cultural and recreational services; and personal and other services sectors had the highest proportion of small businesses in the local government area. The wholesale trade sector had the highest proportion of medium sized businesses, followed by accommodation, cafés and restaurants, while the construction industry recorded the highest share of large businesses.

- The average workforce size across all businesses in the local government area was 3.9 persons. The accommodation, cafés and restaurants sector had the highest average workforce size of 13.7, followed by the electricity, gas and water supply (12.0), wholesale trade (10.5) and health & community services (9.9) industries.

Employment, labour force and income

The Clarence Valley local government area has a higher unemployment rate than NSW and the Mid North Coast region, a low labour force participation rate and high rates of part-time employment. The unemployment rate in the local government area varied between 6.5 per cent and 9 per cent between 2006 and 2009. The number of people employed in the local government area has been relatively constant in the past two years with a labour force size of 20,993 persons in the December quarter of 2009 (Figure 26 and Figure 27).

Incomes in the local government area are significantly lower than the NSW average, and somewhat lower than the regional average.
Figure 26: Unemployment rate in the Clarence Valley local government area. Source: *Clarence Valley Economic Monitor* (Lawrence Consulting June 2010).

Figure 27: Labour force in the Clarence Valley local government area. Source: Lawrence Consulting June 2010.
Property market

Median property prices for houses and units in Grafton and South Grafton are below the median prices for the Mid North Coast region. This information was sourced from the domain website (http://www.domain.com.au/) and shows that the house prices in Grafton are usually higher than in South Grafton. At May 2011, the median house price for Grafton was $270,000 while for South Grafton it was $210,000 (Table 8).

Table 8: Median property prices 12 months to March 2011.

<table>
<thead>
<tr>
<th></th>
<th>Houses</th>
<th></th>
<th>Units</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Grafton</td>
<td>South Grafton</td>
<td>Clarence Valley LGA</td>
<td></td>
</tr>
<tr>
<td>Median Price</td>
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<td>Auction clearance rates</td>
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<tr>
<td></td>
<td>SNR</td>
<td>SNR</td>
<td>$267,000</td>
<td>50%</td>
</tr>
</tbody>
</table>

SNR: Statistically not reliable. Source: Domain website, July 2011.

5.3.3 Social and economic constraints

A large number of Grafton City’s community and recreation facilities are located near and along the length of the Clarence River or the Summerland Way. Based on the information and issues outlined in the Technical Paper – Social and Economic found in Volume 2 of this Report, the following are the potential social and economic constraints relevant to an additional crossing:

- Schools (including pre-schools and adult education facilities).
- Religious buildings and cemeteries.
- Health and emergency services (including nursing homes).
- South Grafton commercial centre (Skinner Street) and Grafton commercial centre (Fitzroy Street and Prince Street).
- Transport infrastructure (for example, railway stations).
- Services clubs.
- Cultural and recreational uses of the river (such as the rowing course, sailing club activities and river festival spectator areas).
- Tourism information centre.
- Social services targeting vulnerable social groups.

These potential constraints are shown in and will be considered further in the study process. The following should be considered in the next phases of the study process and in the development of mitigation mechanisms:

- The location of more vulnerable sections of the community.
- The potential loss of affordable housing.
- Maintaining the viability of the South Grafton commercial precinct.
- The potential effect on river users (recreation, cultural and tourism).
- Community views on these community and recreation facilities and social issues.
Figure 28: Potential social and economic constraints in the Grafton area.
(Revised December 2011)
5.4 Aboriginal heritage

This chapter summarises the consultation undertaken to date with the Aboriginal community in the Grafton area and outlines the known Aboriginal archaeological and cultural heritage in the Grafton area.

Information provided in this chapter is based on preliminary desktop investigations, consultation with the Aboriginal community, and reconnaissance field surveys, involving visual inspection of a small number of accessible properties carried out by Biosis Research. The full Aboriginal archaeological heritage report is found in Volume 2 -Technical Paper: Aboriginal heritage.

5.4.1 Aboriginal community consultation

Previous Aboriginal community consultation

The Aboriginal community consultation for this project builds upon previous consultation that was undertaken during the 2003-2004 investigations and Value Management process.

Previous consultation included discussions with Grafton-Ngerrie Local Aboriginal Land Council as part of the 2003 and 2004 investigations for the additional crossing. The outcomes of these discussions are documented in the report titled An Indigenous Heritage Assessment for Route Selection: Proposed Additional Crossing of Clarence River, Grafton New South Wales (Biosis Research 2004). At that time, Aboriginal community representatives expressed that the following be acknowledged:

- The whole of the Clarence River has significance for the Indigenous population of the area.
- There was some difficulty in assessing the community concerns over such a wide area with no identified specific impacts. In many situations it is only when impacts are proposed that the stories attached to places will be told.
- Different individuals will have different, sometimes conflicting, stories relating to Dreaming sites.
- The Indigenous community wishes to be consulted on a range of issues, not solely cultural heritage.

The Additional Crossing of the Clarence River Feasibility Study Report (February 2003) also documents previous Aboriginal community consultation. The report states the Grafton-Ngerrie Local Aboriginal Land Council requested that no new bridge be considered in the vicinity of Susan Island as this is a very significant site for the local Aboriginal people.

Recent Aboriginal community consultation

Aboriginal community consultation for the additional crossing of the Clarence River at Grafton is currently being undertaken in accordance with the processes outlined in Aboriginal cultural heritage consultation requirements for proponents (OEH 2010) and RMS Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI).

A summary of the Aboriginal community consultation undertaken to date is presented below. Full details of the Aboriginal consultation undertaken to date are presented in Volume 2 -Technical Paper: Aboriginal Heritage.
10 and 11 August 2010 site inspection

Representatives of the Grafton-Ngerrie Local Aboriginal Land Council participated in preliminary field work for the proposed additional crossing on 10 and 11 August 2010. This provided the opportunity to identify and discuss known cultural values of the Grafton area.

Initial comments from the site inspection on 10 and 11 August 2010 were received from the Grafton-Ngerrie Local Aboriginal Land Council on 17 February 2011. The site inspection covered some Grafton and South Grafton areas (refer to Appendix 2 of the Volume 2 - Technical Paper: Aboriginal heritage for details on the areas covered) but did not include Susan and Elizabeth Islands. The comments were:

- The Catholic college property in Victoria Street, Grafton is considered of high cultural significance and should be inspected before ground disturbance.
- The location of the Clarence River Golden Eel site is a spiritual area of high significance to the Aboriginal people and must not be disturbed in any way.
- The former commercial area south of the Golden Eel site should be inspected when the concrete slabs are removed.
- At the Catherine McCauley College located on the Pacific Highway, near the tea-tree farm there is a high likelihood, given the high cultural significance of the area, that any developments will impact Aboriginal culture and heritage significance.

The Grafton-Ngerrie Local Aboriginal Land Council recommend that no development from Iolanthe Street in South Grafton proceeding to the Pacific Highway and heading north east from Bunnings to the Catherine McCauley College, should be planned or further pursued due to the Aboriginal culture and heritage significance of this area.

Aboriginal Focus Group meeting 10 May 2011

An Aboriginal focus group meeting was held at the Grafton-Ngerrie Local Aboriginal Land Council offices in Grafton on Tuesday 10 May 2011 to discuss the best way to identify:

- Aboriginal cultural constraints for an additional crossing of the Clarence River at Grafton.
- Relevant knowledge holders.

It was determined at the meeting that a workshop should be held at the Grafton-Ngerrie Local Aboriginal Land Council office with relevant knowledge holders. This workshop was undertaken on Tuesday 28 June 2011 as described below.

Aboriginal Focus Group workshop 28 June 2011

An Aboriginal focus group workshop was held at the Grafton-Ngerrie Local Aboriginal Land Council offices in Grafton on Tuesday 28 June 2011 to further determine the location and extent of Aboriginal cultural constraints in the Grafton area.

The workshop identified culturally significant areas that require further consultation to determine constraints relevant to an additional crossing of the Clarence River at Grafton. The Grafton-Ngerrie Local Aboriginal Land Council agreed to consult further with community members regarding the cultural significance and constraints to route options of the following areas:

- Elizabeth Island.
- Alipou Creek.
- Swan Creek.
It was indicated at the workshop that Elizabeth Island may be important to men as well as, or instead of, women.

**Grafton-Ngerrie Local Aboriginal Land Council meeting 1 July 2011**

The following is a summary of the outcomes of a meeting held by the Grafton-Ngerrie Local Aboriginal Land Council, as provided in a letter from Wesley Fernando, CEO of Grafton-Ngerrie Local Aboriginal Land Council, (refer to *Volume 2 -Technical Paper: Aboriginal heritage* for further details).

Elizabeth Island is an Aboriginal men’s site with high significance to the Aboriginal community. No disturbance should occur on any part of the Island.

Alipou Creek is the resting place of the Golden Eel which is of great significance to all of the neighbouring tribal groups. There are many scarred trees and a marriage tree in the area that are of high significance. The community feel strongly that Alipou Creek should not be directly impacted. The community is willing to discuss potential impacts on the area between Alipou Creek and the existing bridge.

Great Marlow is an area that Aboriginal people commonly used to travel through and contains many areas of high significance. Any route options considered in this area will need to be assessed by Land Council Site Officers before an accurate assessment can be given.

All development activities will impact on Aboriginal places and objects of Cultural significance, as traditional Aboriginal people were nomadic moving through their country. All country is significant, in addition to this their spirituality is entwined throughout the landscape, therefore it is impossible for any development not to impact on Aboriginal culture and heritage.

### 5.4.2 Existing environment

Table 9 below lists known Aboriginal artefacts and areas of Aboriginal cultural significance found in the Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS) within a 6 km x 6 km area surrounding Grafton.

Table 9: Aboriginal Heritage Information Management Systems database results for a 6 km x 6 km search area centred on the existing Grafton Bridge.

<table>
<thead>
<tr>
<th>AHIMS No</th>
<th>Site locality</th>
<th>Site type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-5-0005</td>
<td>Swan Creek</td>
<td>Burial</td>
<td></td>
</tr>
<tr>
<td>12-6-0086</td>
<td>Grafton</td>
<td>Modified Tree</td>
<td></td>
</tr>
<tr>
<td>12-6-0115</td>
<td>South Grafton</td>
<td>Ceremonial Mound/Ring</td>
<td></td>
</tr>
<tr>
<td>12-6-0158</td>
<td>CH-G-48</td>
<td>Artefact</td>
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</tr>
<tr>
<td>12-6-0216</td>
<td>Grafton</td>
<td>Modified Tree</td>
<td></td>
</tr>
<tr>
<td>12-6-0219</td>
<td>Susan Island</td>
<td>Ceremonial Mound / Ring</td>
<td>Restricted. Access to site card by permission only.</td>
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<tr>
<td>12-6-0326</td>
<td>Clarence River Golden Eel</td>
<td>Aboriginal Ceremony and Dreaming</td>
<td>General restriction Access to site card by permission only.</td>
</tr>
<tr>
<td>12-6-0327</td>
<td>Elizabeth Island Womens Place</td>
<td>Aboriginal Ceremony and Dreaming</td>
<td>Restricted. Access to site card by permission only.</td>
</tr>
<tr>
<td>12-6-0338</td>
<td>Carr’s Creek Camp</td>
<td>Habitation Structure</td>
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<tr>
<td>12-6-0340</td>
<td>South Grafton</td>
<td>Habitation Structure</td>
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<td>12-6-0352</td>
<td>South Grafton</td>
<td>Habitation Structure</td>
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</tbody>
</table>
Known Aboriginal cultural values

The preliminary Aboriginal community consultation described in Chapter 5.4.1 provided the opportunity to identify and discuss known cultural values in the Grafton area.

It is reported in the Additional crossing of the Clarence River: Feasibility Study Report (RTA February 2003) that the Ngerrie Local Aboriginal Land Council requested that no new bridge be considered in the vicinity of Susan Island as this is a very significant site for the local Aboriginal people.

Comments from the Grafton-Ngerrie Local Aboriginal Land Council and the Aboriginal community have been considered when identifying the Aboriginal archaeological sites and areas of cultural significance in the Grafton area.

Identified sites of Aboriginal cultural significance are presented in Figure 29. These sites are likely to have well defined cultural restrictions regarding who within the Aboriginal community can speak about each site, and who they may speak to about the sites. Such cultural restrictions would be respected and managed through the Aboriginal consultation protocol established for the project.
Figure 29: Known Aboriginal cultural values in the Grafton area.
5.4.3 Aboriginal archaeological potential

Levels of Aboriginal archaeological potential have been determined based on a predictive model for Aboriginal archaeological sites on a regional and local level, previous studies in similar landscapes, known sites within the region, knowledge of recent land uses and the results of the preliminary field visit. The model outcome is the archaeological potential map presented in Figure 30.

The map is an indicator of the likelihood of ‘intact’ archaeological material within the region, usually on a particular landform. The degrees of archaeological potential outlined below are not a reflection of the presence or absence of cultural material.

The archaeological potential levels have been identified on mapping and defined as:

- **Low potential**: Low likelihood for intact Aboriginal archaeological remains. Areas that have been identified as having specific locations where there has been a high degree of disturbance since the arrival of non-Aboriginal people, where the impact has been to the extent where no intact deposits are believed to be present. Areas may also include steep slopes or plains away from water sources. Artefacts found in this area are likely to be isolated, representative of ‘background scatter’ and in a highly disturbed context.

- **Moderate potential**: Moderate likelihood for intact Aboriginal archaeological remains. Areas where minor post contact disturbance has occurred; the area is located along creeks and waterways where short term campsites may have been present. Artefact scatters are likely to vary in density, but are concentrated in small areas.

- **High potential**: High likelihood for intact Aboriginal archaeological remains. Areas associated with major creek lines, raised flat landforms such as ridges and hills, or where there has been minimal disturbance to the specific area and it is believed that an intact sensitive landscape exists. Artefacts that remain within these areas are likely to be high density and large in size.
Figure 30: Aboriginal archaeological potential in the Grafton area.
5.5 Non-Aboriginal heritage

This chapter is a summary of the work carried out by Biosis Research for the proposed additional crossing of the Clarence River and outlines the non-Aboriginal heritage characteristics of the Grafton area. The non-Aboriginal Heritage report is found in Volume 2 - Technical Paper: Non-Aboriginal Heritage. Information in the technical paper is derived from a desk top study of heritage items, research at the Grafton Historical Society and two site visits conducted by Biosis Research in 2010.

5.5.1 Existing environment

A desktop search for non-Aboriginal heritage items was carried out from various heritage registers, databases, listings and environmental planning instruments. The search findings are documented in Volume 2 - Technical Paper: Non-Aboriginal Heritage and can be summarised as follows:

- State Heritage Register. Items listed on the State Heritage Register are listed below and presented in Figure 31.
  - Grafton Correctional Centre (Grafton Gaol). 170 Hoof St Grafton (SHR No. 00809).
  - Saraton Theatre. 95 Prince St Grafton (SHR No. 01401)
  - Arcola – house, stables, garden and fence. 150 Victoria St Grafton (SHR No. 00714)
  - Grafton Rail and Road Bridge over Clarence River. North Coast Railway Grafton (SHR No. 01036).
  - Cathedral Church of Christ the King (including hall and cottages). Duke St Grafton (SHR No. 01654).
  - Grafton City Railway Station Group. South Grafton (SHR No. 01154).
  - Grafton City Railway Group Refreshment Room Furniture (SHR No. 01153).

- Section 170 Register of the Heritage Act 1977. These are State Government owned heritage items. They are listed below and presented in Figure 31.
  - Cottage, Country Energy Field Office. 130 Queen St Grafton (Country Energy, SHI DB no. 3110015).
  - Grafton Base Hospital. Crown, Mary, Arthur Streets Grafton (Dept of Health, SHI DB no. 3540226).
  - Grafton, Clarence River Underbridge. 696.143 km North Coast Railway (ARTC SHI DB no. 4280237).
  - Grafton Fire Station. 94 Prince St Grafton (NSW Fire Brigades; SHI DB no. 4690075).
  - Grafton, Pound Street (west) Underbridge. 698.533 km North Coast Railway (ARTC SHI DB no. 4281660).
  - Grafton Railway Viaducts. Kent, Clarence, Villiers, Duke, Prince, Queen and Mary Streets (ARTC SHI DB no. 4280699).
  - Northern Rivers County Council. 17-21 Prince St Grafton (Country Energy, SHI DB no. 3110014).
  - OFT Moveable Heritage - weights and measures currently on loan to the Powerhouse Museum (Office of Fair Trade, SHI DB no. 4270027).
  - RTA Regional Office. 31 Victoria St Grafton (RTA; SHI DB no. 4305617).
- Grafton City Railway Precinct (Railcorp, database no.4806791).
- South Grafton Fire Station. 64 Wharf St South Grafton (SHI DB 4690099).

- North Coast Regional Environmental Plan 1988. Heritage items shown in Schedules 1, 2 and 3 of this Plan are shown in Figure 32.
- Grafton Local Environmental Plan 1988. Heritage items listed in Schedule 1 of the Plan are shown in Figure 33.
- National Shipwrecks Database. There are two items listed under this database: The Hull of SS Induna (Shipwreck ID no. 890) located in proximity to the south bank of the Clarence River west of the Grafton Bridge. This item is shown in Figure 33. The Grafton Punt (Shipwreck ID no. 787) wrecked in 1943. Its location is unknown. Both items have been listed in Schedule 1 of the Grafton Local Environmental Plan 1988.
- Register of the National Estate. Items identified in the Register of National Estate are presented in Figure 34.
- Commonwealth Heritage List. These items are presented in Figure 34.
- National Trust Register. Items identified in the National Trust Register are shown in Figure 35.
- Community Based Heritage Study (CVC 2010). This study recommends amendments to existing heritage listings as well as the listing of additional heritage items. It is noted that in the Clarence Valley Council November 2010 Ordinary Meeting (Council minutes dated November 2010, page 77), Council resolved to adopt all but 18 of the potential heritage items identified in the Community Based Heritage Study.
- Clarence Valley Draft Local Environmental Plan 2010 (Schedule 5). Items identified in this Plan are listed on Schedule 5. The list is a combination of Schedule 1 of the Grafton Local Environmental Plan 1988 and the items listed in the North Coast Regional Environmental Plan 1988. Schedule 5 of the draft Local Environmental Plan also lists tree species within genera Brachychiton, Ficus or Jacaranda located within any road reserve and being more than three metres in height.
- National Heritage List. This list identifies heritage items in the Grafton or South Grafton areas.

In terms of heritage significance among the heritage items listed in the registers, databases, listings and environmental planning instruments discussed above, Biosis Research found considerable variation on the level of relative significance between items. The preliminary summary total provided in Table 10 of identified heritage items includes those on statutory lists, non-statutory lists, the Community-Based Heritage Study 2010 and potential relics identified by Biosis Research through desktop investigation and site visits. The numbers below are a reflection of items per register therefore some items may have been counted a number of times.

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1 The Clarence Valley Local Environmental Plan 2011 was gazetted on 23 December 2011
Table 10: Summary of identified non-Aboriginal heritage items.

<table>
<thead>
<tr>
<th>Item</th>
<th>Commonwealth Heritage List</th>
<th>State Heritage Register</th>
<th>S.170 Registers</th>
<th>North Coast REP</th>
<th>National Trust Register</th>
<th>Register of National Estate</th>
<th>Reics Provision</th>
<th>National Shipwrecks Database</th>
<th>Grafton LEP 1988* (items identified on other lists and registers)</th>
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<tr>
<td>Grafton Post Office</td>
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<td>Hull of SS Induna</td>
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<td>Register of the National Estate</td>
<td>Relics Provision</td>
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<td>Former wharf sites on the banks of the Clarence River</td>
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<tr>
<td>Rail ferry wharf + timber piles in Alipou Creek &amp; wharf remnants on bank</td>
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<td>Site of Wilson’s store</td>
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<tr>
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<td>Istria 95 Victoria St</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former Police Residence 1 Duke St (+ palm tree)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grafton Free Presbyterian Church 138 Fry St</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grafton Teacher’s Centre (former Grammar School) 97 Mary St</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pullens Store and Warehouse Group</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schaeffer House (formerly residence called Kia-Ora) 192 Fitzroy St</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Andrew’s Church and Manse 111-113 Oliver St</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telearah 289 Oliver St</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TJ Ford Pavilion, Grafton Showground</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walker’s Marina Hotel</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Hardware 39 Skinner St</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTALS 1 7 11 31 0 19 10 2 37*

* Note: The items shown in Table 10 for the Grafton LEP 1988 are only those items that appear in more than one register. The Grafton LEP 1988 contains 568 heritage items in Grafton and South Grafton. These are discussed further in Volume 2 - Technical Paper: Non-Aboriginal Heritage.
Non-Aboriginal archaeological sites

Biosis Research *Technical Paper: Non-Aboriginal Heritage* notes a number of archaeological sites that have been identified through analysis of early plans and during site visits conducted in 2010. Areas of archaeological sensitivity in the Grafton area are presented in Figure 36. Areas of archaeological sensitivity include contributory items. These are buildings identified by Biosis Research during field work which contribute to the significance and character of Grafton and South Grafton urban conservation area.

The southern bank of the Clarence River was identified as an area with archaeological sites and potential archaeological sites. Also, visible relics related to two of the former rail wharfs, the railway terminus, the entrance to the rail ferry wharf, the railway turntable and the site of a stock reserve were identified in the vicinity of the Grafton Bridge abutments.
Figure 31: Items in the Grafton area listed on the State Heritage Register and the Section 170 Register.
Figure 32: Items in the Grafton area listed on Schedules 1, 2 and 3 of the North Coast Regional Environmental Plan 1988.
Figure 33: Items in the Grafton area listed on Schedule 1 of the Grafton Local Environmental Plan 1988.
Figure 34: Items in the Grafton area listed on the Register of the National Estate and the Commonwealth Heritage List.
Figure 35: Items in the Grafton area classified by the National Trust.
Figure 36: Areas of archaeological sensitivity in the Grafton area.
5.5.2 Non-Aboriginal heritage constraints

The Grafton area has a large number of heritage items in the form of domestic, government, civic and commercial buildings, terrestrial and maritime archaeological sites as well as cultural plantings. Grafton and South Grafton pose high cultural heritage values which are reflected in the identification of its listed heritage items and the existence of conservation areas.

Impacts on heritage listed items, proposed items and archaeology should be avoided whenever possible. Where avoidance is not possible, impacts to heritage items should be minimised.

5.6 Noise

The existing noise environment has been sourced from desktop information.

5.6.1 Noise constraints

Noise sensitive land uses identified by the NSW Road Noise Policy (Office of Environment and Heritage 2011) include residences, schools, hospitals, aged care facilities, churches, active and passive recreation areas and school playgrounds. These noise sensitive land uses are considered potential constraints for an additional crossing over the Clarence River at Grafton. Noise sensitive receivers located in non-residential areas (for example, a residence located in an industrial area) are also considered potential constraints.

Non-residential noise sensitive receivers are presented in Figure 37.

Further background noise measurements will be undertaken during the short-listing process. These background measurements will be used to model each of the short-listed options to determine the likely noise impacts on sensitive receivers.
Figure 37: Non-residential noise sensitive receivers in the Grafton area
5.7 Ecology

This chapter summarises the existing terrestrial and aquatic ecological conditions and constraints in the Grafton area. It is based on the ecological study undertaken by Biosis Research as part of the investigations for an additional crossing of the Clarence River at Grafton. This study is found in Volume 2 – Technical Paper: Ecology.

5.7.1 Existing environment

5.7.1.1 Terrestrial ecology

Terrestrial flora

A preliminary map of the vegetation types found in the Grafton area is presented in Figure 38. This map is based on desktop research, high resolution aerial photography interpretation and reconnaissance field surveys undertaken in April 2010 and July 2011.

Three endangered ecological communities under the Threatened Species Conservation Act 1995 were identified in the Grafton area, namely freshwater wetlands on coastal floodplains, lowland rainforest on floodplains and sub-tropical coastal floodplain forest as summarised below. Ground-truthing surveys will be conducted as part of the investigations for the short-list of route options to confirm and refine areas with endangered ecological communities.

- Freshwater wetlands on coastal floodplains (Threatened Species Conservation Act 1995): The reedlands adjoining the Clarence River and more patchily along Alipou Creek consist mainly of stands dominated by *Phragmites australis*, with other native aquatic macrophytes including *Schoenoplectus mucronulatus* and *Typha orientalis* also present. The fringing reedland along the Clarence River is broadly consistent with this endangered ecological community.

- Lowland rainforest on floodplains (Threatened Species Conservation Act 1995): According to previous studies, the western end of Susan Island Nature Reserve includes a stand of this endangered ecological community (NSW RTA 2004 and OEH 2009). The Induna Reserve to the south-west of the existing bridge is planted with native rainforest trees, however neither this patch nor any other vegetation in the area is consistent with this endangered ecological community.

- Sub-tropical coastal floodplain forest: All remaining native vegetation on coastal floodplains in NSW falls under the definition of one or more endangered ecological communities under the Threatened Species Conservation Act 1995. The Grafton area is within the modified floodplain of the Clarence River, therefore all native vegetation within this area is part of an endangered ecological community. There are some patches of remnant and regrowth native trees characteristic of this community present within the area, including *Eucalyptus tereticornis* and *Casuarina cunninghamiana*. These patches are predominantly located on the floodplains adjoining and to the south of Alipou Creek, Swan Creek Susan Island, Elizabeth Island and sections along the northern and southern banks of the Clarence River.
Figure 38: Vegetation types in the Grafton area.
Threatened flora with marginal potential habitat in the Grafton area

No threatened flora species were recorded in the reconnaissance field surveys and only small areas of potential habitat for regionally recorded threatened plants were identified in the Grafton area. It should be noted that while potential habitat may be present, existing habitats are considered highly marginal due to the long history of disturbance and relatively poor condition of remaining native vegetation (refer to Table 11).

Table 11: Threatened flora with marginal potential habitat in the Grafton area.

<table>
<thead>
<tr>
<th>Latin Name / Common Name</th>
<th>EPBC Act(^1)</th>
<th>TSC Act(^2)</th>
<th>Potential constraint areas/habitats</th>
<th>Likelihood of occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthraxon hispidus Hairy-joint grass</td>
<td>V</td>
<td>V</td>
<td>Possibly on low-lying areas on paddocks draining to Alipou Creek.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Dendrobium melaleucaphilum Sider orchid</td>
<td>-</td>
<td>E1</td>
<td>This species is epiphytic on <em>Melaleuca styphelioides</em>, recorded in Induna Reserve – however unlikely to support this species.</td>
<td>Very low</td>
</tr>
<tr>
<td><em>Eleocharis tetraquetra</em> Square-stemmed spike-rush</td>
<td>-</td>
<td>E1</td>
<td>Possibly on low-lying areas on paddocks draining to Alipou Creek.</td>
<td>Moderate</td>
</tr>
<tr>
<td><em>Eucalyptus tetrapleura</em> Square-fruited ironbark</td>
<td>V</td>
<td>V</td>
<td>It is possible that this species persists as a remnant or regrowth tree; however it was not recorded during the survey.</td>
<td>Very low</td>
</tr>
<tr>
<td>Hydrocharis dubia Frogbit</td>
<td>V</td>
<td>-</td>
<td>Possibly in some sections of fringing reedlands.</td>
<td>Low</td>
</tr>
<tr>
<td><em>Myrsine richmondensis</em> Ripple-leaf muttonwood</td>
<td>-</td>
<td>E1</td>
<td>May occur in riparian forest along Alipou Creek and/or remnant rainforest patches.</td>
<td>Low</td>
</tr>
<tr>
<td><em>Ochrosia moorei</em> Southern ochrosia</td>
<td>E</td>
<td>E1</td>
<td>May occur in riparian forest along Alipou Creek and/or remnant rainforest patches.</td>
<td>Low-moderate</td>
</tr>
<tr>
<td>Parsonsia dorrigoensis Milky silkpod</td>
<td>E</td>
<td>V</td>
<td>May occur in riparian forest along Alipou Creek and/or remnant rainforest patches.</td>
<td>Low</td>
</tr>
<tr>
<td>Persicaria elatior Tall knotweed</td>
<td>V</td>
<td>V</td>
<td>Possibly in some sections of fringing reedlands.</td>
<td>Low-moderate</td>
</tr>
<tr>
<td><em>Rotala tripartita</em></td>
<td>-</td>
<td>E1</td>
<td>Possibly in some sections of fringing reedlands.</td>
<td>Low</td>
</tr>
</tbody>
</table>

\(^1\) Listed on the *Environment Protection and Biodiversity Conservation Act 1999* as Endangered (E) or Vulnerable (V).

\(^2\) Listed on the *Threatened Species Conservation Act 1995* as Endangered (E1) or Vulnerable (V).
**Terrestrial fauna**

Sixty-three threatened and/or migratory animal species and the habitat of a further 13 threatened and/or migratory fauna have been recorded within 10 km of the Grafton area (OEH Atlas of NSW Wildlife; Birds Australia Atlas of Australian Birds; and, DSEWPC Protected Matters Database). In addition, individuals of the endangered emu (*Dromaius novaehollandiae*) population in the New South Wales North Coast Bioregion and Port Stephens local government area have been recorded within 10 km of the Grafton area. A further 47 threatened animal species are known or predicted to occur within the Clarence Lowlands Catchment Management Authority Sub-region. The complete list of species along with a description of potential habitats is provided in *Volume 2 – Technical Paper: Ecology*.

Based on preliminary investigations and subsequent field surveys, 62 threatened and/or migratory animal species are considered to have potential habitat within the area. It should be noted that while potential habitat may be present in the Grafton area, many existing habitats are considered only marginal due to the long history of disturbance and relatively poor condition of remaining native vegetation.

The reconnaissance field surveys noted colonies of black flying-fox (*Pteropus alecto*) and the threatened grey-headed flying-fox (*Pteropus poliocephalus*) roost on Susan Island. These colonies mobilise at dusk from their Susan Island roosts in all directions in search of feeding sites. Elizabeth Island also provides known and potential habitat for threatened and migratory fauna.

### 5.7.1.2 Aquatic habitats

The major aquatic fauna habitats that are present within the Grafton area are:

- Clarence River.
- Alipou Creek.
- Cowan Creek.
- Carrs Creek.

As part of the preliminary investigations for a proposed additional crossing, an aquatic survey was conducted between 2 and 4 August 2010. The aquatic surveys included fyke netting, luminescent bait trapping and habitat-based assessment and covered selected locations at the Clarence River, Alipou Creek, Cowan Creek, Carrs Creek and Alumy Creek. Further information on the survey can be found in Chapter 4 of *Volume 2 – Technical Paper: Ecology*. The aquatic survey findings can be summarised as follows:

- No aquatic flora species listed as threatened pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* or the *NSW Fisheries Management Act 1994* were recorded during the surveys.

- Eel-tailed catfish (*Tandanus tandanus*) and olive perchlet (*Ambassis agassizii*), both listed on the *Fisheries Management Act* were recorded within the area. The Murray-Darling Basin population of the eel-tailed catfish and the western population of the olive perchlet are listed as endangered populations under the *Fisheries Management Act*. The Clarence River at Grafton is outside the expected distribution of these populations and therefore these listings are not pursuant to current investigations.

- The endangered eastern freshwater cod (*Maccullochella ikei*) (*Environment Protection and Biodiversity Conservation Act* and *Fisheries Management Act 1994*) is known within the Clarence River system, however, this species is expected to be absent in the vicinity of the
area due to the degraded nature of the riparian vegetation along the Clarence River at Grafton and the estuarine and tidal influences that extend to the town of Copmanhurst.

- Australian bass (*Macquaria novemaculeata*) observed within the area, although not listed under the *Environment Protection and Biodiversity Conservation Act* or the *Fisheries Management Act* are under significant decline and are an important angling species within the vicinity of the area.

### 5.7.2 Ecological constraints

Criteria used by Biosis Research to identify land within the Grafton area in terms of potential ecological constraint included:

- Potential presence of endangered ecological communities.
- Significant flora and fauna species records.
- Known and/or potential habitat for threatened terrestrial and aquatic flora and fauna.
- Areas of critical habitat.
- Habitat connectivity.
- Local or regional wildlife corridors.

Figure 39 shows habitat areas identified as potential ecological constraints. Records of threatened and migratory fauna across the Grafton area are identified in the *Volume 2 – Technical Paper: Ecology*. Assessment of ecological constraints has been primarily desktop based. Field surveys were conducted in parts of the proposal area, and were predominantly focused around the Clarence River and associated tributaries. Therefore, not all areas that may pose an ecological constraint have been mapped as such.

The black flying-fox (*Pteropus alecto*) and grey-headed flying-fox (*Pteropus poliocephalus*) populations at Susan Island which disperse at dusk from their roosts to feeding resources in the Grafton area is also considered a constraint for an additional crossing.

Detailed ecological field studies will be undertaken for the area covered by the short-list of options.
Figure 39: Potential ecological constraints in the Grafton area.
5.8 Flooding

Existing flooding conditions and constraints in the Grafton area have been sourced from the *Lower Clarence River Flood Study Review* (WBM, March 2004), which is the most recent flood model adopted by Clarence Valley Council. This information has been complemented with information available on the Clarence Valley Council website.

5.8.1 Existing environment

Flood protection in the Grafton area

Construction of various levee banks and drainage improvements in Grafton has been undertaken progressively over time to help reduce the frequency and severity of flooding in residential and commercial areas. Flood protection works commenced in about 1890 with the construction of drainage improvements and minor levees along low sections of the riverbank.

Subsequent flood mitigation works did not begin until the 1960s, when a major program of levee construction at Grafton and South Grafton was initiated. Since that time, additional levees were gradually constructed, and the height of existing levees increased, to further reduce the frequency of flooding.

Grafton and South Grafton are currently protected by a series of levees that, in addition to natural high ground and the elevated railway and Pacific Highway embankment, surround the town. The levees are shown in Figure 40.

Based on flood modelling results documented in the *Lower Clarence River Flood Study Review* (WBM, 2004), there is approximately a five per cent annual exceedance probability (AEP) that overtopping of the current Grafton and South Grafton levees may occur in a given year. This AEP translates to approximately a 20-year average recurrence interval (ARI) flood event.
Figure 40: Levee system in the Grafton area.
Existing flood behaviour

The existing flooding behaviour of the Grafton area has been assessed using a hydraulic model developed as part of the Lower Clarence River Flood Study Review (WBM, 2004). The model has been calibrated to June 1967, January 1968, May 1980, March 1984, April 1988, May 1996 and March 2001 flood events. Using the calibrated flood model, design flood events modelling for 5-year, 20-year and 100-year average recurrence interval (ARI) and the probable maximum flood (PMF) events have been modelled. The average recurrence interval is the long-term average number of years between the occurrence of a flood as big as (or larger than) the selected event, while the probable maximum flood is the largest flood that could conceivably occur at a particular location.

Table 12 summarises the peak flood levels, velocities and flows for the modelled design flood events at the following locations:

- The Prince Street gauge (Grafton).
- The existing Grafton Bridge.
- Within Grafton (Alumy Creek adjacent to North Street).
- Within South Grafton (Intersection of Abbott Street and Vere Street).

Table 12: Design flood event result summary.

<table>
<thead>
<tr>
<th>Design flood event</th>
<th>Clarence River</th>
<th>Grafton</th>
<th>South Grafton</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak flood level (m AHD)</td>
<td>Peak flood velocity (m/s)</td>
<td>Peak flood flow (m³/s)</td>
</tr>
<tr>
<td>5-year ARI event</td>
<td>6.1</td>
<td>6.0</td>
<td>2.2</td>
</tr>
<tr>
<td>20-year ARI event</td>
<td>8.0</td>
<td>7.7</td>
<td>3.4</td>
</tr>
<tr>
<td>100-year ARI event</td>
<td>8.4</td>
<td>8.1</td>
<td>3.7</td>
</tr>
<tr>
<td>PMF event</td>
<td>9.8</td>
<td>9.4</td>
<td>4.2</td>
</tr>
</tbody>
</table>

1 Average recurrence interval.
2 Probable maximum flood.
3 Mountain View is located approximately 10 km upstream of Grafton. Source: WBM 2004.

Figure 41, Figure 42 and Figure 43 show the extent of the flood peak for 5-year, 20-year and 100-year average recurrence interval design flood events. In summary, Table 12 and the figures below show that:

- The 5-year average recurrence interval event (Figure 41) results show no overtopping of the Grafton urban levees.
- The 20-year average recurrence interval event (Figure 42) results display the flood behaviour when overtopping of the Grafton and South Grafton levies commences. It shows that the levee system in Grafton and South Grafton generally provides flood immunity for a 20-year average recurrence interval event. Based on flood modelling results documented in the Lower Clarence River Flood Study Review (WBM, March 2004), sections of the Grafton flood levee start to overtop during the 1 in 20-year average recurrence interval flood. Due to the flood risk associated with the overtopping of the Grafton levees, this average recurrence interval event represents a critical design flood event for Grafton.
The 100-year average recurrence interval event (Figure 43) results show the flood behaviour associated with a major flood resulting in extensive overtopping of the Grafton and South Grafton levees.

During the 100-year average recurrence interval event, significant inundation of Grafton is experienced with flood depths in some developed areas exceeding one metre.

The probable maximum flood event results show the probable maximum flood event likely to occur within the Grafton region.

Within the main river channel, a general trend of increases in flood level, depth, flow and velocity are experienced for events of increasing average recurrence interval magnitude.

The flood behaviour within the Grafton urban levees is dominated by the volume of floodwater overtopping the levee and the local topography within the levee. Once floodwaters have overtopped the levee, they do not follow the flood gradient trend of the main river. Instead, the flow paths within the levee are defined by local drainage lines, within Grafton predominantly draining north towards the North Meadow and Junction Hill basins, independent of the flood behaviour in the main river.

During all assessed design flood events, excluding the probable maximum flood event, the underside of the existing Grafton Bridge remains above the flood level.

During the probable maximum flood event, peak flood levels impact the underside of the existing Grafton Bridge.
Figure 41: 5-year average recurrence interval event flood extent.
Figure 42: 20-year average recurrence interval event flood extent.
Figure 43: 100-year average recurrence interval event flood extent.
5.8.2 Flooding constraints

Flood levels within Grafton and South Grafton are largely dictated by the volume of floodwater overtopping the respective levee systems. Upstream of the existing Grafton Bridge, the Grafton and South Grafton levees extend for approximately 10 km before tying into natural high ground. Due to the long length of these levees, slight changes in flood level within the main Clarence River have the potential to alter the volume of water overtopping the levee, possibly resulting in significant variations in flood level behind the levee systems.

Bridge structures provide a restriction to flows, potentially resulting in some increase in upstream flood levels. Within Grafton and South Grafton, increased river flood levels resulting from an additional river crossing would be likely to affect the existing level of flood protection provided by the Grafton and South Grafton levees. This has the potential to adversely affect the populations of Grafton and South Grafton, increasing their flood risk exposure.

The following measures will be considered to reduce flood impacts associated with an additional crossing:

- Minimising increases in flood levels resulting from an additional crossing where possible.
- Alignment of proposed bridge piers with the main direction of flood flow within the main river channel.
- If the additional crossing is located adjacent to the existing Grafton Bridge, alignment of proposed bridge piers with those associated with the existing bridge where possible.
- Setting of proposed bridge soffit (underside) levels sufficiently high to remain flood free during major and extreme flood events.

Embankments associated with crossing approach roads also have the potential to result in flood impacts. The magnitude and extent of these impacts will be site dependant, potentially arising where the embankments redirect existing flood flows. To reduce flood impacts associated with the crossing approaches, embankments should be located outside existing local flow paths. Where this is not possible, to avoid significant flood impacts, the additional crossing approaches may require a viaduct design to minimise changes to the existing flow behaviour across the floodplain.

5.8.3 Flood impact assessment

A preliminary review of likely flood impacts resulting from the 25 preliminary route options has been carried out as part of the Preliminary Route Options Report – Part 2 (Refer to Chapter 7.1.3.1).

Further flood modelling will be carried out on the short-list of route options and will be reported in the Route Options Development Report. At that stage, the general methodology that will be used for the assessment of the short-list will include:

- Assessment of the existing flood behaviour using the flood model adopted at the time by Clarence Valley Council (current flood model is the Lower Clarence River Flood Study Review (WBM, March 2004)).
- Update of the flood model to include each short-listed route option.
- Future investigations into the likely flooding impacts of the short-listed route options will assess a range of floods, including floods larger (less frequent) than the 1 in 20-year average recurrence interval flood.
• Identification of the mitigation measures required for each route option to ensure the current level of flood immunity is maintained in Grafton and South Grafton. This may include raising the flood levees in some locations.

The affects of climate change have not been considered at this stage but will be considered during modelling of the short-list.

5.9 Other environmental aspects and constraints

5.9.1 Geology

The Geotechnical Investigation Report contained in the Additional crossing of the Clarence River Grafton: Environmental overview (RTA January 2004) and the North Coast Mineral and Petroleum Resource Assessment (McEvilly et al 2004) indicate that the bedrock underlying the Grafton area likely consists of the Grafton Formation, which includes sandstone, siltstone, claystone and minor coal. Quaternary alluvium is indicated to overlie the Grafton Formation and is described as stream alluvial deposits that are sandy to silty with minor gravels.

Anticipated composition of the Clarence River geology include natural levee deposits of fluvial sand, silt and clay overlying channel bar deposits of fluvial sands, silts, gravels and clay to the north.

To the south of the river, Holocene channel deposits (fluvial sand, silt and clay) are anticipated to overlie channel bar deposits, which would overlie flood plain deposits of fluvial sand, silt and clay. In turn, the flood plain deposits are anticipated to overlie deposits of clay, silt, fluvial sand and marine sand.

Geological conditions in the Grafton area are presented in Figure 44.
Figure 44: Bedrock geology and quaternary geology for the Grafton area.
Clarence River channel boreholes were drilled in 1975 immediately upstream and downstream of the existing bridge as part of an investigation carried out by RMS. The boreholes show a thicker sequence of gravel/sand and gravel with cobble sized material towards the northern bank. The rock level shallows towards the south side of the river. Table 13 summarises the sub surface conditions in the river channel and river bank.

Table 13: Clarence River channel sub surface conditions, adjacent to Grafton Bridge.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
<th>Reduced level at top (m AHD)</th>
<th>Thickness (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alluvium</td>
<td>Sand with some gravels and trace soft clay.</td>
<td>-3.3 to -12.2</td>
<td>4.5 to 9</td>
</tr>
<tr>
<td></td>
<td>Gravel and sand and gravel with cobbled sized material.</td>
<td>-6.9 to -9.8</td>
<td>8.5 to 10.2</td>
</tr>
<tr>
<td>Bedrock (Sandstone with siltstone layers)</td>
<td>Assumed extremely weathered (soil strength).</td>
<td>-19.1 to -21.6</td>
<td>1.3 to 6</td>
</tr>
<tr>
<td></td>
<td>Assumed highly weathered, very low strength, cracked with clay seams.</td>
<td>-20.4 to -26.8</td>
<td></td>
</tr>
</tbody>
</table>


Sub surface conditions in the southern river bank were obtained from boreholes drilled in 1975, 1981, 1987 and 2003 between Susan and Elizabeth Islands and are presented in Table 14.

Table 14: Clarence River southern river bank sub surface conditions between Susan and Elizabeth Islands.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
<th>Reduced level at top (m AHD)</th>
<th>Thickness (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>Clay, organic.</td>
<td>4.1 to 6.2</td>
<td>0.5 to 1.3</td>
</tr>
<tr>
<td>Alluvium</td>
<td>Silty sandy clay, silty clay, sandy clay and clay. Medium to high plasticity. Firm to very stiff in consistency. Locally very soft at and below groundwater level. Silty clay with peat, organic bands and organic content and odours.</td>
<td>-1.67 to 5.9</td>
<td>1.8 to 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.4 to -2.2</td>
<td>1.7 to 14</td>
</tr>
<tr>
<td></td>
<td>Silty sand and gravelly sand to sand, clayey sand to sand, silty and clayey sand. Very loose to very dense.</td>
<td>0.1 to -14.1</td>
<td>1.6 to 9.3</td>
</tr>
<tr>
<td></td>
<td>Sandy silty gravel and sandy gravel with possible cobbles. Very dense.</td>
<td>-9.9 to -14.2</td>
<td>7.2 to 8.8</td>
</tr>
<tr>
<td>Bedrock</td>
<td>Assumed extremely weathered.</td>
<td>-10.3</td>
<td>8.1</td>
</tr>
<tr>
<td></td>
<td>Interbedded siltstone, laminate and sandstone. Highly weathered to fresh.</td>
<td>-15.7 to -21.4</td>
<td></td>
</tr>
</tbody>
</table>


Based on the information above, a schematic cross section of meandering Clarence river system morphology and ground conditions has been prepared as shown in Figure 45.
Figure 45: Schematic cross section of meandering Clarence river system morphology and ground conditions in the Grafton area.

5.9.2 Acid sulphate soils

The 1:25,000 scale Acid Sulphate Soil Risk Map of the Grafton Map Sheet (Milford, 1997) indicates that an additional crossing of the Clarence River at Grafton would fall in areas of high and low acid sulphate soil risk (Refer to Figure 46).

High acid sulphate soil risk is associated with the river channel sediments and the alluvial plain deposits beyond the southern bank adjacent to the Pacific Highway in the vicinity of Alipou and Swan Creeks and in the Great Marlow area on the northern bank. Low acid sulphate soil risk is associated with the alluvial levee and alluvial plain deposits on the northern bank, through Grafton, and the alluvial levee and alluvial plain deposits along the southern bank adjacent to the river.
Figure 46: Acid sulphate soils risk in the Grafton area.
5.9.3 Public utilities infrastructure

Existing utilities and services within the Grafton area were identified by:

- Undertaking a preliminary Dial Before You Dig search for Grafton and South Grafton.
- Identifying stormwater, water and sewerage infrastructure in plans received from Clarence Valley Council.
- Consultation with Essential Energy and Optus.

Major utilities and services in the Grafton area are presented in Figure 47, Figure 48, Figure 49, Figure 50 and Figure 51. The major services include:

- Water supply and sewerage infrastructure (diameter greater than 300 mm) provided by North Coast Water (a business unit of the Clarence Valley Council) (Figure 47 and Figure 48).
- Stormwater infrastructure (bridges, box culverts, pipe culverts greater than 1,200 mm diameter and major open channels) provided by Clarence Valley Council (Figure 49).
- Telecommunications infrastructure provided by Optus, AAPT, Telstra and Telstra NextGen networks (Figure 50).
- Electricity infrastructure provided by Essential Energy (Figure 51). Essential Energy has advised there is a proposal for a new 11 KV cable crossing beneath the Clarence River at Grafton. Essential Energy has also advised the 132 KV crossing above Elizabeth Island (see Figure 51) has a clearance of 19.4 m above high water mark.

These public utility constraints would be considered during the identification of an additional crossing of the Clarence River at Grafton.
Figure 47: Public utility infrastructure in the Grafton area - water mains greater than 300 mm diameter.
Figure 48: Public utility infrastructure in the Grafton area - sewer mains greater than 300 mm diameter.
Figure 49: Public utility infrastructure in the Grafton area - stormwater.
Figure 50: Telecommunications in the Grafton area - optic fibre cables.
Figure 51: Public utility infrastructure in the Grafton area - electricity.
5.9.4 Contaminated Sites

A search was conducted of the Contaminated Land Public Record, as held by the NSW Office of Environment and Heritage. The contaminated land public record is a searchable database of:

- Orders made under Part 3 of the *Contaminated Land Management Act 1997*.
- Approved voluntary management proposals under the *Contaminated Land Management Act 1997* that have not been fully carried out and where the approval of the Office of Environment and Heritage has not been revoked.
- Site audit statements provided to the Office of Environment and Heritage under Section 53B of the *Contaminated Land Management Act 1997* that relate to significantly contaminated land.
- Where practicable, copies of anything formerly required to be part of the public record.
- Actions taken by the Office of Environment and Heritage under Section 35 or 36 of the *Environmentally Hazardous Chemicals Act 1985*.

The search found no records of contaminated sites in the Grafton area.