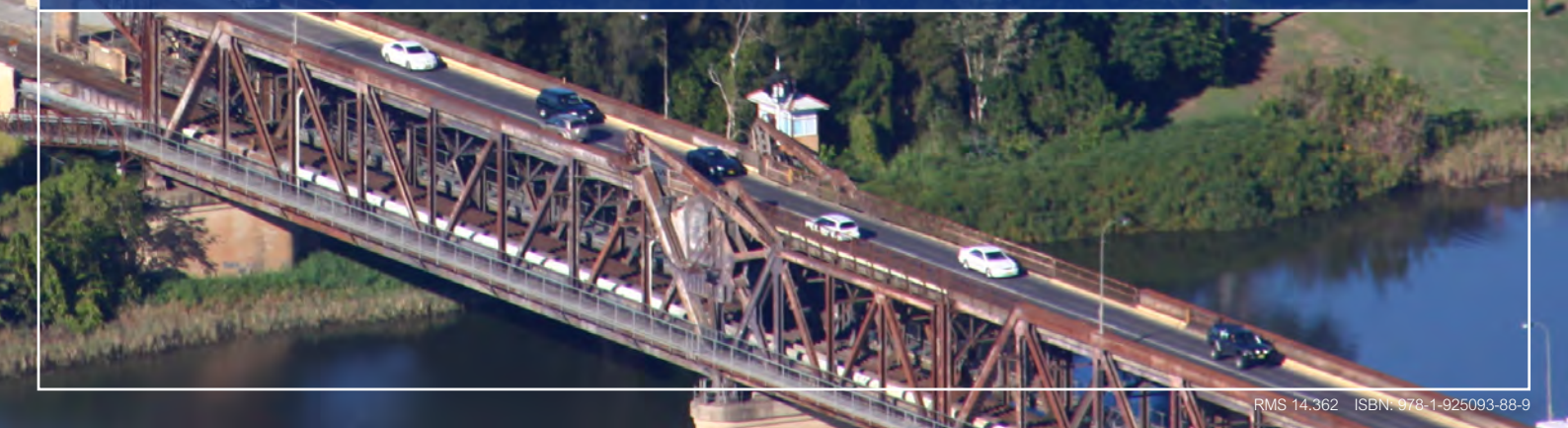
NSW GOVERNMENT | Transport Roads & Maritime Services

Additional Crossing of the Clarence River at Grafton

Environmental Impact Statement

AUGUST 2014



RMS 14.362 ISBN: 978-1-925093-88-9

Roads and Maritime Services

Additional crossing of the Clarence River at Grafton

Environmental impact statement

August 2014

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Roads and Maritime Services Publication Number

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Appendix I – Technical Paper: Socio-economic assessment

Appendix J – Technical Paper: Urban design and landscape concept report (including landscape character and visual impact assessment)

Appendix K – Technical Paper: Levee works landscape and visual appraisal

Appendix L – Technical Paper: Flora and fauna assessment.

Certification

Submission of environmental impact statement prepared under Part 5.1 of the *Environmental Planning and Assessment Act 1979*

Environmental impact statement prepared by:	
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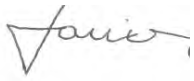
Name:	Adam Cameron MEngPrac (Civil) Senior Project Development Manager Infrastructure Development
Address:	76 Victoria Street Grafton NSW 2046
Proposed development: Additional crossing of the Clarence River at Grafton (the Grafton Bridge project).	
Address of the land on which the infrastructure to which the statement relates is located: Parts of Villiers, Dobie, Pound, Clarence and Greaves streets in Grafton. Parts of Iolanthe, Through and Spring streets and the Pacific and Gwydir highways in South Grafton. Sections of the Clarence River. Other areas in Grafton and South Grafton within the Clarence Valley local government area.	
Description of the infrastructure to which the statement relates: • A new road bridge across the Clarence River about 70 metres downstream of the existing road and rail bridge (which is to be retained) • Upgrading parts of the road network in Grafton and South Grafton to connect the new bridge to the existing road network • Provision of a pedestrian and cycle path and signalised pedestrian crossings • Replacing part of the existing rail viaduct where it crosses Pound Street in Grafton.	

Environmental impact statement: An environmental impact statement is attached addressing all matters in accordance with Part 5.1 of the *Environmental Planning and Assessment Act 1979*.	
Declaration: I certify that I have prepared the contents of this environmental impact statement in response to the Director-General's environmental assessment requirements dated 3 October 2013 and the relevant provisions of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. To the best of my knowledge the environmental impact statement contains all available information that is relevant to the environmental assessment of the infrastructure to which the statement relates and the information which it contains is not false or misleading.	
Signature:	
Name:	Javier Valderrama
Date:	15 August 2014

Executive summary

What is proposed?

Roads and Maritime Services (Roads and Maritime) is seeking approval for a new bridge over the Clarence River at Grafton on the NSW Mid North Coast. The project involves:

- Building a road bridge across the Clarence River about 70 metres downstream of the existing road and rail bridge (which is to be retained)
- Upgrading parts of the road network in Grafton and South Grafton to connect the new bridge to the existing road network
- Replacing part of the rail viaduct where it crosses Pound Street in Grafton
- Providing a pedestrian and cycle path and signalised pedestrian crossings.

What are the project objectives?

The project objectives are to:

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

Why is it needed?

The project is needed to:

- Provide a practical alternative for road users needing to cross the Clarence River at Grafton. The existing bridge is the only crossing in the Grafton area for people travelling between Grafton and South Grafton. The nearest alternative bridge over the river is in Maclean, about 41 kilometres east of Grafton
- Relieve current and future traffic congestion on the existing bridge over the Clarence River. The bridge is already operating at capacity during peak periods, and forecast traffic growth will worsen congestion problems
- Improve road safety for motorists, pedestrians and cyclists travelling across the river
- Provide a crossing that is designed for the demands of existing and future levels of traffic use and present-day vehicles. The current bridge, which was built in 1932, constrains traffic due to the following design problems:
    - Bottlenecks: There are two lanes of traffic in each direction approaching the bridge, but the traffic must merge into a single lane in each direction on the bridge
    - Kinks: The bridge has pronounced kinks in its horizontal alignment at the northern and southern ends which cannot be negotiated by long, heavy vehicles without crossing the centreline and bringing oncoming traffic to a standstill
- Provide a crossing for large, heavy vehicles. There is a 25/26 metre long B-double trucks ban on the current bridge during peak periods, which restricts efficient freight movement over the Clarence River.

How would the project satisfy these needs?

The project would satisfy the above needs by:

- Increasing traffic capacity across the Clarence River, which would relieve traffic congestion on the existing bridge and provide capacity for future traffic growth. In addition, the proposed upgrades of the local road network would perform within acceptable limits of operation until at least 2039 based on traffic forecasts
- Providing a safe crossing for pedestrians and cyclists through purpose-designed pedestrian and cycle paths
- Providing a crossing that is designed to contemporary road design standards, without kinks or bottlenecks, and allowing for the safe movement of all vehicles, including large, heavy vehicles
- Improving freight transport efficiency by providing an alternative route across the Clarence River.

By satisfying these needs, the project would also facilitate local economic development by providing better access for local residents into Grafton and South Grafton, including residents in the predicted growth area of Clarenza.

What alternatives were considered?

Roads and Maritime considered three alternatives to carrying out the project:

- 'Do nothing' (also known as the 'base case')
- Minimal network improvements
- Traffic demand management.

It was found that none of these alternatives would solve existing traffic congestion across the bridge during peak periods or provide the required capacity for forecast traffic volumes; improve road safety and traffic efficiency; or support Grafton's economic development. Therefore, none of these alternatives was considered further by Roads and Maritime.

How did the design process proceed?

The project development process involved an integrated design approach in which engineers, urban designers, environmental and heritage specialists worked collaboratively, complementing input from the community and stakeholders.

The process involved the following steps:

- Identifying preliminary route options, including options identified by the community
- Assessing the preliminary route options based on socio-economic, heritage, environmental, engineering and cost constraints as well as community input. Six options were shortlisted on the basis of this assessment
- Assessing the six shortlisted route options
- Choosing the preferred option. On 23 April 2013, the NSW Minister for Roads and Freight announced the preferred option for the project.

Consultation with State and local government agencies was ongoing throughout the development of the design presented in the environmental impact statement (EIS).

How did the community participate in selecting the preferred project?

Community participation has been important in guiding the project development process. Roads and Maritime considered feedback from the community during the route selection process, the preparation of this EIS and the project's engineering design. Roads and Maritime will continue to consult with government agencies, stakeholders and the community during the next stages of the project.

What will be the main benefits of the project?

The project would:

- Increase traffic capacity across the Clarence River, which would relieve congestion during peak periods and meet future traffic demands
- Enhance road safety for road users, including pedestrians and cyclists
- Improve traffic efficiency between and within Grafton and South Grafton and the predicted growth area of Clarenza
- Provide a bridge over the Clarence River that meets contemporary design standards, and meets the needs of present-day vehicles, including large, heavy vehicles
- Improve the level of flood immunity of the surrounding approach roads
- Support regional and local economic development, and provide growth and employment opportunities in the Grafton CBD and the Iolanthe Street precinct.

What are the main adverse outcomes expected?

The project would result in a number of adverse impacts.

There would be temporary construction related impacts such as noise, vibration, changed traffic conditions, dust, and water quality issues.

There would also be permanent impacts such as:

- Traffic noise in areas that currently have low levels of road traffic noise
- Changes to access arrangements for some residents, educational establishments and businesses
- Impacts on the Grafton heritage conservation area and a number of heritage items of local significance
- The acquisition of property (48 properties would need to be either totally or partially acquired)
- Visual impacts and impacts on the landscape character of the project area.

How will the likely impacts be managed?

The project has been designed to avoid and minimise impacts wherever possible.

In the first instance, this involved carefully selecting a route and designing an alignment that would avoid or minimise impacts wherever possible. In addition, environmental safeguards are integrated into the concept design.

This EIS contains measures to mitigate and/or manage the anticipated impacts. These environmental management measures include the preparation and implementation of a construction environmental management plan to minimise or avoid potential impacts during construction. The construction environmental management plan would include safeguards such as the creation of no-go areas around sensitive heritage sites, and erosion and sediment control measures to protect local waterways from runoff.

Management measures are also proposed to be implemented during the operational stage of the project.

If the project is approved, the design, construction and operation of the project would be carried out in accordance with these environmental management measures, as well as any additional measures identified in conditions of approval for the project.

How can I comment on the project and/or the EIS?

The NSW Department of Planning and Environment will make the EIS publicly available for a minimum of 30 days. During this period, it will be available at the Department of Planning and Environment's website:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6103

or the Roads and Maritime project website:

www.rms.nsw.gov.au/graftonbridge

Members of the public can also read the EIS at selected Roads and Maritime offices and other locations in the Clarence Valley local government area, including:

- Roads and Maritime Services Pacific Highway Office, 21 Prince Street, Grafton
- Roads and Maritime Services Regional Office, 76 Victoria Street, Grafton
- Clarence Valley Council, 2 Prince Street, Grafton
- Clarence Valley Council, Maclean office, 50 River Street, Maclean
- Maclean Library, Stanley Street, Maclean
- Grafton Library, 126-144 Pound Street, Grafton.

Throughout the exhibition period, Roads and Maritime will also be conducting community information sessions and will open a project information advice line to answer questions from the community relating to the project. The project information line number is 1800 633 332 (toll free).

Roads and Maritime invites members of the public to comment on the EIS and the project. To provide feedback, written submissions should be addressed to the Director, Infrastructure Projects during the exhibition period. All submissions received will be placed on the Department of Planning and Environment's website. Submissions should be made to http://majorprojects.planning.nsw.gov.au.

Written submissions may also be directed to:

Department of Planning and Environment

GPO Box 39 Sydney NSW 2001

Following the display period, Department of Planning and Environment will provide Roads and Maritime with a copy of the submissions, and Roads and Maritime will prepare a submissions report. This report will include any proposed changes in response to submissions received.

1 Introduction

This chapter introduces the project and provides a brief outline of its need, scope, and location. It also outlines the structure of this environmental impact statement (EIS).

1.1 The project

Roads and Maritime Services (Roads and Maritime) is seeking approval for a new road bridge over the Clarence River at Grafton (the project), on the NSW Mid North Coast. The approval is sought under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act / the Act) given the status of the project as State significant infrastructure.

The project would involve:

- Construction of a new bridge over the Clarence River about 70 metres downstream of the existing road and rail bridge (which is to be retained)
- Upgrades to parts of the road network in Grafton and South Grafton to connect the new bridge to the existing road network, including:
    - Widening Iolanthe Street to four lanes
    - Widening the Gwydir Highway to four lanes between Bent Street and the Pacific Highway
    - Realigning the existing Pacific Highway to join Iolanthe Street near Through Street
    - Providing a new roundabout at the intersection of the Pacific Highway and Gwydir Highway
    - Providing a new roundabout at the intersection of Through Street and Iolanthe Street
    - Limiting Spring Street and the Old Pacific Highway to left in and left out only where they meet Iolanthe Street
    - Realigning Butters Lane
    - Widening Pound Street to four lanes between Villiers Street and the approach to the new bridge
    - Providing traffic signals at the intersection at Pound Street and Clarence Street
    - Closing Kent Street where it is crossed by the bridge approach road
    - Realigning and lowering Greaves Street beneath the new bridge
    - Realigning Bridge Street to join directly to the southern part of Pound Street (east of the new bridge approach). There would be no direct connection between Pound Street south and the new bridge approach
    - Widening Clarence Street to provide formal car park spaces
    - Minor modifications to the existing Dobie Street and Villiers Street roundabout.
- The existing rail viaduct section across Pound Street would be replaced with a new bridge structure to provide sufficient vertical clearance for the upgrade of Pound Street
- Construction of a pedestrian and cycle path and signalised pedestrian crossings for access to and across the new bridge and throughout Grafton and South Grafton

- Flood mitigation works, which includes raising the height of sections of the existing levee upstream of the existing bridge in Grafton and South Grafton
- Ancillary works such as public utility adjustments, construction compounds and stockpile areas and water management measures.

A detailed description of the project is provided in Chapter 5 and Chapter 6. This EIS has been prepared based on the project concept design. If approved, a further detailed design process will follow which may require refinements to the concept design.

The project is needed to address short-term and long-term transport needs within Grafton and South Grafton. The primary drivers of the project are to:

- Relieve current and future traffic congestion across the existing bridge
- Provide greater accessibility (measured in terms of travel time and reliability) for the journey to work, other private travel, freight and commercial activities
- Enhance road safety for all road users over the length of the project.

The need for the project and project objectives are described in more detail in Chapter 3.

The project is estimated to cost around $200 million (in 2013 dollar terms). At this stage a construction program has not yet been determined, however it is expected construction would take about three years.

1.2 Project location

The project is located at Grafton in the Clarence Valley local government area, on the NSW Mid North Coast, about 610 kilometres north of Sydney. The project follows the alignment of the preferred option announced by Roads and Maritime in April 2013. The southern end of the project is located at the junction of Bent Street (the Summerland Way) and the Gwydir Highway in South Grafton and the northern end is located at the junction of Pound Street and Villiers Street in Grafton. The new bridge would be about 70 metres to the east (downstream) of the existing bridge.

Grafton is located on the northern and southern banks of the Clarence River, about 37 kilometres inland from the coast. Grafton is a major regional centre within the Mid North Coast Region and is a focal point for regional road, river and other transport networks. It is also the focus of higher order services to the Clarence Valley sub-region such as a major hospital, regional airport, State government offices, sports and entertainment venues, retail shopping centres and livestock selling centre among other services.

The location and regional context of the project is shown in Figure 1-1 and key project features are shown in Figure 1-2. The design presented in Figure 1-2 would be subject to further refinement during the detailed design stage.

Figure 1-1 Location of the project at Grafton on the NSW North Coast

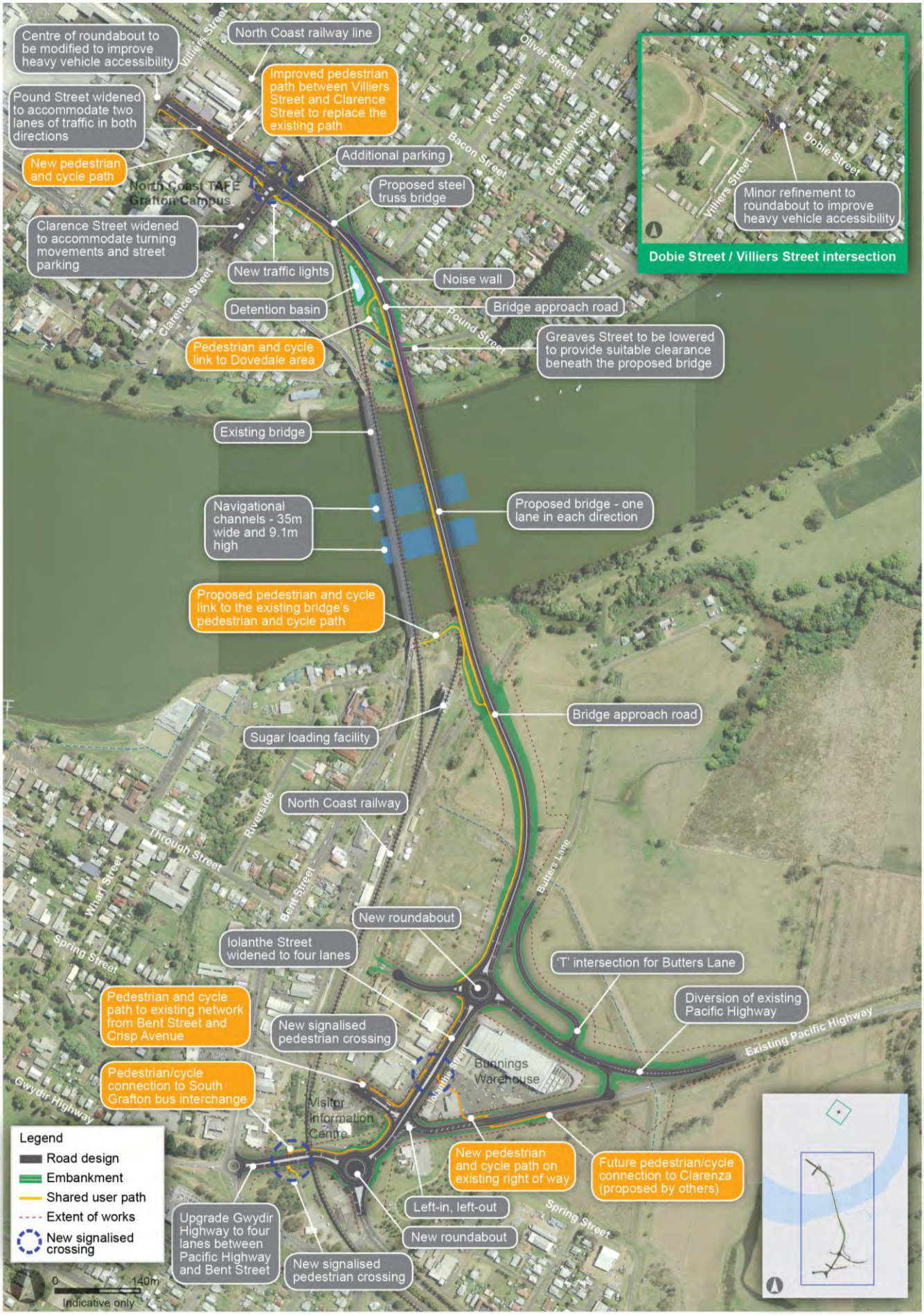


Figure 1-2 Key project features

Note: Design is subject to further refinement during the detailed design stage

1.3 Structure of this EIS

This EIS has been prepared to address the requirements issued by the former Director-General (now Secretary) of the former Department of Planning and Infrastructure (now Department of Planning and Environment) on 3 October 2013 and the relevant provisions of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

The EIS is divided into two volumes. Volume 1 comprises the EIS report, which presents the following information:

- Introduction – provides a broad overview of the project and the structure of the EIS (Chapter 1)
- Assessment process – outlines the statutory requirements and explains the steps in the assessment and approval process (Chapter 2)
- Strategic justification and project need – provides the strategic context, explains the need for the project and identifies the project objectives (Chapter 3)
- Project development and alternatives – provides an overview of the alternatives and options considered in developing the project including the consequences of not proceeding (Chapter 4)
- Project description (operation and construction) – provides a detailed description of the project including the route alignment, design standards, key design features and construction methodologies and staging (Chapter 5 and Chapter 6)
- Consultation – outlines the consultation activities carried out, issues raised and how these have been addressed (Chapter 7)
- Assessment of key issues – identifies the key environmental issues, assesses the impacts, and proposes environmental management measures (Chapter 8)
- Assessment of other issues – identifies other environmental issues, assesses the impacts, and proposes environmental management measures (Chapter 9)
- Summary of environmental management measures – collates all of the environmental management measures for the project identified through the impact assessment (Chapter 10)
- Environmental risk analysis – details the risk analysis process by which the potential environmental issues for assessment were identified (Chapter 11)
- Project strategic justification and conclusion – presents the justification for the project, including consideration of the principles of ecologically sustainable development and the objectives of the EP&A Act (Chapter 12)
- References (Chapter 13).

Volume 2 contains the following appendices, on which the EIS is based:

- Appendix A – Director-General's requirements and checklist
- Appendix B – Environmental Planning and Assessment Regulation 2000 checklist
- Appendix C – Draft community consultation strategy
- Appendix D – Technical Paper: Traffic and transport
- Appendix E – Technical Paper: Flooding and hydrology assessment
- Appendix F – Technical Paper: Noise and vibration assessment
- Appendix G – Technical Paper: Non-Aboriginal heritage assessment
- Appendix H – Technical Paper: Aboriginal heritage assessment

- Appendix I – Technical Paper: Socio-economic assessment
- Appendix J – Technical Paper: Urban design and landscape concept report (including landscape character and visual impact assessment)
- Appendix K – Technical Paper: Levee works landscape and visual appraisal
- Appendix L – Technical Paper: Flora and fauna assessment.

2 Assessment process

This chapter describes the planning approval process for the project as well as other relevant environmental planning and statutory approval requirements.

2.1 Approval framework

2.1.1 Environmental Planning and Assessment Act 1979

Roads and Maritime is seeking project approval for an additional crossing over the Clarence River at Grafton under Part 5.1 State significant infrastructure of the *Environmental Planning and Assessment Act 1979* (the EP&A Act / the Act).

Clause 14 of the *State Environmental Planning Policy (State and Regional Development) 2011* declares the development pursuant to section 115U(2) of the EP&A Act, to be "State significant infrastructure" if:

(a) the development on the land concerned is, by the operation of a State environmental planning policy, permissible without development consent under Part 4 of the EP&A Act; and

(b) the development is specified in Schedule 3 of the SEPP.

The project falls within the category of development that is permissible without consent pursuant to clause 94 of the *State Environmental Planning Policy (Infrastructure) 2007* (the Infrastructure SEPP). Clause 94 applies to development for the purpose of a road or road infrastructure facilities and provides that such development, when carried out by or on behalf of a public authority, is permissible without consent. The project is for the purpose of a "road" or "road infrastructure facility" under the Infrastructure SEPP.

Further, the project falls within clause 1 of Schedule 3 of the *State Environmental Planning Policy (State and Regional Development) 2011*. This clause of Schedule 3 identifies as State significant infrastructure, infrastructure or other development that (but for Part 5.1 of the EP&A Act and within the meaning of Part 5 of the EP&A Act) would be an activity for which the proponent is also the determining authority and would, in the opinion of the proponent, require an EIS to be obtained under Part 5 of the EP&A Act. The project falls within this category of development and as the project is likely to significantly affect the environment, it would require an EIS to be obtained under Part 5 of the EP&A Act.

A State significant infrastructure application report was prepared and submitted to the Department of Planning and Environment in August 2013. The project will be assessed as State significant infrastructure under Part 5.1 of the EP&A Act.

The approval process under Part 5.1 of the EP&A Act is illustrated in Figure 2-1. Further information on the assessment process is available on the Department of Planning and Environment website (www.planning.nsw.gov.au).

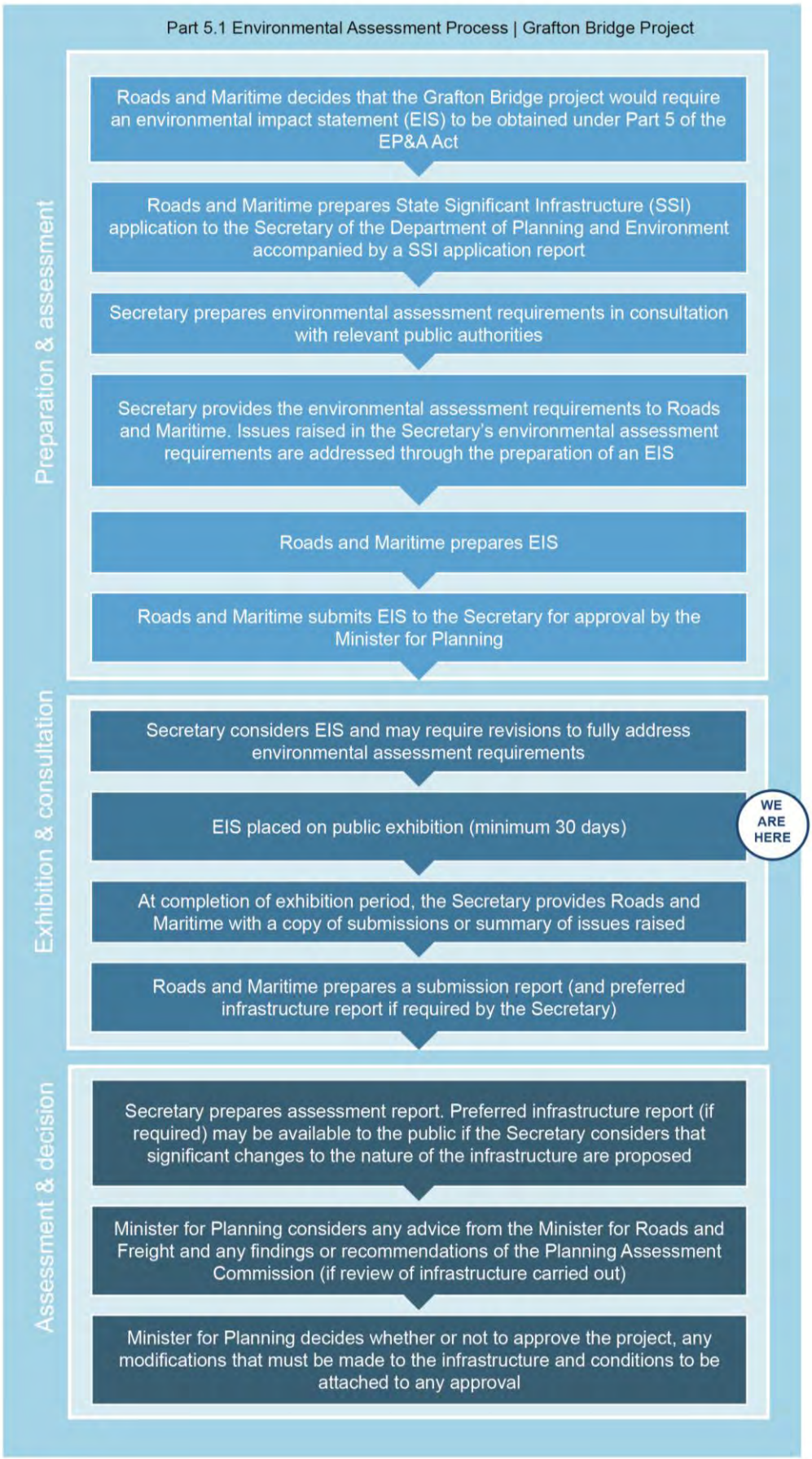


Figure 2-1 Part 5.1 environmental assessment and approval process

2.2 Environmental planning instruments that would have otherwise applied

The project is declared to be State significant infrastructure by the *State Environmental Planning Policy (State and Regional Development) 2011*. Therefore, under section115ZF of the EP&A Act, the local environmental plan and various state environmental planning policies which would have otherwise applied, do not apply to the project, including the:

- *Clarence Valley Local Environmental Plan 2011 (CVLEP)*
- *State Environmental Planning Policy No. 44 – Koala Habitat Protection*
- *State Environmental Planning Policy No. 55 – Remediation of Land*
- *State Environmental Planning Policy (Infrastructure) 2007.*

2.3 Other legislation

2.3.1 NSW legislation

A number of approvals are not required for a State significant infrastructure project approved under Part 5.1 of the EP&A Act (section 115ZG). Those approvals relevant to the project are:

- Permits under sections 201, 205 and 219 of the *Fisheries Management Act 1994*
- Approvals under Part 4 and excavation permits under section 139 of the *Heritage Act 1977*
- Aboriginal heritage permits under section 90 of the *National Parks and Wildlife Act 1974*
- Authorisations under the *Native Vegetation Act 2003* to clear native vegetation or State protected land
- A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*
- A bush fire safety authority under section 100B of the *Rural Fires Act 1997*
- The concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of that Act.

Approvals under other NSW legislation that may apply to the project include:

- An approval under the *Crown Lands Act 1989* to grant a relevant interest (ie licence, permit, easement or right of way) over a Crown Reserve. This is further discussed in Section 8.7
- At the time of writing this EIS, the NSW Office of Water was in the process of preparing a water sharing plan for the Clarence Alluvial Water Sources. Until the water sharing plan is adopted, the *Water Act 1912* would apply should access to ground or surface water be required during construction. This is further discussed in Section 8.10.

Other legislation that may apply to the project includes the:

- *Land Acquisition (Just Terms Compensation) Act 1991* – which applies to the acquisition of any land required for the project. Land acquisition requirements are further discussed in Section 8.7
- *Crown Lands Act 1989* – which applies to the acquisition of land reserved under this Act. Crown land impacted by the project is further discussed in Section 8.7.

- *Contaminated Land Management Act 1997* – which applies in the event that the project causes or contributes to contamination. This is further discussed in Section 8.10.
- *Protection of the Environment Operations Act 1997* – which applies to the prevention of pollution, appropriate disposal of waste and the need to notify the Environment Protection Authority in the event of any incidents that cause or have the potential to cause material environmental harm. Under section 115ZH of the EP&A Act, certain approvals cannot be refused if necessary to carry out State significant infrastructure. This applies to any environmental protection licence required to be obtained for the project under the *Protection of the Environment Operations Act 1997.*

2.3.2 Commonwealth legislation

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), proposed 'actions' that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land, or are being carried out by a Commonwealth agency, must be referred to the Commonwealth Government. If the Commonwealth Minister for the Environment determines that a referred project is a "controlled action", the Commonwealth Minister's approval of the project would be required in addition to approval from the NSW Minister for Planning and Environment.

Based on the results of the environmental investigations carried out for this EIS, it is considered that no matters of national environmental significance or areas of Commonwealth land are likely to be impacted by the project. Accordingly, Roads and Maritime has concluded that no referral to the Commonwealth Government is required under the EPBC Act.

3 Strategic justification and project need

This chapter outlines the strategic planning framework for the project. It also identifies the need for the project and the project objectives, and concludes with a statement of strategic need.

Table 3-1 presents the Director-General's environmental assessment requirements (now known as the Secretary's environmental assessment requirements) relevant to the strategic justification and project need, and where they are addressed in this chapter.

Table 3-1 Director-General's environmental assessment requirements relevant to the strategic justification and project need

Director General's environmental assessment requirements	Where addressed in EIS
A statement of the objectives of the project, including a description of the strategic need, justification, objectives and outcomes for the project, taking into account existing and proposed transport infrastructure and services within the adjoining subregions, and as relevant the outcomes and objectives of relevant strategic planning and transport policies, including, but not limited to, NSW 2021, NSW Government State Infrastructure Strategy, and the Mid North Coast Regional Strategy.	Relevant strategic planning and transport policies – Section 3.1. Justification – Section 3.2 and Chapter 12 Statement of the objectives of the project – Section 3.3. Statement of strategic need – Section 3.4

3.1 Strategic planning and policy framework

This section describes the compatibility of the project with key strategic planning and policy documents. The documents relevant to the project are:

- *NSW 2021: A Plan to Make NSW Number One* (NSW Government, 2011)
- *The State Infrastructure Strategy 2012–2032* (NSW Government, 2012)
- *Mid North Coast Regional Strategy* (Department of Planning, 2009)
- *NSW Long Term Transport Master Plan* (Transport for NSW, 2012)
- *Mid North Coast Regional Transport Plan* (TfNSW, 2013)
- *NSW Freight and Ports Strategy* (TfNSW, 2013)
- *National Land Freight Strategy discussion paper* (Infrastructure Australia, 2011)
- *National Road Safety Strategy 2011–2020* (Australian Transport Council, 2011)
- *Northern Rivers Regional Plan 2011* (Regional Development Australia – Northern Rivers, 2011)
- *Clarence River Way Masterplan* (CVC and Clouston Associates, 2009)
- *Grafton Waterfront Precinct Masterplan* (CVC and Clouston Associates, 2011)
- *Bike Plan and Pedestrian Access and Mobility Plan* (CVC and QED, 2008)
- *Clarenza Cycleway Options Study* (CVC and Lewis Ford & Associates Consulting Engineers, 2012).

These documents are discussed in the following sections.

3.1.1 NSW 2021: A Plan to Make NSW Number One

NSW 2021: A Plan to Make NSW Number One (NSW Department of Premier and Cabinet, 2011) presents the NSW Government's strategy for the State over the next 10 years. It is based on five strategies with underlying goals. The five strategies are to: rebuild the economy, return quality services, renovate infrastructure, strengthen the local environment and communities, and restore accountability to government.

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

The project would support the transport goals in the plan by reducing travel times between Grafton and South Grafton, including for public transport services, and by improving road safety.

3.1.2 The State Infrastructure Strategy

The *State Infrastructure Strategy* (Department of Premier and Cabinet, 2012) is a 20-year strategy that assesses the current state of infrastructure and recommends specific infrastructure investments and reforms.

Two of the objectives identified by the strategy for regional NSW are to:

- Improve access to employment and to connect people and communities
- Improve local transport networks.

The project would help to achieve these objectives by enhancing access to Grafton CBD and South Grafton for vehicles, pedestrians and cyclists and by improving traffic capacity and relieving congestion across the Clarence River.

3.1.3 Mid North Coast Regional Strategy

The *Mid North Coast Regional Strategy* (Department of Planning, 2009) was developed by the NSW Government in consultation with local councils. This regional strategy guides land use planning to 2031 in eight local government areas, including Clarence Valley where Grafton is located. The aims of the strategy include encouraging the growth and redevelopment of the region's major centres, protecting cultural and Aboriginal heritage values and incorporating specific regional infrastructure requirements to ensure that population growth is supported by services and associated infrastructure.

The strategy maps growth areas that are available for future urban development. These areas aim to reinforce the region's settlement hierarchy while supporting scenic green breaks between coastal communities and protecting important assets and resources. By 2031, the Mid North Coast population is expected to grow by more than 28 per cent to around 424,400. The strategy classifies Grafton as one of four major regional centres which will be required to accommodate the majority of future development.

The project would help to meet the long-term development needs of the Mid North Coast region as it would improve access and transport efficiency, which would enhance the ability of Grafton to fulfill its function as a major regional centre. The project would provide a safe and efficient crossing of the Clarence River. This is essential for maintaining established transport routes. It would also support industry and the wider community, facilitating growth and development of this important regional centre.

3.1.4 NSW Long Term Transport Master Plan

The *NSW Long Term Transport Master Plan* (Transport for NSW, 2012) sets the direction for transport planning and delivery for the next 20 years. The plan aims to

ensure the State's infrastructure priorities, including the State Infrastructure Strategy, are taken forward in an integrated manner.

A medium-to-long-term initiative outlined in the plan for the Northern Rivers region is to provide an additional crossing of the Clarence River at Grafton. This initiative is recognised as improving access across the region, providing an alternative route to the Pacific Highway, supporting Grafton as a major regional centre, and relieving congestion on the existing bridge.

One of the objectives of the plan is also to support regional development by improving accessibility to jobs, services and people, improving freight connections to markets, and providing better links between clusters of business activity.

The project would help to deliver this objective by improving connectivity within the Northern Rivers and Mid North Coast regions, and by supporting more reliable access to quality services and to employment and educational opportunities.

3.1.5 Mid North Coast Regional Transport Plan

The *Mid North Coast Regional Transport Plan* (TfNSW, 2013) identifies specific challenges the regions transport networks face and prioritises actions to address these challenges. Regional transport plans are built on the strategic direction, initiatives and state-wide context set by the *Long Term Transport Master Plan*. The broad actions are under three themes: better transport services, ensuring effective regulation and improving transport infrastructure. The regional transport plans provide a detailed analysis of local transport needs and priorities and respond to issues raised during regional consultation to develop the master plan.

The Mid North Coast regional transport plan has an action to invest in the road network. This includes working on road initiatives to support travel to and from the Mid North Coast including refining the concept design of the preferred option for the second crossing of the Clarence River at Grafton, then preparing and displaying the EIS for community comment.

3.1.6 NSW Freight and Ports Strategy

The *NSW Freight and Ports Strategy* (Transport for NSW, 2013) seeks to support economic growth in NSW through the delivery of an efficient and effective freight network. The strategy provides a framework for industry, all levels of government and stakeholders to guide investment and other decisions to enhance freight logistics in NSW.

The project would improve the efficiency of the road network by removing restrictions on the movement of large heavy vehicles across the Clarence River during peak periods, which in turn would improve the efficiency of freight servicing Grafton and surrounds.

3.1.7 National Land Freight Strategy discussion paper

The *National Land Freight Network Strategy discussion paper* (Infrastructure Australia, 2011) provides a case and priorities for a national land freight network strategy, and an indicative list of projects and programs that Infrastructure Australia has identified for inclusion in a long-term national land freight network plan.

The overarching purpose of the discussion paper is to drive the development of efficient, sustainable freight logistics that balance the needs of a growing Australian community and economy, with the quality-of-life aspirations of the Australian people.

The project is consistent with the discussion paper as it would be a heavy vehicle route that would help to meet the road freight transport needs of the Northern Rivers and Mid North Coast regions.

3.1.8 National Road Safety Strategy 2011-2020

The *National Road Safety Strategy 2011–2020* (Australian Transport Council, 2011) identifies initiatives to improve the safety of Australia's roads. The strategy is based on the safe-system approach, which is a holistic view of the road transport system and the interactions among roads and roadsides, travel speeds, vehicle and road users. As a step towards this long-term vision, this strategy presents a 10-year plan to reduce the annual number of deaths and serious injuries on Australian roads by at least 30 per cent.

This strategy outlines broad directions for the future of Australian road safety. The initiatives and options are set out in four key areas – safe roads, safe speeds, safe vehicles and safe people.

The project is consistent with the strategy as it would improve road safety on key parts of the road network in Grafton and South Grafton, which would help to meet the strategy's plan to improve safety on Australian roads. Further analysis of how the project would contribute to road safety is presented in Section 8.1.

3.1.9 Northern Rivers Regional Plan 2013-2016

The *Northern Rivers Regional Plan* (Regional Development Australia – Northern Rivers, 2013) responds to seven regional priorities including:

- Connected communities
- A learning region
- Natural infrastructure
- Sustainable industry
- Inclusive communities
- Regional identity
- A collaborative region.

These seven regional priorities inform the proposed initiatives, activities and projects for the Northern Rivers region. The plan sets out a vision for the future, and highlights the challenges and opportunities faced in social, environmental and economic development, and proposes desired outcomes for each. The plan's 2020 vision for the Northern Rivers region is "a healthy, prosperous and sustainable future for the communities of the Northern Rivers region".

The project would help to meet the long-term development needs identified in the plan. In particular, it would improve connections for people and communities and improve the efficiency of local transport networks.

3.1.10 Clarence River Way Masterplan

Clarence River Way Masterplan (CVC, 2009) is an integrated multifaceted approach to revitalising tourism in the Clarence Valley. A strategic intent of the masterplan is to reposition Grafton as a 'River City' tourist destination. The masterplan sets actions to achieve this including revitalising the river edge at Grafton and providing opportunities for new development to provide the public foreshore access to the river front. The masterplan seeks to position the Clarence River as one of the nation's great river experiences.

The project would help to meet the development goals for the Clarence Valley by improving access for tourists and by improving local transport networks to connect communities to the Clarence River. The project's urban design objectives and principles have taken into account the desired future landscape and urban design character set out in the masterplan.

3.1.11 Grafton Waterfront Precinct Masterplan

The *Grafton Waterfront Precinct Masterplan* (CVC, 2011) recognises the potential of the Clarence River and aims to position it as one of the nation's great river experiences. The masterplan proposes a revitalisation program for the river edge area between Queen Street and the existing bridge.

The masterplan illustrates how the vision and design principles might be applied in transforming the waterfront to a well-used and busy river boulevard. One of the key elements is a continuous shared waterfront walkway, providing direct access to the riverfront.

The project would help to enhance the Grafton waterfront experience for tourists and the local community by improving local transport network efficiency, and by largely avoiding direct impacts on the waterfront precinct presented in the plan.

3.1.12 Bike Plan and Pedestrian Access and Mobility Plan

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

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

The project would provide additional pedestrian and cycling paths that would improve access to and from Grafton and South Grafton. The proposed pedestrian and cycle paths allow for the expansion of existing and planned Council cycleways for Grafton and South Grafton.

3.1.13 Clarenza Cycleway Options Study

The *Clarenza Cycleway Options Study* (CVC, 2012) identifies and assesses route options for the construction of a pedestrian and cycle path between the existing pedestrian and cycle path north of the South Grafton Railway Station and the McAuley Catholic College in Hennessy Drive, off the Pacific Highway at Clarenza.

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

The project has the potential to complement the proposed pedestrian and cycle path to Clarenza by providing a pedestrian and cycle path on the new bridge with a link to Clarenza, and by providing a safe crossing of the Pacific Highway.

3.2 Need for the project

The project is needed to:

- Provide a practical alternative to road users for crossing the Clarence River at Grafton
- Relieve congestion across the river over the existing bridge which currently operates at capacity during peak periods
- Provide an additional crossing that is not constrained by narrow lanes, kinks or travel restrictions for large heavy vehicles
- Respond to the forecasted traffic demand across the Clarence River.

A discussion of the project need is included below.

3.2.1 Limited existing crossings of the Clarence River near Grafton

The existing bridge, built in 1932, is the only crossing of the Clarence River in the Grafton area. Road users travelling between Grafton and South Grafton, including those making both local and through trips, use the existing bridge as there is no practical alternative route. The nearest alternative bridge crossing over the Clarence River is in Maclean located about 41 kilometres north of Grafton.

The existing Grafton Bridge also forms part of the alternative regional north–south road link when the Pacific Highway is closed due to road traffic incidents or flooding. Otherwise the nearest alternative crossing is the Ulmarra ferry, which is not suitable for high traffic volumes.

3.2.2 Issues with the existing bridge

Roads and Maritime considers that the project is needed to improve road safety and the efficiency of the local traffic network. This stems from the following issues with the existing bridge.

Bridge is at capacity during peak periods

Traffic counts carried out across the bridge in August 2010 indicate that the bridge was carrying around 1,360 vehicles per hour in the northbound direction for the morning peak and around 1,330 vehicles per hour in the southbound direction for the evening peak. The *Guide to Traffic Management Part 3: Traffic studies and analysis* (Austroads, 2009) indicates that the theoretical capacity of the bridge could be considered to be in the range of 900 to 1,400 vehicles per lane per hour.

This indicates that the bridge is at capacity during peak periods.

Kinks in the alignment of the existing bridge

The bridge has pronounced kinks in its horizontal alignment at the northern and southern ends. Long, heavy vehicles cannot negotiate the kinks without crossing the centreline, creating a risk of crashes and causing traffic in both directions to slow or stop. This is compounded by narrow lane widths and reduced lateral clearances on the existing bridge.

Because of the stop start traffic conditions at the kinks, traffic queues back past the merging lanes on the approaches at both ends of the bridge. This has a flow on effect causing delays at the merge points. This, in turn, contributes to queuing and delays on the bridge approaches, particularly during peak periods when queuing extends to the Gwydir Highway and Pacific Highway in South Grafton and to Fitzroy Street in Grafton.

Crash hotspots on the bridge and approach roads

Roads and Maritime CrashLink database statistics indicate that current crash location hotspots in Grafton and South Grafton include areas along the Summerland Way,

particularly at the kinks in the bridge alignment and at heavily trafficked intersections at each end of the crossing (refer to Section 8.1 for more detail).

Low speed during peak periods

Due to the above issues, traffic flows across the bridge during peak periods are slow. In the morning peak hour, northbound traffic speeds are around 16 kilometres per hour in a 50 kilometre per hour zone.

Low speeds affect the efficiency of commuter and freight movements across the bridge. Due to the congestion, there is a 25/26 metre long B-double trucks ban on the bridge during peak periods, which also restricts freight movement. Traffic congestion associated with the bridge, and the resultant delays, are affecting the efficiency of the Summerland Way at Grafton (the designated inland heavy vehicle route linking southern Queensland with the Richmond River and Clarence River valleys).

Roads and Maritime forecasts that this traffic congestion will worsen over time, and substantially affect the performance of the State and local road network. Future traffic growth is discussed in the following section.

3.2.3 Future traffic growth and transport modelling

Strategic transport modelling of Grafton and its surrounds was carried out to develop a detailed understanding of the existing and future traffic demands and patterns for the Grafton and South Grafton areas. This is documented in the *Route Options Development Report Technical Paper: Traffic assessment* (GTA, 2012).

The work involved reviewing population and land use forecasts in consultation with Clarence Valley Council and the Department of Planning and Environment to assess the traffic impacts of existing and likely future development and to estimate future demands across the river up to 2039. The dwelling targets were informed by the *Mid North Coast Regional Strategy 2006-31* (Department of Planning, 2009).

The key residential growth areas were identified as Junction Hill (where work has already commenced on a new subdivision), followed by Waterview Heights, and finally Clarenza.

A summary of the resulting growth in traffic demand for trips across the existing bridge is presented in Table 3-2 for both the morning and evening peak periods.

Table 3-2 Forecast traffic demand during peak periods across the existing bridge (number of vehicles)

Year	Morning peak (7am to 9am)		Evening peak (3pm to 5pm)	
	Northbound	Southbound	Northbound	Southbound
2019	2562	1723	2475	3073
2029	3643	2487	3357	4150
2039	4276	2876	3828	4798

Table 3-2 indicates that the demand for traffic across the existing bridge will increase, which will further add to the existing traffic congestion during peak periods because the existing bridge is already at capacity during peak periods (refer to Section 3.2.1).

3.2.4 Consequences of not proceeding with the project

If the project is not built, the following consequences could be expected in coming years:

- As traffic growth increases there would be a substantial deterioration in the traffic performance of the existing bridge
- The risk of crashes on the existing bridge would increase or, at best, there would be a continuation of the existing road safety issues associated with the existing bridge
- The permitted times for freight and other vehicles using the Summerland Way at Grafton would continue to be restricted during peak hour periods, which would affect the ability of Grafton to fulfill its function as a major regional centre
- Local and regional economic development would be constrained by the limited traffic capacity across the Clarence River
- The existing local road network would be unable to meet Grafton's short-term and long-term transport needs
- Travel times would not be predictable and consistent due to traffic congestion.

3.3 Project objectives

The purpose of the project is to address short-term and long-term transport needs within Grafton and South Grafton. The project objectives and associated supporting objectives are listed below.

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 that reduces delays between Grafton and South Grafton in peak periods to an acceptable level of service for 30 years after opening
- Provide adequate vertical clearance for heavy vehicles
- Consider demand management strategies to minimise delays to local and through traffic.

Support regional and local economic development

- Provide transport solutions that complement existing and future land uses and support development opportunities
- Provide improved opportunities for economic and tourist development for Grafton
- Provide for commercial transport including B-doubles where required
- Provide flood immunity for the bridge for a one in 100-year flood event, and for the approach roads for a one in 20-year flood event, where economically justified
- Provide navigational clearance from the additional crossing for river users.

Involve all stakeholders and consider their interests

- Develop solutions that consider community expectations for the project

- Satisfy the technical and procedural requirements of Roads and Maritime 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 good benefit-cost ratio
- 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 the 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.

3.4 Statement of strategic need

The project is required to address the key transport needs of existing and future traffic travelling to or from Grafton and South Grafton, linking to the Pacific Highway, the Gwydir Highway and the Summerland Way. In particular, the project is needed to:

- Provide a practical alternative for road users needing to cross the Clarence River at Grafton. The existing bridge is the only crossing in the Grafton area for people travelling between Grafton and South Grafton. The nearest alternative bridge over the river is in Maclean, about 41 kilometres east of Grafton
- Relieve current and future traffic congestion on the existing bridge over the Clarence River. The bridge is already operating at capacity during peak periods, and forecast traffic growth will worsen congestion problems
- Improve road safety for motorists, pedestrians and cyclists travelling across the river
- Provide a crossing that is designed for the demands of present-day vehicles. The existing bridge, which was built in 1932, constrains traffic due to the following design problems:
    - Bottlenecks: There are two lanes of traffic in each direction approaching the bridge, but the traffic must merge into a single lane in each direction on the bridge
    - Kinks: The bridge has pronounced kinks in its horizontal alignment at the northern and southern ends which cannot be negotiated by long, heavy vehicles without crossing the centreline and bringing oncoming traffic to a standstill
- Provide a crossing for large, heavy vehicles. There is a 25/26 metre long B-double trucks ban on the existing bridge during peak periods, which restricts efficient freight movement over the Clarence River.

The project would satisfy the above needs by:

- Increasing traffic capacity across the Clarence River, which would relieve traffic congestion on the existing bridge and provide capacity for future traffic growth. In

addition, the proposed upgrades of the local road network would perform within acceptable limits of operation to at least 2039 based on traffic forecasts

- Providing a safe crossing for pedestrians and cyclists by providing purpose-designed pedestrian and cycle paths
- Providing a crossing that is designed to contemporary road design standards, without kinks or bottlenecks, and allowing for the safe movement of all vehicles, including large, heavy vehicles
- Improving freight transport efficiency by providing an alternative route across the Clarence River.

By satisfying these needs, the project would also facilitate local economic development by improving access for local residents into Grafton and South Grafton, including residents in the predicted growth area of Clarenza.

The objectives of the project are consistent with the strategic planning and policy framework of local and State of government.

The project would have some adverse impacts, and the construction solution, outlined in Chapter 6, has been chosen to minimise disruption to the local Grafton and South Grafton community. Project impacts would be managed through the management measures outlined in Chapter 8.

4 Project development and alternatives

This chapter describes the various alternatives and options that were considered as part of the project development process and explains how and why the project was selected as the preferred option.

The Director-General's environmental assessment requirements relevant to the project development and alternatives addressed in this chapter are shown in Table 4-1.

Table 4-1 Director-General's environmental assessment requirements relevant to project development and alternatives

Director General's environmental assessment requirements	Where addressed in EIS
An analysis of feasible alternatives to the carrying out of the project and project justification, including: An analysis of alternatives/options considered having regard to the project objectives (including an assessment of the environmental costs and benefits of the project relative to alternatives and the consequences of not carrying out the project), and	Section 4.1 Section 4.2
Provision of a clear discussion of the route development and selection process, the suitability of the chosen alignment and whether or not the project is in the public interest.	Section 4.2 and Section 12.3

4.1 Alternatives

The following four alternatives were considered:

- Do nothing (base case)
- Minimal network improvements
- Traffic demand management
- Additional crossing of the Clarence River.

Consideration of these alternatives in the context of achieving the project objectives are described in the following sections.

4.1.1 'Do nothing' (base case)

The 'do nothing' (base case) alternative involved retaining the existing Grafton Bridge and local road network in its current configuration.

The main benefit of the 'do nothing' (base case) alternative is that no capital expenditure or resources would be required for implementation.

Roads and Maritime carried out traffic modelling to predict future traffic demand over the bridge for the 'do nothing' (base case) alternative. This is documented in the *Traffic study for preliminary options* (GTA, 2010). The study found that with the 'do nothing' (base case) alternative the future average vehicle speed would decrease throughout the Grafton and South Grafton road network during peak periods. This is illustrated in Figure 4-1.

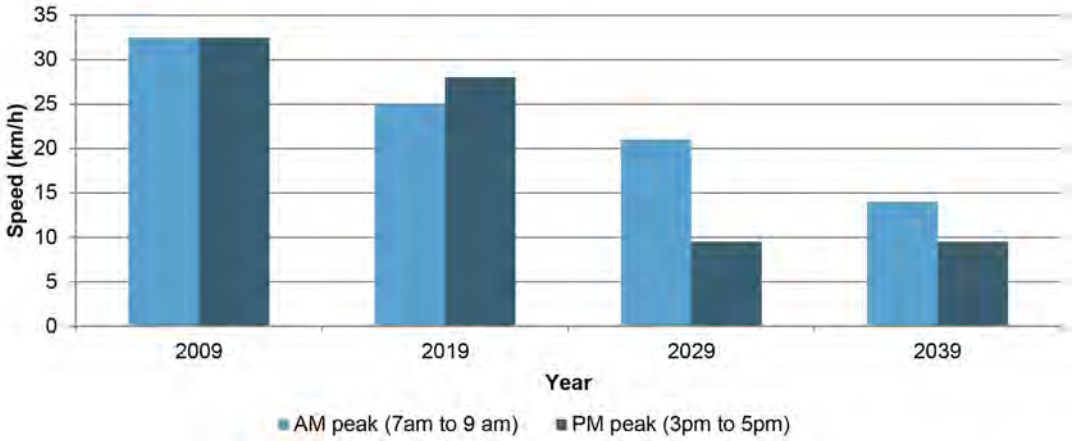


Figure 4-1 Average travel speed for Grafton and South Grafton road network under a 'do nothing' (base case) scenario in the morning and afternoon peak (Source: GTA, 2010).

The *Route Options Development Report Technical Paper: Traffic assessment* (GTA, 2012) predicts that with the 'do nothing' (base case) alternative traffic volumes that will need to travel across the river will increase (Table 4-2). Such an increase will further add to the existing traffic congestion of the bridge during peak periods.

Table 4-2 Forecast traffic volumes during peak periods across the bridge (number of vehicles)

Year	AM peak (7am to 9am)		PM peak (3pm to 5pm)	
	Number of vehicles northbound	Number of vehicles southbound	Number of vehicles northbound	Number of vehicles southbound
2019	2562	1723	2475	3073
2029	3643	2487	3357	4150
2039	4276	2876	3828	4798

The 'do nothing' (base case) alternative would therefore fail to solve the existing traffic congestion across the bridge during peak periods and would not provide the required capacity to respond to the future traffic volumes expected across the river. It would not improve road safety and traffic efficiency and would not support Grafton's economic development. As such, this alternative was not considered further by Roads and Maritime.

4.1.2 Minimal network improvements

The minimal network improvements alternative consists of works within the Grafton and South Grafton local road network aimed at addressing local congestion and capacity constraints. These works are documented in the *Route Options Development Report* (Roads and Maritime, 2012) and include:

- Upgrading Pound Street to two traffic lanes in each direction between Villiers Street and Prince Street
- Upgrading of Gwydir Highway to two traffic lanes in each direction between the Pacific Highway and Bent Street
- Upgrading of the Villiers Street and Dobie Street roundabout to improve turning movements for heavy vehicles
- Upgrading of the Gwydir Highway and Skinner Street roundabout from a single lane roundabout to a two lane roundabout.

This alternative does not include a new bridge across the Clarence River.

The main benefit of this minimal network improvement alternative is that it would have a significantly lower capital cost than building a new bridge. It would also provide a short-term alleviation of the traffic congestion in the Grafton and South Grafton local road network.

This alternative was not considered to be viable as it would not cater for increased traffic volumes across the bridge. Traffic modelling documented in the *Route Options Development Report Technical Paper: Traffic assessment* (GTA, 2012) predicted that under a minimal network improvement scenario, traffic congestion associated with the existing bridge and traffic performance on the local road network would continue to deteriorate as traffic demand increases. In particular, by 2049:

- The total number of trips across the bridge is forecast to increase by 83 per cent
- The total number of vehicle kilometres travelled across the network is forecast to increase by 118 per cent
- The total number of vehicle hours travelled across the network is forecast to increase by 1000 per cent
- The average vehicle speed on the bridge is forecast to decrease to less than three kilometres per hour during the morning peak, as shown in Figure 4-2.

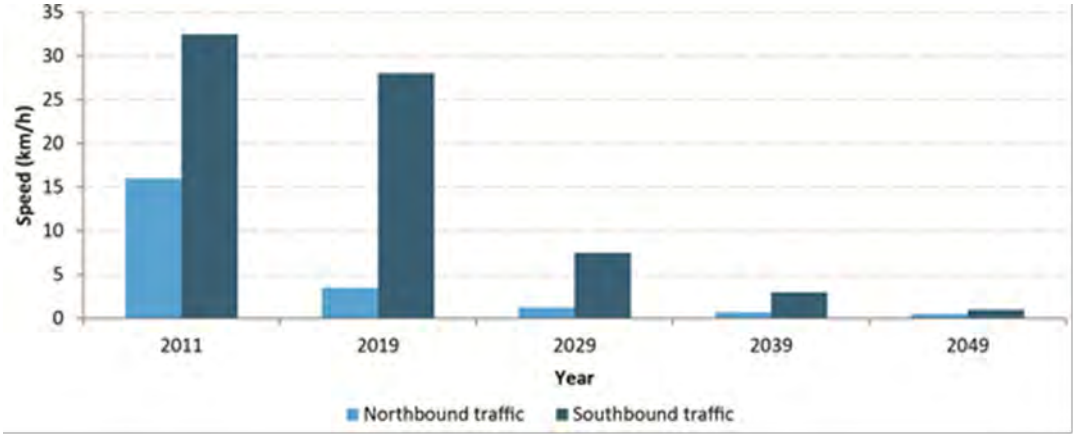


Figure 4-2 Average travel speed on Grafton Bridge under a minimal network improvement scenario in the morning peak (Source: Roads and Maritime, 2012a).

The model found that the minimal network improvement alternative would alleviate the traffic congestion in the very short-term but would fail to provide the required traffic capacity to respond to the future traffic growth for trips across the river. As the minimal network improvement alternative would not meet the project transport objectives, it was not considered a viable alternative and was therefore discounted.

4.1.3 Travel demand management

Travel demand management is the application of strategies and policies to reduce travel demand (specifically that of private motor vehicles), or to redistribute this demand in space or in time. The main benefit of travel demand management is its cost effectiveness when compared to building a new bridge.

Potential travel demand management measures for this project include:

- Walking and cycling
- Public transport (buses)
- Parking restrictions
- Peak spreading (ie travelling outside of peak periods or changing business hours).

The effectiveness of potential travel demand management measures is generally governed by three broad factors:

- The travel demand (eg the volume of traffic) to be managed
- The existing travel characteristics of the transport network
- The types of travel demand management measures available for implementation.

An analysis of the traffic volumes that would need to be managed through travel demand management measures, the travel to work patterns for the area, and the opportunities and limitations of the identified travel demand measures in the context of the Grafton area are presented in the following sections.

Traffic volumes to be managed through travel demand management measures

The existing bridge is currently at practical capacity during peak periods. Travel demand management measures would need to accommodate any additional demand in the future to avoid the need to increase capacity for crossing the Clarence River between Grafton and South Grafton (eg by providing an additional crossing).

The traffic model documented in the *Route Options Development Report Technical Paper: Traffic assessment* (GTA, 2012) forecasts the demand for trips across the Clarence River in years 2019, 2029 and 2039. The forecast trips in the morning and evening peak periods for each of these years, along with the existing traffic volumes, are shown in Table 4-3.

The traffic volumes to be managed through travel demand management measures for a given year can be taken as the difference between the 2011 volumes and the volumes for the given year. The traffic volumes that would need to be managed through travel demand management measures are shown in Table 4-3.

Table 4-3 also shows that the additional traffic volumes to be managed in 2019 are 768 vehicles in the morning peak and 875 vehicles in the evening peak. By 2029 and 2039, travel demand management measures would need to replace a much larger proportion of the total travel demand.

Table 4-3 Traffic volumes to be managed through travel demand management measures

Year	Morning peak period (7am 9am)			Evening peak period (4pm 6pm)		
	Number of vehicles northbound	Number of vehicles southbound	Total number of vehicles	Number of vehicles northbound	Number of vehicles southbound	Total number of vehicles
Existing traffic volumes						
2011	2306	1573	**3879**	2037	2544	**4581**
Forecast traffic volumes						
2019	2763	1884	**4647**	2417	3039	**5456**
2029	3760	2516	**6276**	3477	4116	**7593**
2039	4260	2852	**7112**	3891	4786	**8677**
Traffic volumes to be managed through travel demand management measures						
2019	457	311	**768**	380	495	**875**
2029	1454	943	**2397**	1440	1572	**3012**

Year	Morning peak period (7am 9am)			Evening peak period (4pm 6pm)		
	Number of vehicles northbound	Number of vehicles southbound	Total number of vehicles	Number of vehicles northbound	Number of vehicles southbound	Total number of vehicles
2039	1954	1279	**3123**	1854	2242	**4096**

Travel to work patterns

The 2011 census (ABS, 2011) reported that, on the census day in the Grafton Urban Centre Locality about 84.7 per cent of people travelled to work by car (either as a driver or passenger), 0.1 per cent by train and 0.6 per cent by bus. In addition, 3.1 per cent of people walked and 7.5 per cent of people travelled by bicycle to work.

The existing travel to work patterns would need to change substantially to reduce the number of vehicles that use the existing bridge during peak periods, and the additional traffic demand expected in future years.

Analysis of travel demand management measures

The opportunities and limitations of the identified travel demand measures in the context of the Grafton area are examined in Table 4-4. Table 4-4 also examines long-distance travel and land use planning considerations relevant to the implementation of travel demand management measures.

Table 4-4 Potential travel demand management measures to reduce traffic on the existing bridge

Demand management measure	Opportunities and limitations
Walking and cycling There are currently pedestrian and cycle paths on either side of the existing bridge. These are situated level with the existing rail track and below the road deck.	There is a perception of risk concerning these pedestrian and cycle paths, as they are below the road deck and there is no passive surveillance for users. There have been reported assaults on these pedestrian and cycle paths. There is an opportunity to improve these pedestrian and cycle paths to address safety concerns and increase their attractiveness for pedestrians and cyclists. Investment could include installing CCTV cameras, widening the pedestrian and cycle paths, and/or designating one side for cyclists and the other for pedestrians only (due to the existing widths of the paths, widening is likely to be needed). However, these improvements are likely to have only a marginal effect on existing travel to work patterns.

Demand management measure	Opportunities and limitations
Public transport Five bus services operate across the river servicing areas on the southern side of the Clarence River, as well as the towns of Yamba and Maclean. These services only go as far as the Fitzroy Street and Prince Street junction in Grafton. The service frequency varies depending on the route. The most frequent service is every 30 minutes in the mornings. The timetables for buses services in Grafton indicate that most services operate until 5pm.	The attractiveness of bus services is often related to convenience, travel time savings, and cost. In the Grafton area, the low frequency of bus services, their limited coverage, and limited services after 5pm, are the main limitations to this demand management measure. In addition, travel time savings are unlikely to be realised as buses would be subject to the same congestion as all other traffic during peak hour periods across the bridge. Also, Grafton has limited parking restrictions and no paid parking, so there are no disincentives to private vehicle use.
Parking restrictions Grafton and South Grafton CBDs have a good availability of on-street parking, with limited parking restrictions. Only a part of the Grafton CBD shopping district has one- and two-hour limit parking restrictions. Drivers working in the CBD often park outside of these time-limited parking zones and then walk to their work places.	Although introducing parking restrictions in Grafton and South Grafton CBDs could help to change the existing travel to work patterns, these are unlikely to be supported by regional communities such as Grafton due to the lack of any real alternatives to the private motor vehicle, and the complexity of trips for people working in Grafton and South Grafton. One- and two-hour limit parking areas may be extended over time, but they are unlikely to be increased in size to present an impediment to CBD workers parking just outside of the restricted area and walking to work.

Demand management measure	Opportunities and limitations
Peak spreading There is anecdotal evidence of people changing their travel times to avoid peak times on the bridge (BBC Consulting Planners, 2012a). There is also anecdotal evidence of other freight vehicles delivering earlier or later in the day to avoid peak congestion times (this issue was identified by several freight companies during consultation for the route options development phase). Currently, there is a 25/26 metre long B-double trucks ban on the existing bridge between 7.30am and 9.30am and between 3pm and 6pm. This ban has been enforced as a traffic management measure to alleviate congestion during peak hours.	Opportunities for commuters to change travel times to avoid congestion are limited by school times, as many trips in the morning peak also include school drop-offs. These trips are in addition to a number of school buses using the bridge, particularly in the morning peak. There may be an opportunity to restrict the time of day that all heavy vehicles (except buses) use the existing bridge. This is likely to marginally improve the capacity of the bridge by reducing the disruption caused by heavy vehicles negotiating the kinks. However, buses would still need to use the bridge for school and for public transport. All heavy vehicles restrictions are likely to have unacceptable impacts on local businesses due to changes on freight delivery times. It would also constrain regional freight transport along the Summerland Way. Another alternative would be to change business hours. Under this scenario, businesses and services would extend the service beyond normal business hours. Such change is likely to increase business operating costs and would require a major shift on social behaviour. There are limited opportunities for substantial changes to start and finish times for local businesses. This is due to a variety of factors including the initial point made above relating to school times, the likely lack of support from the retail sector as many businesses rely on customers being in town between 9am and 5pm. Further, the retail and business sector in Grafton is not large enough to cater for the substantial spreading of business hours. This is difficult to achieve in many cities with a greater number of people accessing goods and services.
Long-distance travel Workers travel from as far as Coffs Harbour to the south and Maclean (about 46 km) and Yamba (about 63 km) to the north to access employment opportunities in Grafton. These trips are most suited to the private vehicle given the complexity of the trip (which may involve dropping off school children and picking up shopping on the home journey), and differing start and end times for these trips.	Alternative transport modes, such as cycling and public transport, are unlikely to be feasible because of the length of journey, the level of complexity of the trip and the high probability that these trips would need to travel on major roads such as the Pacific Highway, which carry a significant proportion of heavy vehicles. For example, travelling via bus would offer no advantage over a private vehicle. The bus travel time would be longer due to the need to stop to pick and/or drop off passengers on route, and buses would be subject to the same congestion at the existing bridge as private vehicles. Therefore, the faster travel time and convenience of a private vehicle limits the effectiveness of alternative modes for long trips.

Demand management measure	Opportunities and limitations
Land use planning The growth in trips across the Clarence River in Grafton is affected by land use planning within the Grafton area. The largest residential growth area identified by Council and the *Mid North Coast Regional Strategy* (Department of Planning, 2009) is mainly around Clarenza (south of the Clarence River) and the main employment area is in Grafton (north of the Clarence River). The main retail area, hospital and TAFE are also located on the northern side of the river.	While there is potential to consolidate the commercial role of South Grafton CBD and/or develop a local shopping precinct at a later stage in Clarenza, these are unlikely to replace the existing and well established retail and service function of Grafton.

Demand management measures would be difficult to implement without major social and behavioural change in Grafton. The analysis presented in Table 4-4 shows that opportunities to implement travel demand management measures in the Grafton area are limited and are likely to have only a marginal effect on managing travel demand during peak periods.

Therefore, travel demand management measures would not meet the project objectives, such as meeting the short-term and long-term transport needs within Grafton and South Grafton, improving safety and traffic efficiency between and within Grafton and South Grafton, and supporting regional and local economic development. As such, this was not considered a viable alternative.

4.1.4 Additional crossing of the Clarence River

This alternative involved retaining the existing Grafton Bridge and construction of an additional crossing over the Clarence River.

The existing bridge, built in 1932, is the only crossing of the Clarence River in the Grafton area. Road users travelling between Grafton and South Grafton, including those making both local and through trips, use the existing bridge as there is no practical alternative route. The nearest alternative bridge crossing over the Clarence River is in Ashby Heights located about 60 kilometres north of Grafton.

The existing Grafton Bridge also forms part of the alternative regional north–south road link when the Pacific Highway is closed due to road traffic incidents or flooding.

The *Route Options Development Report* (Roads and Maritime, 2012) identified a number of issues with the existing bridge:

- The existing bridge is at capacity during peak periods with low travel speeds experienced by all road users
- Kinks in the horizontal alignment of the existing bridge, creating risk of crashes and causing traffic in both lanes to slow contributing to congestion and delays. This has flow on effects causing delays at merge points on approach roads
- Restrictions for large, heavy vehicles during peak periods which restricts efficient freight movements
- Crash hotspots on the bridge and approach roads
- As traffic growth increases there would be substantial deterioration in the performance of the existing bridge.

Although this alternative would have environmental, social and economic costs, it is the preferred alternative because it best addresses the issues with the existing bridge outlined above. In contrast to the other alternatives, this additional crossing would:

- Provide a practical alternative to road users for crossing the Clarence River at Grafton
- Improve road safety for motorists, pedestrians and cyclists travelling across the river
- Relieve congestion across the river over the existing bridge which currently operates at capacity during peak periods
- Provide an additional crossing that is not constrained by narrow lanes, kinks or traffic restrictions to large heavy vehicles
- Respond to the forecasted traffic demand across the Clarence River.

The additional crossing over the Clarence River was determined to best meet the project objectives, including enhancing road safety and traffic efficiency between Grafton and South Grafton, supporting local and regional development. In addition, the route option development process detailed in Section 4.2 met the project objectives by involving all stakeholders and considering their interests.

This alternative was therefore selected to move forward to the options selection process.

4.2 Option development process for the project

An additional crossing of the Clarence River at Grafton is needed to address key transport needs of existing and future traffic travelling to or from Grafton and South Grafton. A range of options were investigated to identify the preferred location for an additional crossing.

The process followed for the development and assessment of route options and the identification of a preferred option is outlined in Figure 4-3 and involved:

- Identification of the preliminary route options
- Assessment of the preliminary route options and identification of shortlisted options
- Assessment of the shortlisted options
- Identification and announcement of the preferred option.

The methodology used for the identification of a preferred option was an integrated process which involved engineers, environmental, social, economic and heritage specialists and urban designers working collaboratively. This integrated process was overlaid by extensive consultation with the community and stakeholder groups. The environmental sensitivities and constraints of Grafton and its surrounding areas have been taken into account in the process to develop route options and to select the preferred option. Through this process adverse impacts have been avoided or minimised to the greatest extent practicable

Community and stakeholder consultation carried out during the options development process is summarised in Section 7.3.

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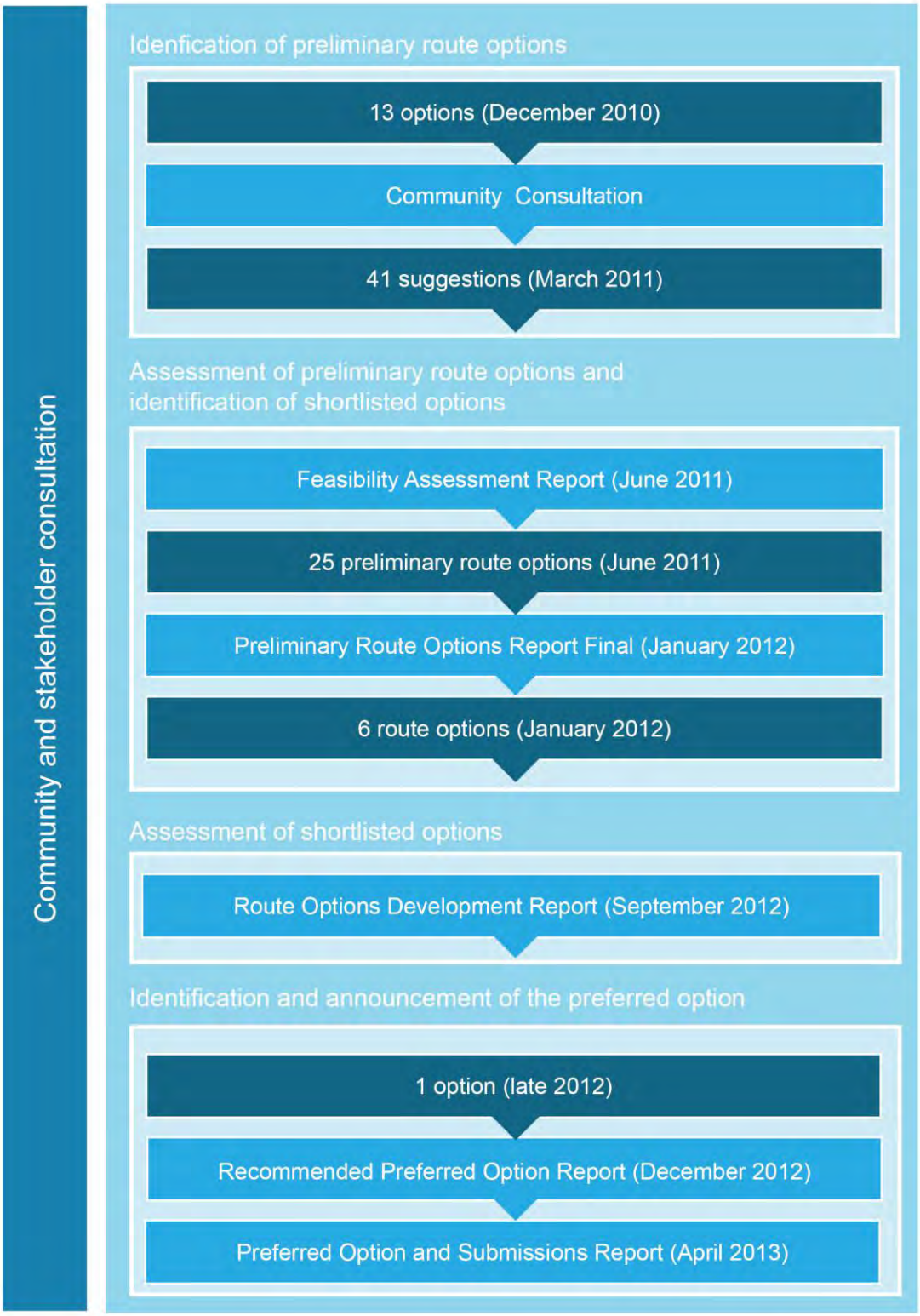

Figure 4-3 Route option development and selection of a preferred option process

4.2.1 Identification of the preliminary route options

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 2005 and restarted in 2009.

In December 2010, Roads and Maritime announced a revised approach to engage more effectively with the community and stakeholders in identifying a preferred route for an additional crossing. A community update issued in December 2010 identified 13 preliminary route options and invited community comment via a postal survey. Subsequent phone and business surveys were also carried out to understand issues important to the community to be considered when determining a preferred route.

Community and businesses feedback from the postal survey identified a further 28 crossing suggestions, bringing the total to 41. There were a total of 430 submissions received as part of the consultation period between 6 December 2010 and 8 February 2011. Key themes raised, in no particular order, included:

- Just building the bridge and giving certainty to the community
- Locating the bridge for both short and long term traffic needs
- Minimising impacts on the community (including noise, visual amenity and quality of life)
- Getting traffic, including heavy vehicles, out of town
- Protecting the existing bridge.

Due to the significant number of crossing locations suggested by the community, Roads and Maritime developed a process to identify a recommended preferred option from the 41 suggestions.

The initial phase of this process was to assess the feasibility of the 41 suggestions.

The assessment involved grouping the suggestions into strategic corridors and assessing each suggestion against key engineering and environmental considerations. It was important that the options taken forward for more investigation satisfied basic requirements and would have no clear and significant environmental impact.

To group the suggestions into corridors, the area covered by the suggestions was divided into five corridors which represented the strategic desire lines across the Clarence River as identified by the project team.

The feasibility assessment was then carried out using the following considerations:

- Engineering and constructability issues
- Land use and land use zoning impacts
- Aboriginal heritage impacts
- Impacts on native plants and animals
- Flooding impacts.

The project team held a workshop on 14 April 2011, to identify feasible options for further consideration. The workshop, consisting of Roads and Maritime staff and Arup representatives, recommended 25 preliminary route options for further engineering and environmental studies to assist in the identification of a preferred location for an additional crossing of the Clarence River. This assessment was undertaken against the considerations listed above. The 25 preliminary route options and the five corridors are presented in Figure 4-4.

The findings of the feasibility assessment of the 41 preliminary route options are documented in the *Feasibility Assessment Report* (Roads and Maritime, 2011).

4.2.2 Assessment of the preliminary route options

The process for the preliminary route options development phase was to identify a shortlist of options by selecting the best route option(s) within each of the strategic corridors based on technical investigations and community input.

Key inputs into the selection of the shortlist were:

- The findings of the technical investigations and specialist studies undertaken for the project
- Feedback received from the community
- Outcomes of a community and stakeholder evaluation workshop held in November 2011.

Technical investigations included desktop studies on the existing environment and consideration of landscape and urban character, land use and planning, social and economic, Aboriginal heritage, non-Aboriginal heritage, noise, ecology, flooding and other environmental aspects.

Community feedback was received via community updates, forums, information and feedback sessions, face to face meetings with stakeholder groups, and public display of the *Preliminary Route Options Report – Part 1* (Roads and Maritime, 2011) and the *Preliminary Route Options Report – Parts 1 and 2* (Roads and Maritime, 2011).

Up until 1 December 2011, 36 submissions had been received in relation to the *Preliminary Route Options Report – Parts 1 and 2* (Roads and Maritime, 2011). These submissions included written submissions received by post and email, and verbal feedback recorded by the project team at the information and feedback sessions.

The submissions raised a range of issues which have been categorised by the project team. A summary of the key comments / issues raised is provided below:

- Traffic: traffic congestion in the CBD and Grafton area; the need to avoid sensitive areas; concerns regarding future traffic management; and the accuracy of reports to date
- Planning: comments and questions relating to the location of route options; alternative transport and facilities; future industrial and residential growth and the need to plan for improved connections; the integration of this project with other potential projects; and recreational requirements
- Social impacts: property acquisitions; impact on community facilities; sensitive areas; events and recreation; and impacts on the amenity of Grafton due to increased traffic growth
- Economic impacts: concerns and comments relating to benefit cost ratios in relation to investigations already undertaken
- Design: designing for flood protection and navigational clearance for tall sail boats
- Project objectives: concerns about the consideration of project objectives in relation to other key studies; and addressing earlier outcomes against the findings of the *Preliminary Route Options Report – Parts 1 and 2* (Roads and Maritime, 2011)
- Community consultation: concerns about addressing outcomes of the postal and business surveys in the *Preliminary Route Options Report – Parts 1 and 2* (Roads and Maritime, 2011); wider representation at the community and stakeholder evaluation workshop and the process to identify a shortlist of route options

- Environment: concerns about noise monitoring and Aboriginal archaeological potential and cultural significance being fully considered.

As well as raising issues for consideration by the project team, several submissions included a preference for individual options, a preferred corridor, or a preferred option in each of the five corridors.

The assessment was carried out on a corridor-by-corridor basis to identify the best route option(s) within each of the five corridors shown in Figure 4-4. The assessment examined the options against the key and supporting objectives identified for the project by using key indicators based around the project objectives. These included:

- Road safety audits
- Time travelled for both heavy vehicles and other traffic
- Distance travelled for both heavy vehicles and other traffic
- Level of connectivity between existing and future land uses
- Level of community involvement
- Costs
- Impacts on various land uses (including residential, business and rural)
- Noise and visual amenity
- Impacts on heritage, including Aboriginal and non-Aboriginal
- Impacts on biodiversity
- Hydrology, including flooding impacts.

The outcome was six options shortlisted for further investigation: E, A, C, 11, 14 and 15 (refer to Figure 4-5). In January 2012, these six route options were announced for further investigation. The assessment and shortlisting process is documented in the *Preliminary Route Options Report – Final* (Roads and Maritime, 2012).

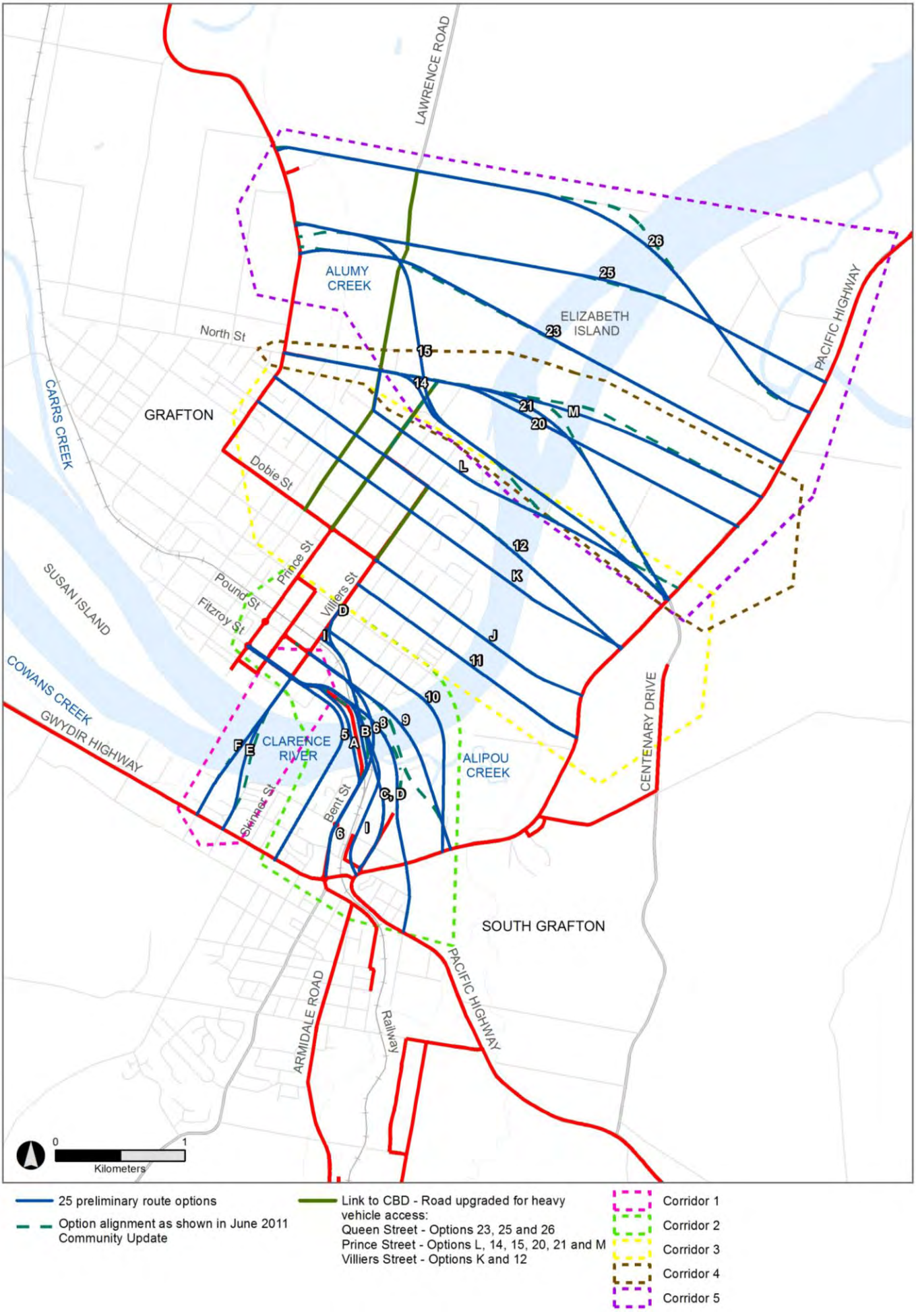

Figure 4-4 Preliminary route options (Source: *Preliminary Route Options Report – Final* (Roads and Maritime, 2012))

4.2.3 Assessment of shortlisted options

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

The six route options were subject to consultation and assessment in September, October and November 2012 to identify the preferred location for the additional crossing.

The six shortlisted route options as shown in Figure 4-5 were as follows:

- Option E. About 1 km upstream of the existing bridge - from Cowan Street, South Grafton to Villiers Street, Grafton. The new bridge would have one lane in each direction. The existing bridge would remain one lane in each direction
- Option A. Adjacent to the existing bridge upstream – from Bent Street, South Grafton to Villiers Street, Grafton via Fitzroy Street. The new bridge would have one lane southbound and two lanes northbound. The existing bridge would become one lane southbound
- Option C. Adjacent to the existing bridge downstream – from the junction of the Pacific and Gwydir highways, South Grafton to Villiers Street, Grafton via Pound Street. The new bridge would have one lane in each direction. The existing bridge would remain one lane in each direction
- Option 11. About 1 km downstream of the existing bridge - from the Pacific Highway near McClares Lane north of South Grafton to Villiers Street, Grafton via Fry Street. The new bridge would have one lane in each direction. The existing bridge would remain one lane in each direction
- Option 14. About 2.5 km downstream of the existing bridge - from the junction of the Pacific Highway and Centenary Drive, north of South Grafton to Turf Street (Summerland Way), Grafton via Kirchner and North streets. The new bridge would have one lane in each direction. The existing bridge would remain one lane in each direction
- Option 15. About 2.5 km downstream of the existing bridge - from the junction of the Pacific Highway and Centenary Drive, north of South Grafton to Summerland Way, Grafton north of North Street via Kirchner Street. The new bridge would have one lane in each direction. The existing bridge would remain one lane in each direction.

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

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

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

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

of Grafton CBD', or for an option near the existing bridge, described as 'in town' options.

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

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

Independent review

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

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

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

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

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

Value management workshop

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

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

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

The workshop participants also found that:

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

- Option A was, on balance, a poorer performing option than Options E and C when assessed against functional, socio-economic and environmental criteria. It was higher in cost than Option E and provided poorer value for money than both Options E and C. Its disadvantages include impacts on businesses, especially along Bent Street, South Grafton.

Recommended preferred option

Following the value management workshop, Roads and Maritime undertook a further review of the options based on:

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

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

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

- On balance, it presents greater overall value to the community than Option E, in particular addressing long term connectivity, providing for economic growth and supporting Grafton as a regional centre
- It best meets the project objectives
- It provides better transport efficiency improvements over the whole of the road network for both the short and long term, including for road freight movements, as it:
    - Better supports the distribution of traffic flows between the eastern and western sides of South Grafton, especially traffic travelling to and from the south-east as it is located east of the existing bridge and provides better access to the Pacific Highway to the north and south and to Clarenza. Option C also provides good access to Armidale Road
    - Provides a better road hierarchy as it provides a parallel road network with improved redundancy
    - Avoids channelling traffic flows from both crossings into the junction of Fitzroy and Villiers Streets
    - By directing traffic to the intersection of Villiers and Pound Streets, provides a better opportunity for traffic to travel around the edge of the Grafton CBD.
- It performs well in the other areas of the functional assessment criteria
- It provides better outcomes in the socio-economic area, including its ability to better support Grafton as a regional centre, it has less impacts to businesses and fewer noise impacts
- It provides better outcomes than Option E in terms of non-Aboriginal heritage by avoiding impacts on the important and intact heritage precinct around Villiers Street and Victoria Street. It also traverses through a shorter length of heritage conservation area
- It performs comparatively to Option E in terms of capital cost and BCR at this stage of project development.

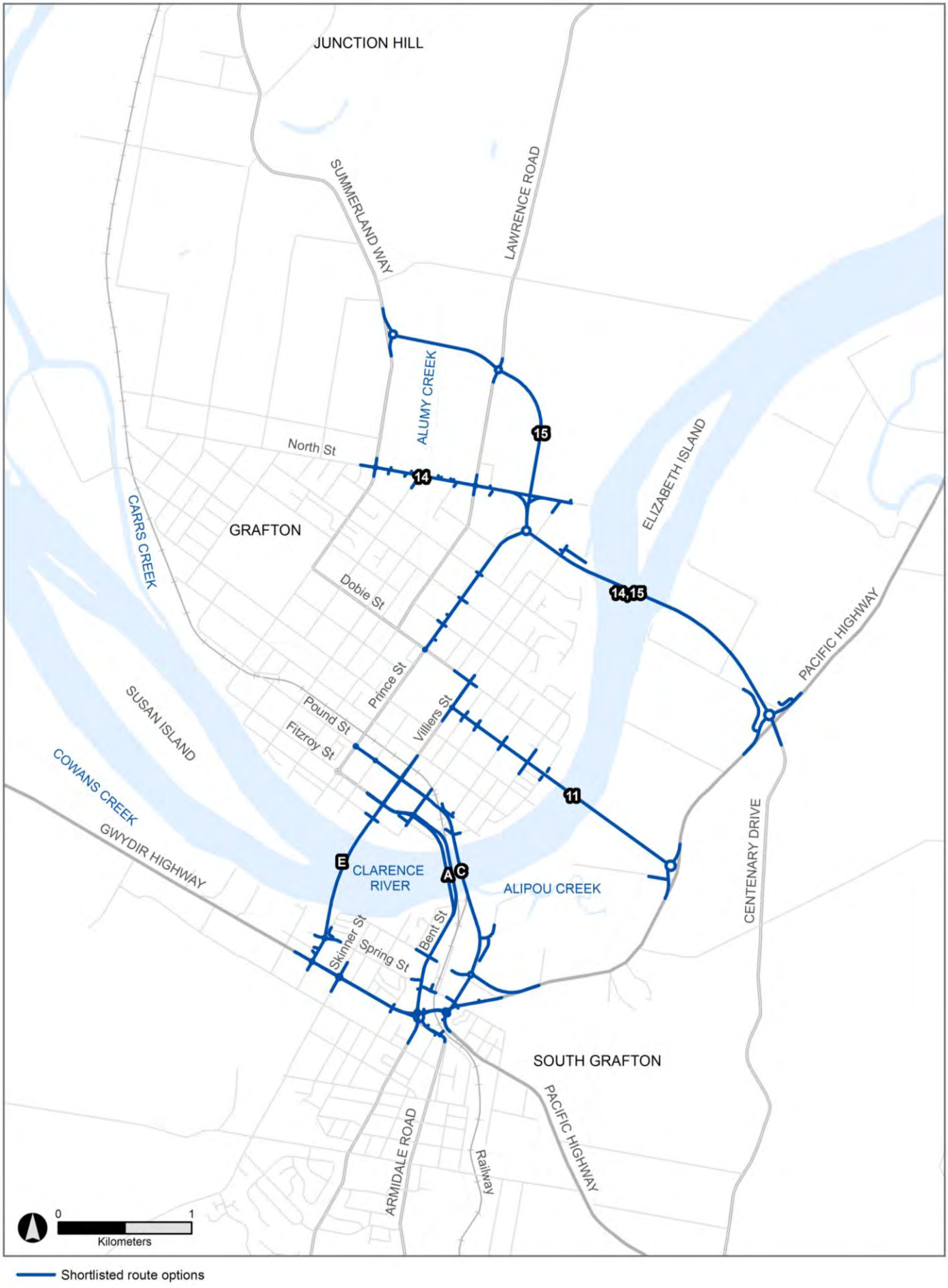

Figure 4-5 Shortlisted route options for an additional crossing of the Clarence River at Grafton (Source: *Route Options Development Report* (Roads and Maritime, 2012))

Figure 4-6 Preferred option announced on 23 April 2013 (Source: *Preferred Option and Submissions Report* (Roads and Maritime, 2013))

4.2.4 Identification and announcement of the preferred option

The *Recommended Preferred Option Report* was placed on exhibition from 19 December 2012 to 4 March 2013. A number of supporting consultation activities were carried out to ensure that information was received by the wider community and opportunities were available for comment and questions. The exhibition period, during which comments on the report were invited, was initially due to finish on 18 February 2013, but was extended until 4 March 2013 to allow members of the community impacted by floods in Grafton additional time to comment.

In April 2013, Option C was confirmed as the preferred option for an additional crossing of the Clarence River at Grafton. Refinements were made to the recommended preferred option after Roads and Maritime's review of the preliminary design, stakeholder consultation and feedback received during the public display of the *Recommended Preferred Option Report*.

The preferred option, as announced, is presented in Figure 4-6.

The design refinements made since the announcement of the preferred option are discussed in Section 4.3.

4.3 Refinements to the preferred option

Roads and Maritime has made a number of design refinements since the preferred option was announced in April 2013. These refinements were made to reduce the extent of the impacts of the project. The outcomes of these refinements were published in the preliminary concept design community update (November 2013) and displayed/exhibited for public comment. These refinements include:

- The number of local road and intersection upgrades identified in the preferred option has been reduced so that only the upgrades needed to provide acceptable traffic performance at least to the year 2039 are proposed
- Consideration of alternate bridge types considering cost, constructability and flood mitigation requirements
- Refinements to the local road network in Grafton
- Refinements to the local road network in South Grafton
- Location of pedestrian and cycle paths in Grafton and South Grafton to improve connectivity
- Refinements to the Pound Street railway viaduct.

These refinements have reduced property impacts in some areas such as around Skinner Street in South Grafton, but increased impacts around Pound Street in Grafton. The refinements have been incorporated into the concept design, which is assessed in this EIS (a complete description of the project is provided in Chapter 5 and Chapter 6). The refinements are described in more detail below.

4.3.1 Reduction in the amount of local road network upgrades

Following the announcement of the preferred option, Roads and Maritime decided to seek approval for those elements needed to provide acceptable traffic performance at least to 2039 (20 years after project opening, not the original 30 years as outlined in the project objectives). This decision was made to reduce the number of local road and intersection upgrades needed, to reduce the footprint of the project, reducing potential impacts and the capital investment required to implement the project.

Roads and Maritime carried out more detailed traffic modelling and analysis to determine the road network upgrades needed to provide acceptable traffic performance at least to 2039. Based on this analysis, the following refinements to the preferred option were identified:

- An upgrade of Skinner Street and Gwydir Highway roundabout was no longer needed due to refinements made at the southern approach which minimises the potential for queuing on the day of opening. Therefore, this intersection upgrade was not included in the project and has been removed from the preferred option footprint
- A substantial reduction in the extent of local road network upgrades required in Grafton. These refinements are described in Section 4.3.2
- Minor refinements to the local road network in South Grafton. These refinements are described in Section 4.3.4
- The works required to improve the operation of the Villiers Street and Dobie Street roundabout were reduced to minimise potential property impacts. It was determined that only minor kerb widening would be needed to improve navigation of heavy vehicles through the roundabout. This kerb widening would largely be done within the existing road reserve.

4.3.2 Alternate bridge type options

The location of the preferred option close to the existing bridge has influenced the design of the proposed bridge across the Clarence River. The main spans of the proposed bridge would generally match the main spans of the existing bridge with the piers in the river generally aligned between the two bridges. This is needed to maintain navigation channels in the river, for safe river navigation (unaligned piers would create hazards in the river) and to minimise potential flood impacts (hydraulic efficiencies of aligned piers).

The main spans on the existing bridge are about 74 metres long. To keep the piers of the two bridges generally aligned would require the main spans of the proposed bridge to be at least 74 metres long, or multiples of 74 (eg 148 metres or 222 metres). The need for long spans limits the possible bridge type options that could be considered for the project.

The bridge type options listed below were assessed considering cost, constructability, visual impacts, impacts on the existing heritage listed bridge and flood mitigation requirements. The bridge types and key aspects of these types of bridges are briefly described below and an example of each bridge type option is shown in Figure 4-7:

- Cable-stayed bridge: Large structure that could span the river without piers in the river avoiding the need for flood mitigation works. This bridge type would have high construction costs and high ongoing maintenance costs compared with other bridge types. With tall pylons (over 100 metres), a cable stay bridge would be a visually prominent feature that would overpower the existing State heritage listed bridge.
- Extradosed bridge: This is a cross between a cable stay bridge and a concrete box girder bridge. It has the potential for long spans that could minimise the number of piers in the river, reducing the extent of flood mitigation works. This bridge type would have high construction costs and high ongoing maintenance costs compared with other bridge types. There are potential constructability issues for this type of bridge as there is little experience with this type of bridge structure in Australia.
- Steel bridge (steel truss or steel plate girder): A steel truss bridge would have little visual difference from the existing bridge which may detract from the existing State heritage listed bridge. A steel plate girder bridge could result in a visually different bridge that complements the existing bridge and would offer flexibility for the design of the bridge, accommodating changes in vertical and horizontal alignment. A steel bridge (truss or girder) would have high construction costs and high ongoing maintenance costs compared with a concrete box girder bridge.

- Concrete box-girder bridge: This bridge type offers flexibility in the design of the bridge, can be visually different without overpowering the existing State heritage listed bridge. It would have lower construction costs and ongoing maintenance costs compared with other bridge types.

Cable-stayed bridge – Sirhowy Enterprise Way, Wales

Extradosed bridge – Bridge across Drava River in Ptuj, Slovenia

Steel plate girder bridge- Foyle Bridge, Derry – Northern Ireland

Steel truss bridge – STAR Light Rapid Transit, Kuala Lumpur

Concrete box-girder bridge – Kwun Tong, Hong Kong

Figure 4-7 Bridge type options considered for the project

The concrete box girder bridge was selected as the preferred bridge type for an additional crossing of the Clarence River for the following reasons:

- There is potential for a concrete box girder to be visually different from the existing State heritage listed bridge without visually overpowering it
- Constructability: This bridge type is regularly constructed in Australia and there are experienced construction companies with the capability to build this type of structure
- Construction costs and maintenance costs would be low compared with the other options considered for the project
- A concrete box girder would offer greater flexibility in the design of the bridge. This bridge type could accommodate changes to the vertical and horizontal alignment of the bridge
- The spans and pier arrangements for the concrete box girder would likely match those of the existing bridge. This bridge option would not reduce the potential flood impacts of the project.

4.3.3 Refinements to the local road network in Grafton

Roads and Maritime has made the following refinements to the local road network in Grafton:

- Reduction in the extent of upgrades required for Pound Street – the extent of works would stop short of the southern roundabout approach at the intersection of Pound Street and Villiers Street. The existing roundabout at the intersection of Pound Street and Villiers Street would be retained with minor modifications
- Upgrades to Villiers Street on either side of Pound Street have not been included in the project
- Reduction of the design footprint on the corner of Pound Street and Villiers Street to avoid demolition of the Ravensford heritage listed property
- Upgrades to Fitzroy Street and Craig Street (including the roundabout at the intersection of Fitzroy, Craig and Clarence streets) have not been included in the project
- Integration of a proposed pedestrian and cycle path with existing and future planned cycle and pedestrian facilities in South Grafton managed by Clarence Valley Council
- Modification of the signalised intersection at the junction of Pound Street and Clarence Street. The right turn pocket from Pound Street to Clarence Street (west) has not been included in the project to reduce impacts on street parking for businesses along Pound Street
- Provision of car parking on the corner of Clarence and Pound streets.

These changes are reflected in the project described in Chapter 5.

4.3.4 Refinements to the local road network in South Grafton

Refinements to the local road network in South Grafton were investigated to reduce the number of local road and intersection upgrades needed, to improve operation of the surrounding road network, to improve connections to existing and future pedestrian and cycle paths (refer to Section 4.3.5) and to ensure the project provides acceptable traffic performance at least to 2039.

A number of options were investigated that incorporated various intersection arrangements along the Pacific Highway and Iolanthe Street. These options included a combination of roundabouts and traffic lights at key intersections, and considered safe pedestrian and cyclist connectivity in and around the precinct and towards the proposed bridge.

The options were assessed by Roads and Maritime considering traffic performance, cost, connectivity and access, potential direct property impacts and environmental impacts. A preferred option was selected based on overall performance, value for money, level of connectivity for pedestrians and cyclists and minimising impacts on the environment and property. The preferred option for the South Grafton area consists of:

- A roundabout at the intersection of the Pacific Highway and Gwydir Highway
- A roundabout at the intersection of the realigned Pacific Highway, Iolanthe Street and Through Street
- Left-in left-out arrangements for Spring Street and the existing Pacific Highway
- Realignment of Butters Lane to join the realigned Pacific Highway (north of Bunnings Warehouse) to improve access to and from Butters Lane.

The proposed arrangements for this option are described in more detail in Section 5.2.3 and shown in Figure 5-2.

Further to the above, there is the potential for initial road network upgrades at year of opening in South Grafton which would remove the realignment of the Pacific Highway and include a smaller roundabout at Spring Street and the existing Pacific Highway. The possible initial road network upgrades at year of opening in South Grafton are described in Section 5.2.3 and shown in Figure 5-7.

Both preferred option for the South Grafton area and possible initial road network upgrades in South Grafton have been assessed within the EIS.

4.3.5 Pedestrian and cycle path refinements

Roads and Maritime has refined the pedestrian and cycle path that was included in the preferred option. The proposed path would have new connections to the pedestrian and cycle path on the existing bridge via a new path that would run parallel to the southern bank of the Clarence River.

The proposed path would also facilitate connections to proposed future paths, including:

- Clarence Valley Council's proposed pedestrian and cycle path to Clarenza as described in Council's *Bike Plan and Pedestrian Access and Mobility Plan* (CVC and QED, 2008).The new connection would be via an existing right of way located at Bunnings Warehouse and along the Pacific Highway north
- The existing pedestrian and cycle network in South Grafton via a future pedestrian and cycle path that would run northwest on Spring Street (consistent with Clarence Valley Council's *Bike Plan and Pedestrian Access and Mobility Plan* (CVC and QED, 2008)).

These refinements were made to further improve integration of the proposed pedestrian and cycle path with existing and proposed pedestrian and cycle facilities in the area.

Roads and Maritime has also added mid-block signalised pedestrian crossings at the following locations:

- Iolanthe Street between Though Street and Spring Street
- Gwydir Highway between Iolanthe Street and Bent Street.

The signalised pedestrian crossings were included to provide for the safe movement of pedestrians and cyclists across roads which are forecast to experience high traffic volumes, particularly during peak periods.

Roads and Maritime also considered locating the pedestrian and cycle path on the downstream side of the proposed bridge. This would provide uninterrupted views of the Clarence River. However, this option was not considered further because a path on the upstream side would provide the most direct route between key destinations in Grafton and South Grafton.

The main benefits of a pedestrian and cycle path on the upstream side of the proposed bridge are:

- Improved pedestrian and cycle connectivity. This option provides the most direct route over the new bridge between the majority of origin/destination points in Grafton and South Grafton
- The Through Street arm presents the safest location for an uncontrolled crossing of the Pacific Highway/Iolanthe Street/Through Street roundabout. A crossing on other arms would require signals and would need to be set back from the intersection
- Provides direct views of the existing heritage listed bridge (note: that the bridges would be about 70 metres apart with views from a level similar to the rail deck looking towards the road deck and upper features of the existing bridge).

4.3.6 Pound Street railway viaduct replacement options

The preferred option included the lowering of Pound Street in Grafton to provide high vehicle clearance of 5.3 metres beneath the existing railway viaduct between Kent Street and Clarence Street.

Following further design refinements, it is proposed to replace part of the railway viaduct where it crosses Pound Street, rather than lower Pound Street. The existing three-span concrete arched section of the viaduct would be demolished and replaced with a new steel structure. The new railway viaduct section would consist of a single-span steel bridge about 49 metres long.

Replacing the viaduct with a single-span bridge would have the following advantages:

- It would provide adequate clearance to traffic travelling beneath the viaduct without lowering Pound Street. A minimum clearance of five metres would be provided
- It would reduce the flood management measures needed to manage existing localised flooding around the low point in Pound Street from local storm events
- It would improve the operation of the Pound Street and Clarence Street intersection by allowing four traffic lanes to pass beneath the viaduct. This would increase the merge length downstream of the intersection, which would improve the capacity of the intersection
- It would improve road safety by removing existing viaduct piers that are potential hazards
- It would allow sufficient width for a potential future upgrade to four traffic lanes. A single-span bridge would offer the greatest flexibility for the road's horizontal geometry under the viaduct, particularly in achieving standard approach and departure geometry to and from the Clarence Street intersection.

4.4 Confirmation of preferred option for the project

The project, which consists of the preferred option with a number of refinements, is in the public interest and would best meet the project objectives when compared with other options that were considered.

In comparison with the other options, the preferred option would best enhance road safety for all road users including pedestrians and cyclists, improve traffic efficiency, support regional and local economic development and provide value for money to the community.

Adverse impacts of the preferred option would include property acquisition, social and economic impacts, noise impacts, impacts on the landscape and visual amenity of Grafton, direct impacts on non-Aboriginal heritage items of local significance, impacts on Aboriginal heritage, biodiversity and flooding. The preferred option would also have short-term impacts during construction.

These impacts have been considered during the route options development, assessment and selection stages. Identified impacts would be managed using the measures identified in this EIS report and further considered during the detailed design stage of the project.

The preferred option for the Grafton Bridge and other elements of the project are presented in detail in Chapter 5.

5 Project description – operation

This chapter provides a detailed description of the project including the project elements, design standards and detailed design requirements.

The key project elements are described in Section 5.2. Design criteria (refer to Section 5.3) are proposed to deliver a project that performs against the project objectives and to provide a clear basis for the detailed design stage (refer to Section 5.4).

Table 5-1 shows the Director-General's environmental assessment requirements relevant to the project description and where they are addressed in this chapter.

Table 5-1 Director-General's environmental assessment requirements relevant to the project description – operation

Director General's environmental assessment requirements	Where addressed in EIS
The Environmental Impact Statement (EIS) must be prepared in accordance with, and meet the minimum requirements of, Part 3 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (the Regulation), including:	Throughout this EIS report
The information required under clause 6 of Schedule 2 of the Regulation.	Throughout this EIS report
The content listed in clause 7 of Schedule 2 of the Regulation, including but not limited to:	
- A detailed description of the project, including:	Section 5.2
- Proposed route, and local road network treatments.	Section 5.2.1, Section 5.2.2 and Section 5.2.3
- Bridge design, and road user, pedestrian and cyclist facilities (including street furniture and lighting).	Section 5.2, Section 5.2.5 and Section 5.2.10
- Relationship and/or interaction with existing public and freight transport services (including rail, bus and water-based traffic, and rail and bus stops).	Section 5.2.13
Details of the bridge clearance, with reference to the proposed minimum vertical and horizontal clearances for the navigable channel.	Section 5.2.1
Design details such as lighting, balustrades, street furniture and their integration generally.	Section 5.2.9 and Section 5.2.10

5.1 Project scope

The project description presented in this EIS represents the concept design for the project. Sufficient flexibility has been provided in the concept design to allow for refinement during detailed design or in response to any submissions received following the exhibition of the EIS or to minimise environmental impacts. The final design may therefore vary from the concept design described in this chapter.

The main elements of the project are presented in Figure 5-1 and Figure 5-2 and include:

- A new road bridge across the Clarence River about 70 metres downstream of the existing road and rail bridge (which is to be retained)

- Upgrading parts of the road network in Grafton and South Grafton to connect the new bridge to the existing road network
- Replacing part of the existing rail viaduct where it crosses Pound Street in Grafton
- Provision of a pedestrian and cycle path and signalised pedestrian crossings.

These elements are described in more detail in the following sections. The design presented in this chapter is subject to further refinement during the detailed design stage.

There would also be ancillary works, structures and facilities that would be required to construct the project (refer to Chapter 6) in addition to environmental management measures (refer to Chapter 10).

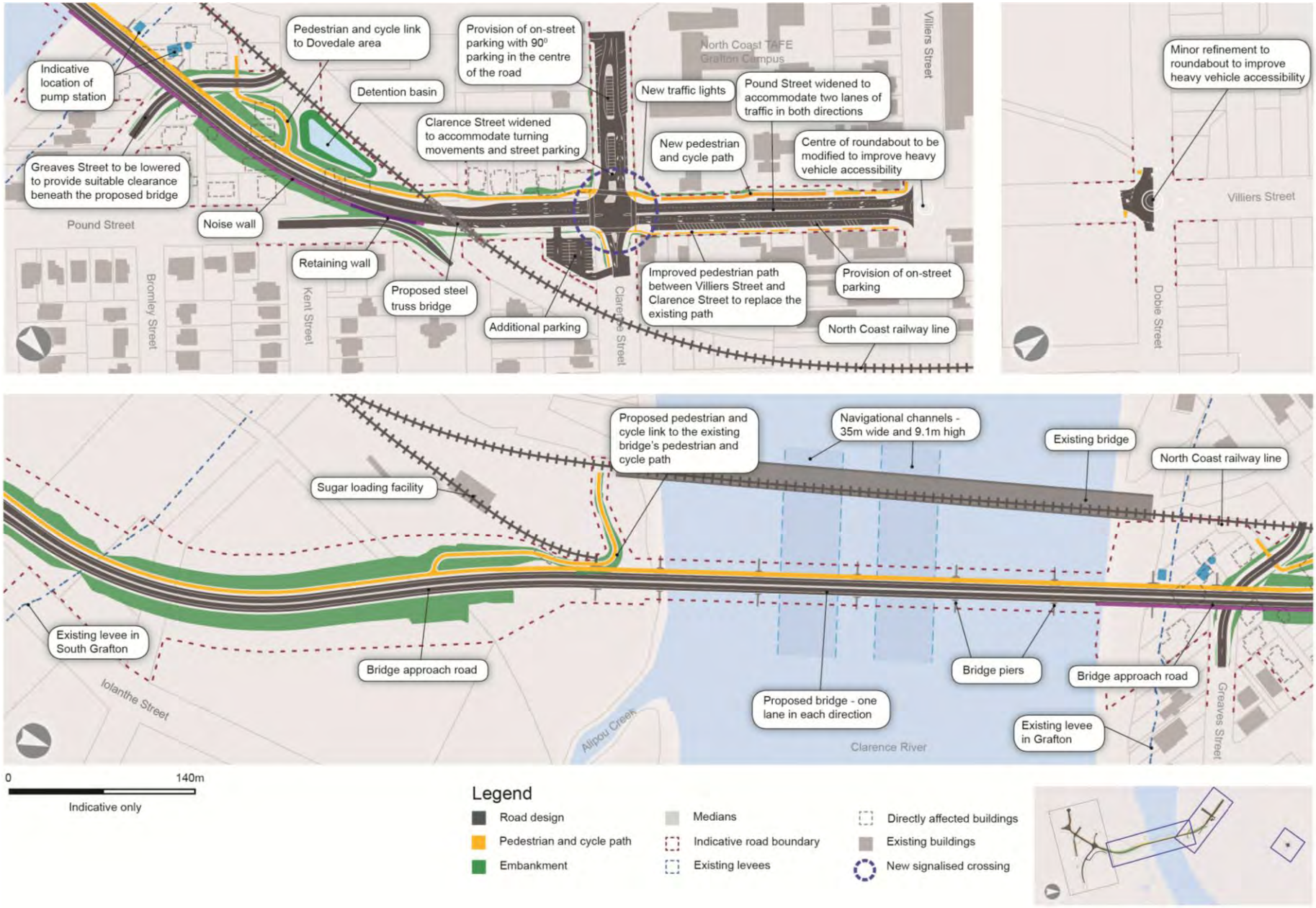

Figure 5-1 Key project elements in Grafton and across the Clarence River

Note: Design is subject to further refinement during the detailed design stage

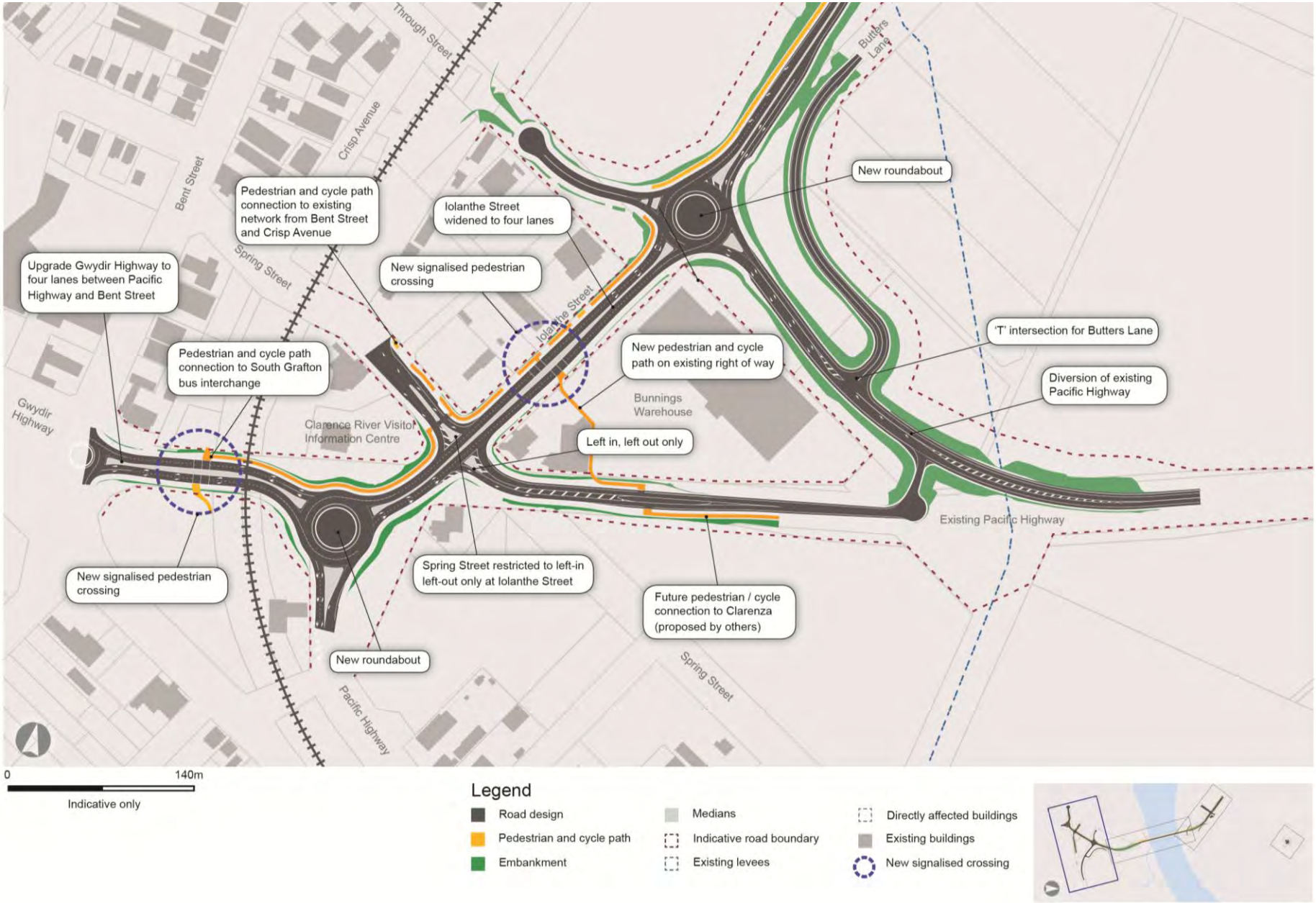

Figure 5-2 Key project elements in South Grafton

Note: Design is subject to further refinement during the detailed design stage

5.2 Project elements

This section provides a description of the main elements of the project.

5.2.1 Bridge alignment

Indicative long sections and cross-sections of the proposed bridge are presented in Figure 5-3, Figure 5-4, Figure 5-5 and Figure 5-6.

The proposed bridge would be located about 70 metres downstream (east) of the existing bridge. It would be about 553 metres long with an overall deck width of about 17 metres. The bridge would be a concrete box girder bridge consisting of:

- Two traffic lanes (one northbound and one southbound), separated by a raised median
- Road shoulders two metres wide on the outside of each traffic lane
- A pedestrian and cycle path on the western (upstream) side of the bridge
- An approach viaduct, about 58 metres long, on the South Grafton side of the Clarence River
- An approach viaduct, about 29 metres long, on the Grafton side of the Clarence River.

Below-water bridge structures

The bridge foundations would comprise piles bored into bedrock. These would support concrete pile caps, piers and superstructure. The pile caps would be constructed of reinforced concrete partially submerged but visible at all times for navigational safety.

All pile caps would have a similar shape to each other for consistency.

Bridge spans, piers and abutments

Indicative details of the bridge spans, piers and abutments are illustrated in Figure 5-3, Figure 5-4, Figure 5-5 and Figure 5-6.

The proposed concrete box girder section of the bridge would be about 466 metres long across the main river channel. The concrete box girder would consist of five main spans, each about 74 metres long and a back span at both ends, each about 48 metres long.

On both the southern and northern banks of the river, the bridge superstructure would transition from a concrete box girder to a concrete 'super-T' form. The super-T section of the bridge on the southern river bank would consist of two spans, each about 29 metres long, between the southern abutment and a transition pier with the main concrete box girder. The super-T section of bridge on the northern river bank would consist of a single span, about 29 metres long between the northern abutment and a transition pier with the main concrete box girder.

All of the bridge piers would be constructed from reinforced concrete or similar material. The piers in the main river channel would generally align with the piers of the existing bridge.

The two bridge abutments would be constructed of reinforced concrete or similar material. The northern bridge abutment would be located to the north of Greaves Street. The southern bridge abutment would be located close to the existing railway turntable in the Australian Rail Track Corporation (ARTC) land in South Grafton.

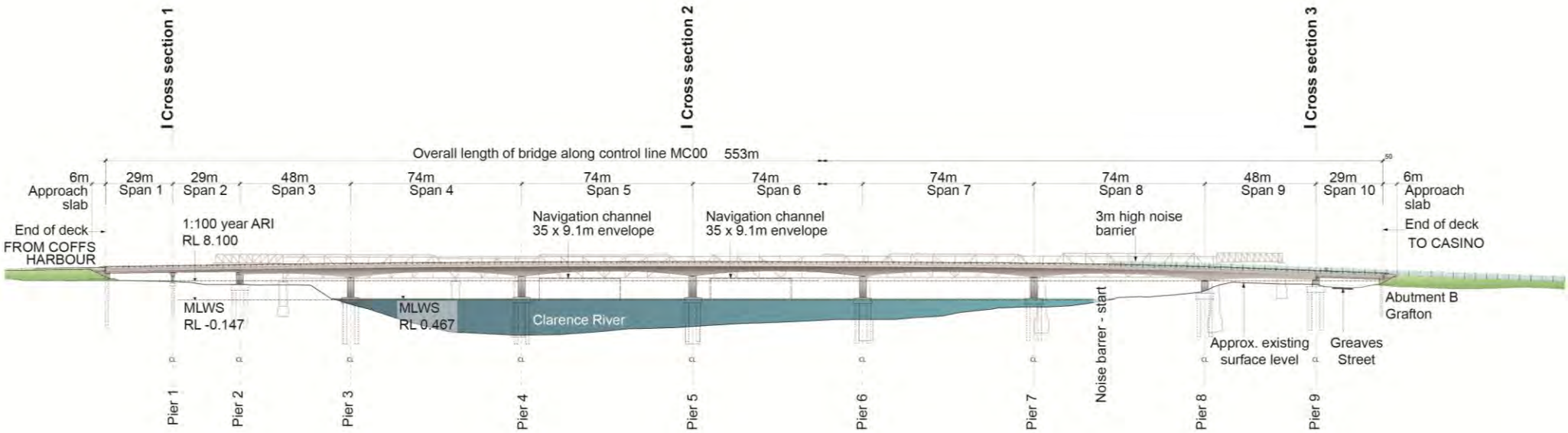

Figure 5-3 Grafton bridge long section (existing bridge in background)

Note: Design is subject to further refinement during the detailed design stage.

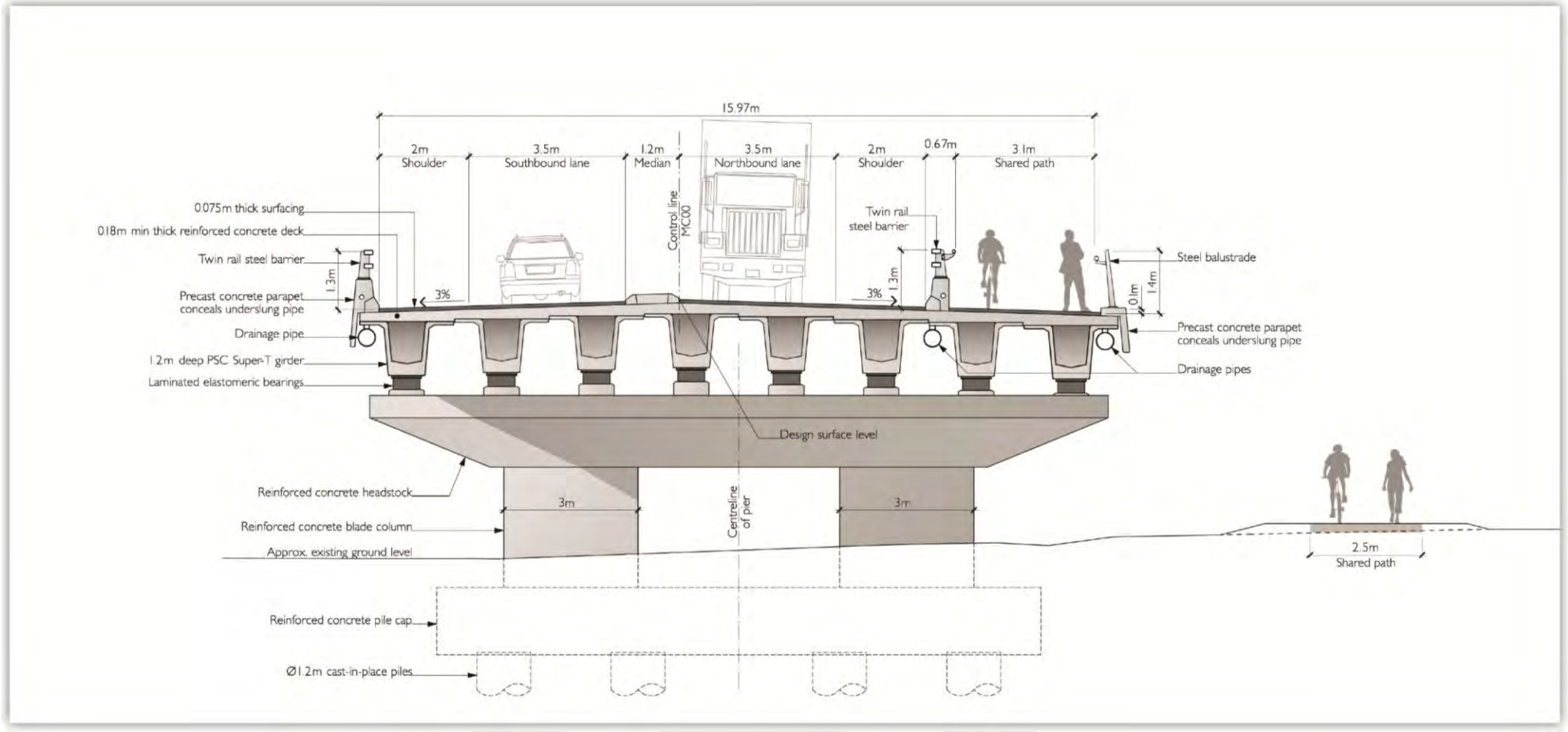

Figure 5-4 Bridge cross-section 1 (southern end of the bridge)

Note: Design is subject to further refinement during the detailed design stage.

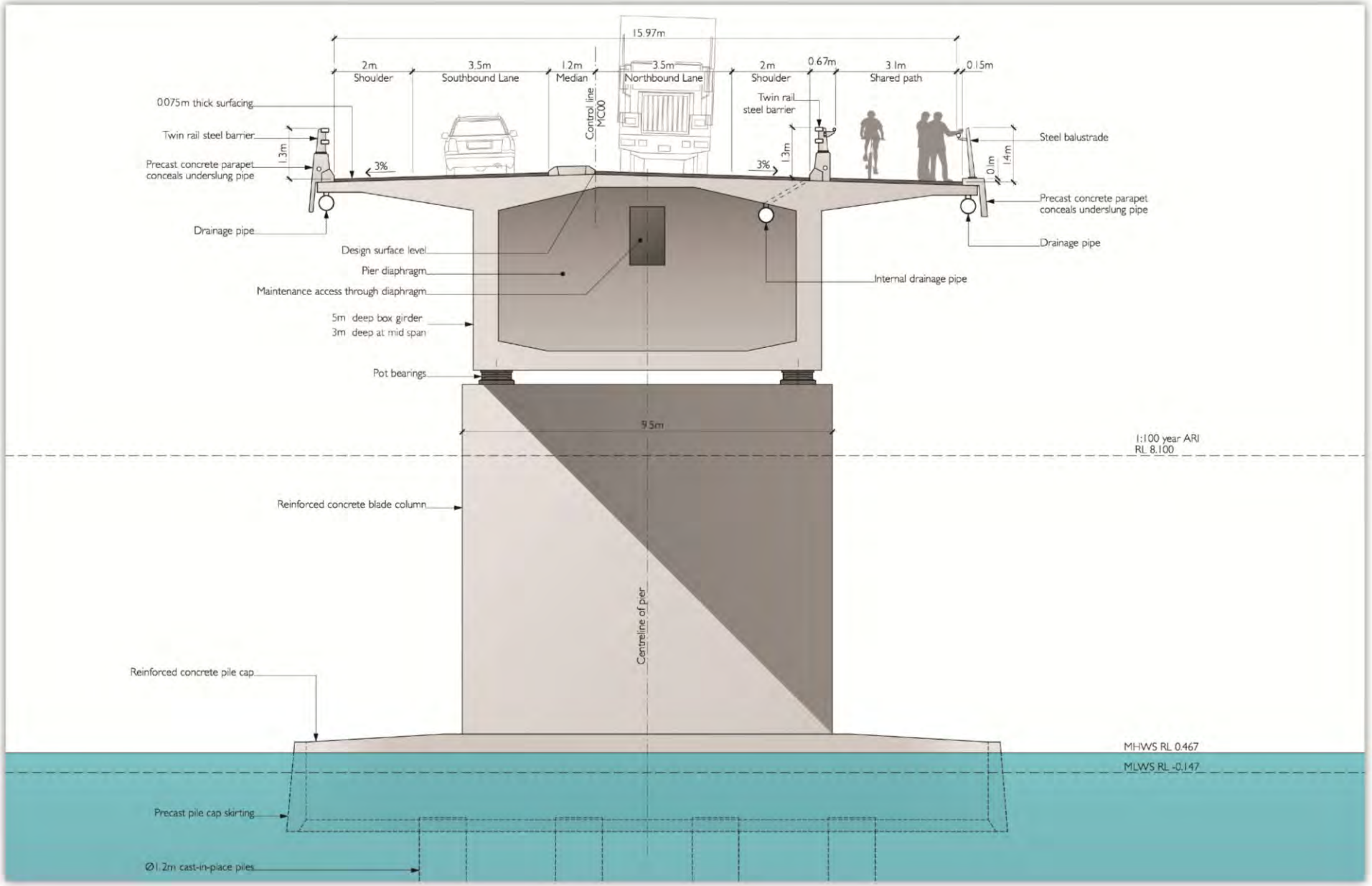

Figure 5-5 Bridge cross-section 2 (bridge spanning river)

Note: Design is subject to further refinement during the detailed design stage.

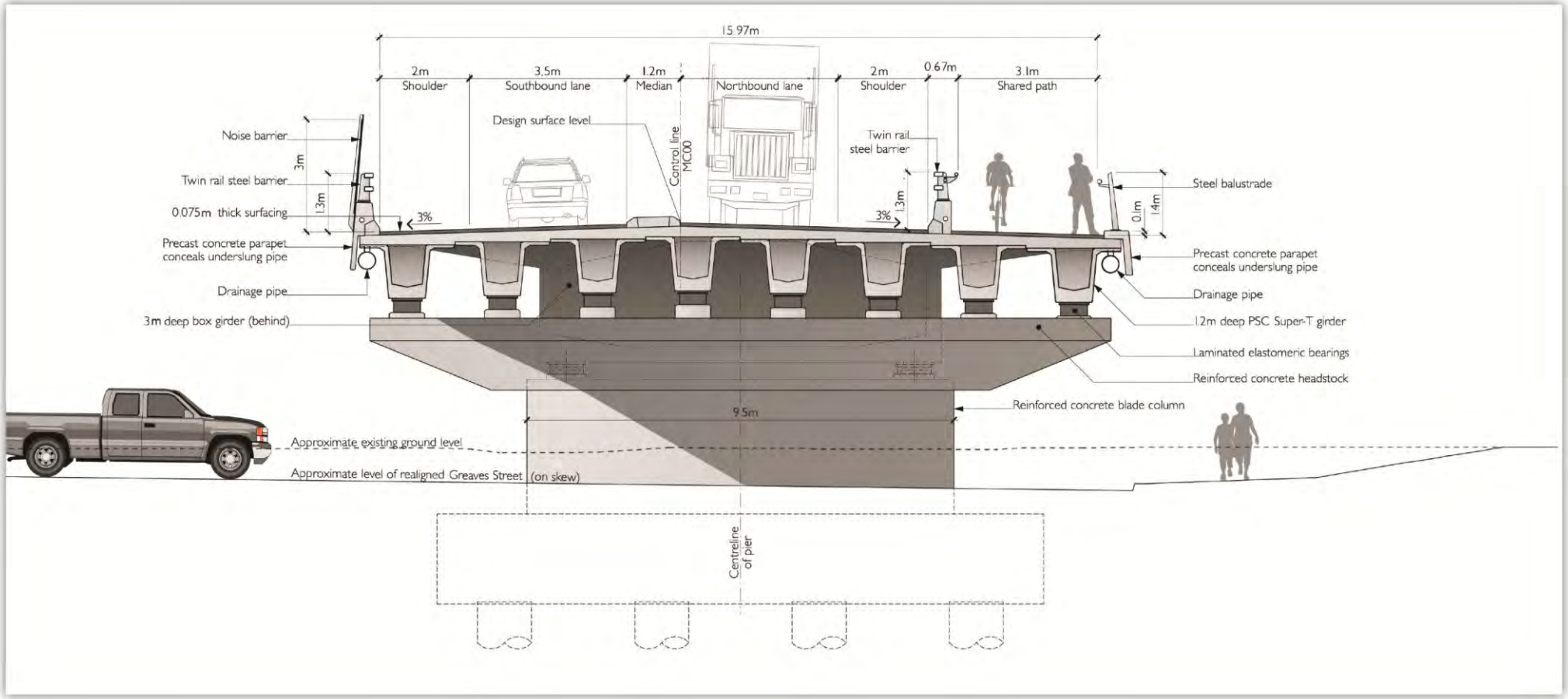

Figure 5-6 Bridge cross-section 3 (northern end of the bridge)

Note: Design is subject to further refinement during the detailed design stage.

Bridge navigable clearance

Details of the navigation channels are illustrated in Figure 5-3 and Figure 5-4.

There would be two clear navigable channels beneath the proposed bridge each with:

- A minimum horizontal clearance of 35 metres
- A minimum vertical clearance of 9.1 metres above mean high water spring.

In addition to the two clear navigable channels, there would be two additional channels, each about 67 metres wide, consistent with the existing bridge clearance.

The detailed design stage of the project would consider the provision of permanent aids to navigation on the proposed bridge in accordance with the International Association of Marine Aids to Navigation and Lighting Authorities, which provides recommendations for the specification of aids to navigation of bridges within inland waterways. It is proposed that green and red navigation lights marking the deep-water navigation channel extents, and a cardinal white light in the centre of the span at deck level, be provided on the bridge to aid boat operators at night. Complementary day markings may also be provided. The final arrangement of the aids to navigation, including lighting flashing sequences, would be confirmed by Roads and Maritime during the detailed design stage.

Bridge deck

Cross-sections of the bridge deck are illustrated in Figure 5-4, Figure 5-5 and Figure 5-6.

The bridge deck would be about 17 metres wide and would have:

- A pedestrian and cycle path about 3.1 metres wide on the western (upstream) side that would connect to the Pacific Highway at Iolanthe Street in South Grafton and to Pound Street in Grafton
- Pedestrian balustrades on the western (upstream) side of the bridge to ensure pedestrian safety. The balustrades would allow sunlight onto the bridge deck and maximise views from the bridge
- Traffic barriers on each side of the carriageway
- One northbound lane and one southbound lane for vehicles. The lanes would be 3.5 metres wide
- Road shoulders two metres wide on the outside of each travel lane
- One median, 1.2 metres wide, to separate the northbound and southbound travel lanes.

5.2.2 Local road network upgrades in Grafton

The proposed road network upgrades in Grafton are presented in Table 5-2 and illustrated in Figure 5-1. These upgrades are needed to connect the new bridge approach roads with the existing road network and support forecast traffic demands on the new bridge. Local road network upgrades will be subject to further refinement during the detailed design stage. The proposed pedestrian and cyclist facilities in Grafton are discussed in Section 5.2.5.

Table 5-2 Proposed local road network upgrades in Grafton

Location	Description
Main alignment	
Proposed bridge – northern approach	A new road would be constructed between the Pound Street rail viaduct and the northern abutment of the proposed bridge. The new road would consist of two 3.5 m lanes (one in each direction) with a 2 m shoulder, a 1.2 m raised median and a 2.5 m pedestrian and cycle path on the western side. There would be a short section of retaining wall along the eastern side of the proposed bridge approach road opposite the reconfigured intersection of Pound Street and Bridge Street. The retaining wall would be about 51 m long and between 0.3 m and 1.3 m high.
Pound Street	Pound Street would be widened to four lanes (two lanes in each direction) between the rail viaduct and Villiers Street. The section of Pound Street south of the new northern bridge approach road would be separated from the rest of Pound Street. On-street parking would be provided on both sides of Pound Street between Clarence Street and Villiers Street. Proposed parking arrangements are shown in Figure 5-1 and would be finalised during detailed design. Driveway accesses along Pound Street between the northern bridge approach road and Villiers Street would be limited to left-in and left-out only.
Main intersections	
Pound Street and Clarence Street intersection	This intersection would be signalised and some movements would be restricted, including: • The right-turn from Pound Street to Clarence Street from both approaches would be prohibited • The Clarence Street eastern approach would be limited to left-in and left-out only • The through movement would be prohibited on the Clarence Street western approach.
Dobie Street and Villiers Street roundabout	Minor refinements would be made to the existing roundabout including extending the concrete apron to make it easier for heavy vehicles to negotiate the roundabout.
Other road network upgrades	
Greaves Street	Greaves Street would be slightly realigned and lowered to pass beneath the proposed bridge.
Kent Street	The northern approach divides Kent Street. Kent Street (west) would be closed at Greaves Street. Kent Street (east) would be closed at the existing intersection with Pound Street.
Bridge Street	Bridge Street would be realigned to tie into the section of Pound Street east of the new bridge approach.

Location	Description
Clarence Street	Clarence Street would be upgraded between Pound Street and the Summerland Way (Craig Street) with additional parking provided on both sides of Clarence Street and centrally between the traffic lanes. Proposed parking arrangements are shown in Figure 5-1. The intersection of Pound Street and Clarence Street would be upgraded and signalised.

5.2.3 Local road network upgrades in South Grafton

The proposed road network upgrades in South Grafton are shown in Figure 5-2 and described in Table 5-3 . These upgrades are needed to connect the bridge approach roads with the existing road network and to support forecast traffic demands at the new bridge. Local road network upgrades are subject to further refinement during the detailed design stage. Proposed pedestrian and cyclist facilities in South Grafton are discussed in Section 5.2.5.

Table 5-3 Proposed local road network upgrades in South Grafton

Location	Description
Main alignment	
Proposed bridge southern approach	A new road connection would be constructed between the existing Iolanthe Street and Through Street intersection and the proposed bridge. The new road would consist of two 3.5 m lanes (one in each direction) with a 2 m shoulder, a 1.2 m raised median and a 2.5 m pedestrian and cycle path on the western side. The new connection would separate the northern part of Iolanthe Street and Butters Lane from the rest of Iolanthe Street.
Iolanthe Street	Iolanthe Street would be widened to four lanes (two lanes in each direction) between the Gwydir Highway and the new southern bridge approach road. Driveway accesses along Iolanthe Street would generally be limited to left-in and left-out only. A signalised pedestrian crossing would be provided mid-block between Spring Street and Through Street.
Main intersections	
Through Street and Iolanthe Street intersection	A new roundabout would be constructed next to the existing intersection of Through Street and Iolanthe Street. This would include a connection to the proposed Pacific Highway (north) realignment.
Butters Lane connection	Iolanthe Street/Butters Lane would be realigned to connect to a new T-intersection on the realigned Pacific Highway (north).
Pacific Highway (south), Gwydir Highway and Iolanthe Street roundabout	A new roundabout would be constructed at the intersection of Pacific Highway (south), Gwydir Highway and Iolanthe Street. The Pacific Highway (south) would be connected with the Pacific Highway (north) along Iolanthe Street between the new roundabouts on Gwydir Highway and Through Street.

Location	Description
Bent Street/Gwydir Highway	The existing Gwydir Highway and Bent Street roundabout would be upgraded to tie in with the widened Gwydir Highway on the eastern side.
Other road network upgrades	
Pacific Highway (north) realignment	The Pacific Highway (north) would be realigned to connect to a new roundabout at the intersection of Iolanthe Street and Through Street.
Pacific Highway cul-de-sac	The existing Pacific Highway (north) would be closed with a turning circle installed nearby to Bunnings Warehouse. This section of old Pacific Highway (north) would be maintained to provide access to properties. A left-out only connection to the realigned Pacific Highway would be provided from the existing Pacific Highway (north).
Spring Street	Spring Street would be restricted to left-in left-out only at Iolanthe Street.
Gwydir Highway	The Gwydir Highway would be upgraded to four lanes between the Pacific Highway and Bent Street. A signalised pedestrian crossing would be provided mid-block between Bent Street and the Pacific Highway.

Possible initial road network upgrades at year of opening in South Grafton

Traffic modelling carried out for the project (refer to Section 8.1 and *Appendix D, Technical Paper: Traffic and Transport*) suggests that not all of the upgrades for the South Grafton local road network would be needed at year of opening. As a consequence, Roads and Maritime may only provide the initial upgrades shown in Figure 5-7 and Table 5-4 at year of opening. The remainder of the South Grafton road network upgrades as described in Figure 5-2 would be completed as the roads and intersections that connect to the southern bridge approach road reach capacity during peak periods. The timing for completion of the remainder of the road network upgrades would depend on traffic performance, actual growth in traffic demand and availability of funding.

The initial upgrades shown in Figure 5-7 and Table 5-4 are contained within the construction work zone.

This EIS addresses the potential impacts of both the initial and completed road network upgrades in South Grafton. The EIS is focussed on the construction work zone and associated environmental impacts of the completed road network upgrades as these would have a greater impact than those of the initial road network upgrades. The environmental management measures that are proposed in this EIS are applicable to both possible initial and completed road network upgrades in South Grafton.

Figure 5-7 Possible initial road network upgrades at year of opening in South Grafton

Note: Design is subject to further refinement during the detailed design stage

Table 5-4 Possible initial road network upgrades at year of opening in South Grafton

Location	Description
Main alignment	
Proposed bridge – southern approach	As described in Table 5-3
Iolanthe Street	As described in Table 5-3.
Main intersections	
Through Street and Iolanthe Street intersection	A new roundabout would be constructed near the existing intersection of Through Street and Iolanthe Street which would include a direct connection to Iolanthe Street/Butters Lane.
Iolanthe Street/Butters Lane connection	Iolanthe Street/Butters Lane would be realigned to connect to a new roundabout at the intersection of Iolanthe Street and Through Street as detailed above.
Pacific Highway (south), Gwydir Highway and Iolanthe Street roundabout	As described in Table 5-3.
Bent Street/Gwydir Highway	As described in Table 5-3.
Other road network upgrades	
Pacific Highway (north)	The Pacific Highway (north) would be maintained on its current alignment and connect with Iolanthe Street at a new roundabout at the Iolanthe Street/Spring Street intersection. A signalised pedestrian crossing would be provided on the Pacific Highway about 100 m east of the Iolanthe Street intersection.
Spring Street	A new roundabout would be constructed at the intersection of Iolanthe Street, Spring Street and the Pacific Highway (north). The section of Spring Street beneath the rail viaduct (between Crisp Avenue and the rail access road) would be restricted to one-way westbound.
Gwydir Highway (Ryan Street)	As described in Table 5-3.

5.2.4 Pound Street viaduct replacement

The existing three span concrete arch section of viaduct crossing Pound Street would be replaced to allow adequate space and clearances for the new proposed road alignment. The three arches, two central piers and bridge superstructure would be demolished and replaced with a new single span steel truss bridge about 49 metres long.

The proposed superstructure would likely include steel trusses, cross beams, a precast concrete deck slab and ballasted track.

The substructure would consist of two new reinforced concrete walls connected to the existing pier at the south end of the bridge and the existing abutment at the north end of the bridge.

The bridge would be supported on two fixed bearings at the northern abutment and on two sliding bearings in the longitudinal direction at the pier. The replacement of the viaduct would be designed based on Australian Standards, in conjunction with Roads and Maritime and ARTC specifications.

5.2.5 Pedestrian and cyclist access and circulation

The project includes a pedestrian and cycle path, which would run on the western (upstream) side of the project, providing a continuous path from the Pacific Highway roundabout with the Gwydir Highway and Iolanthe Street, across the bridge and onto Pound Street in Grafton.

The proposed pedestrian and cycle path has been designed to integrate with Clarence Valley Council's existing and future planned cycle and pedestrian facilities including the existing bridge pedestrian and cycle paths. The path design takes into consideration the likely level of use, Council's *Bike Plan and Pedestrian Access and Mobility Plan* (CVC and QED, 2008) and the *Guide to Road Design – Part 6A: Pedestrian and Cyclist Paths*.(Austroads, 2009).

The main features of the proposed pedestrian and cycle path in Grafton, on the new bridge and in South Grafton are described below and illustrated in Figure 5-8.

Grafton section

A pedestrian and cycle path would be provided on the southern side of Pound Street, improving local connectivity by linking Grafton and South Grafton via the new bridge. The path would be about 2.5 metres wide along Pound Street and the bridge approach road and would connect to:

- Existing footpaths on Clarence Street, Villiers Street and Pound Street and Council's future pedestrian and cycle paths as proposed in its *Bike Plan and Pedestrian Access and Mobility Plan* (CVC and QED, 2008)
- A signalised crossing at the intersection of Pound and Clarence streets to allow safe movements in all directions and improve the safety of pedestrians and cyclists
- The Dovedale area via a link to Kent Street. The Dovedale area is the residential area in Grafton north of the Clarence River foreshore and east of the existing railway viaduct.

In addition to the pedestrian and cycle path, the following pedestrian facilities would also be provided in Grafton and constructed consistent with Council standards:

- A 1.5 metre wide pedestrian path between Villiers Street and Clarence Street on the northern side to replace the existing path
- A 1.2 metre wide pedestrian path on the western side of Clarence Street, linking Pound Street with the existing TAFE driveway entrance
- A 2.5 metre wide path connection from the northern bridge approach to the existing bridge, tying in with the existing path at Greaves Street.

Bridge section

The proposed 3.1 metres wide pedestrian and cycle path would be located on the western (upstream) side of the bridge.

A physical barrier made from a material like concrete or steel would separate the pedestrian and cycle path from traffic lanes on the bridge.

South Grafton section

A pedestrian and cycle path about 2.5 metres wide is proposed along the western side of the southern approach road to the bridge. The proposed path in South Grafton would be constructed consistent with Council standards and would connect to:

- The existing bridge's pedestrian and cycle path via a new path parallel to the Clarence River south bank
- The South Grafton bus interchange via a new path crossing the Gwydir Highway
- The future pedestrian and cycle path to Clarenza (proposed by Clarence Valley Council and described in Council's *Bike Plan and Pedestrian Access and Mobility Plan* (CVC and QED, 2008)) via a new path on an existing right-of-way at Bunnings Warehouse and along the Pacific Highway north.

Mid-block signalised pedestrian crossings are proposed to provide safe crossing points for pedestrians and cyclists at the following locations:

- Iolanthe Street between Though Street and Spring Street. This would allow safe east–west movements across Iolanthe Street
- Gwydir Highway between Iolanthe Street and Bent Street. This would allow safe north–south movements across the Gwydir Highway
- If the possible initial upgrades are constructed (as described in Section 5.2.3), a signalised pedestrian crossing would be needed on the Pacific Highway east of Iolanthe Street (note that this crossing would not be needed if the Pacific Highway is realigned to join Iolanthe Street at the Through Street roundabout). This crossing would allow safe north–south movements across the Pacific Highway.

5.2.6 Flood mitigation works

About 3.7 kilometres of existing levee in Grafton and seven kilometres of existing levee in South Grafton upstream of the proposed bridge would be raised up by about 0.2 metres to maintain the current level of flood immunity within Grafton and South Grafton. The extent of the proposed flood mitigation works is presented in Figure 5-9.

The project would also include flood mitigation works for a number of impacted properties located outside the levee system. Flood mitigation options for these properties would be developed and implemented in consultation with property owners and Clarence Valley Council before the bridge construction works begins. Refer to Section 8.2 and *Appendix E Technical Paper: Flooding and hydrology assessment* for details on impacts on flooding resulting from the project.

Figure 5-8 Pedestrian and cyclist access and circulation in Grafton and South Grafton

Note: Design is subject to further refinement during the detailed design stage.

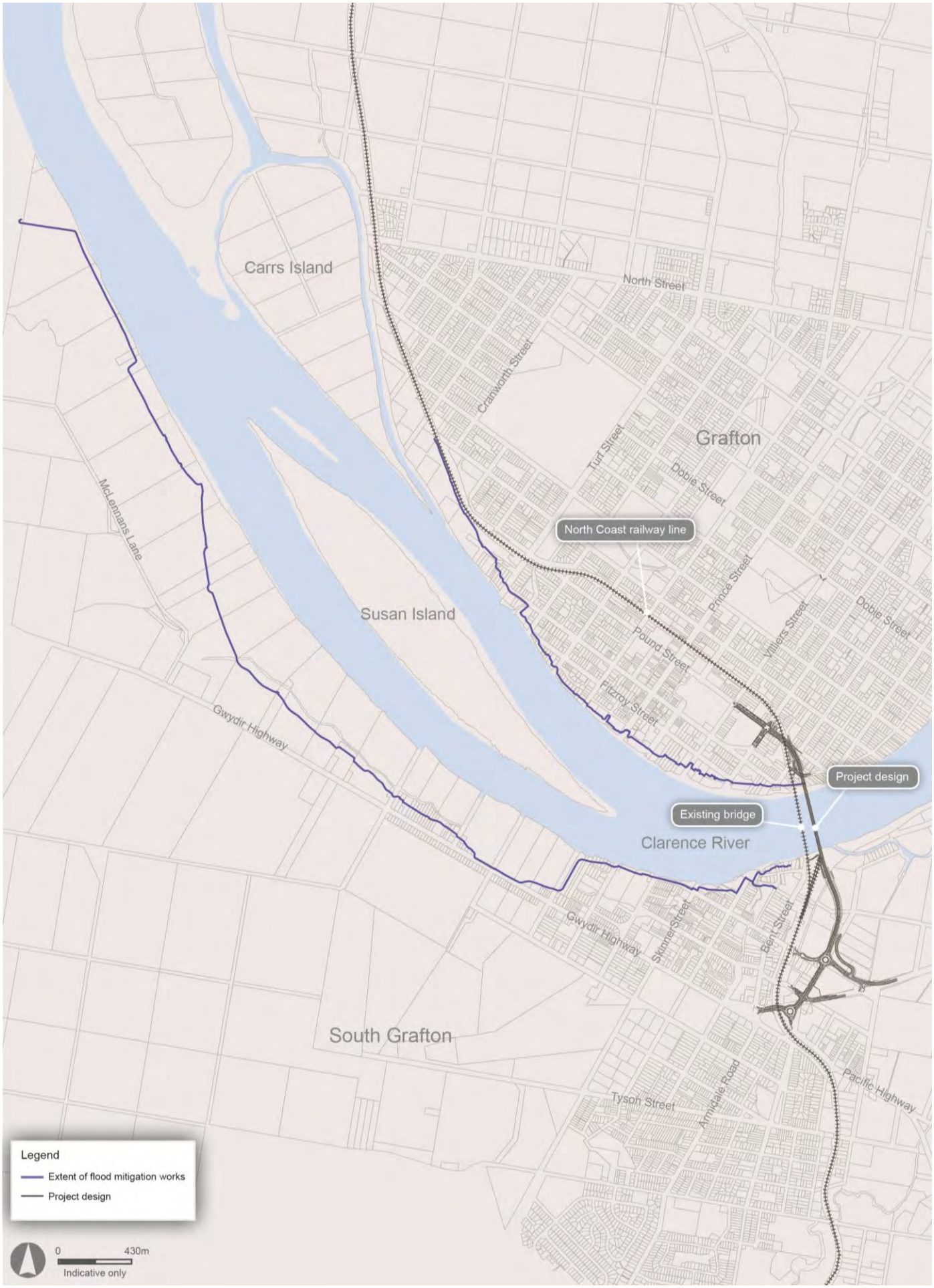

Figure 5-9 Key project elements: flood mitigation works

Note: Design is subject to further refinement during the detailed design stage.

5.2.7 Noise mitigation works

The proposed noise mitigation works consist of a noise barrier and noise architectural treatment at a number of properties. These are described below.

Noise barrier

The noise assessment identified that a noise barrier would be required to mitigate noise impacts from the elevated bridge and approach road on the surrounding neighbourhood (refer to Section 8.4 and *Appendix F: Technical Paper: Noise and vibration*). The noise barrier would be located on the eastern side (downstream side) of the northern bridge and approach road (refer to Figure 1-2) and would be about three metres high (measured from the road surface) and about 310 metres long. The barrier dimensions and materials would be confirmed during detailed design.

Noise architectural treatment

The noise assessment also identified that architectural treatment would be required for a number of properties which would experience an exceedance of the noise threshold levels (refer to Section 8.4 and *Appendix F, Technical Paper: Noise and vibration*). Architectural noise treatments may include (but not limited to) one or a combination of the following:

- Upgraded windows
- Doors and window seals
- Provision of fresh air ventilation/air-conditioning.

The number of properties requiring architectural treatment would be refined and confirmed after project approval and once the project detailed design is developed. Architectural treatments would be developed and implemented in consultation with the noise affected land owners.

5.2.8 Drainage and operational water quality

This section describes the proposed stormwater management system for the project. An assessment of the project impacts on the water quality is presented in Section 8.10.

Drainage strategy for Grafton

The existing drainage system in Grafton is a combination of piped networks and open drainage channels. Where the existing road has kerbs, the stormwater runoff is collected via pits and transferred to pipes and open channels, before it is discharged into the Clarence River.

The proposed drainage strategy for the project in Grafton would be to use or modify the existing drainage networks where possible. Where this is not possible, the existing drainage would be removed and replaced with pits that direct the stormwater runoff into grass-lined open channels or swales where possible, which would provide some water quality treatment. Where this is not possible, a pit and pipe network would be implemented. The proposed stormwater drainage would ultimately drain into the Clarence River, consistent with Council's existing stormwater drainage network.

Any grass-lined open channels or swales identified during detailed design would be designed to optimise water quality performance.

There is an existing low point along Pound Street, between Bridge Street and Kent Street. Water is known to pond across Pound Street in this area during local storm events. The proposed stormwater management system on Pound Street would allow flood-free access to the new bridge in 20-year average recurrence interval event floods and would include:

- A detention basin south of Pound Street. The size of the basin would be determined in detailed design and would be developed to maximise the storage and minimise the pumping needs
- A pump station to extract water from the detention basin and convey it to the Clarence River. The pump station would be enclosed in a pump house located near the foreshore. The pump station size would be confirmed during detailed design
- A series of culverts beneath Pound Street to connect the catchment north of Pound Street with the proposed detention basin.

The stormwater management system proposed for the project is presented in Figure 5-10.

Drainage strategy for the proposed bridge

Drainage on the proposed bridge would be developed for the 10-year average recurrence interval rainfall event and to suit the longitudinal grade of the bridge. Scuppers (outlets for draining water) would be located at regular intervals along the bridge deck to collect the stormwater runoff from the bridge deck. This water would be directed into a longitudinal drainage network that would either be contained within the bridge superstructure or supported under the bridge deck. Stormwater on the bridge would be conveyed to both ends of the bridge and discharged into the existing drainage networks.

The need to provide measures to manage emergency spills would be evaluated during the detailed design phase. Basins would be considered to capture contaminants in the event of a spill on the bridge.

Drainage strategy for South Grafton

The existing drainage system in South Grafton is a combination of piped networks and open drainage channels, with the stormwater runoff ultimately discharging into the Clarence River.

The proposed drainage strategy would be designed to replicate the existing situation as closely as possible. Where possible, the existing drainage networks would be modified and re-used. Where this is not possible, the existing drainage would be removed and replaced with pits that direct the stormwater runoff into grass-lined open channels running along the toe of the road embankment, consistent with Council's existing stormwater drainage network.

The stormwater runoff would be directed through a series of grass-lined open channels and culverts, eventually discharging through a culvert in the flood levee with a flap valve. The stormwater runoff would receive some water quality treatment in the grass-lined channels. From here the water would disperse over the floodplain and ultimately end up in Alipou Creek.

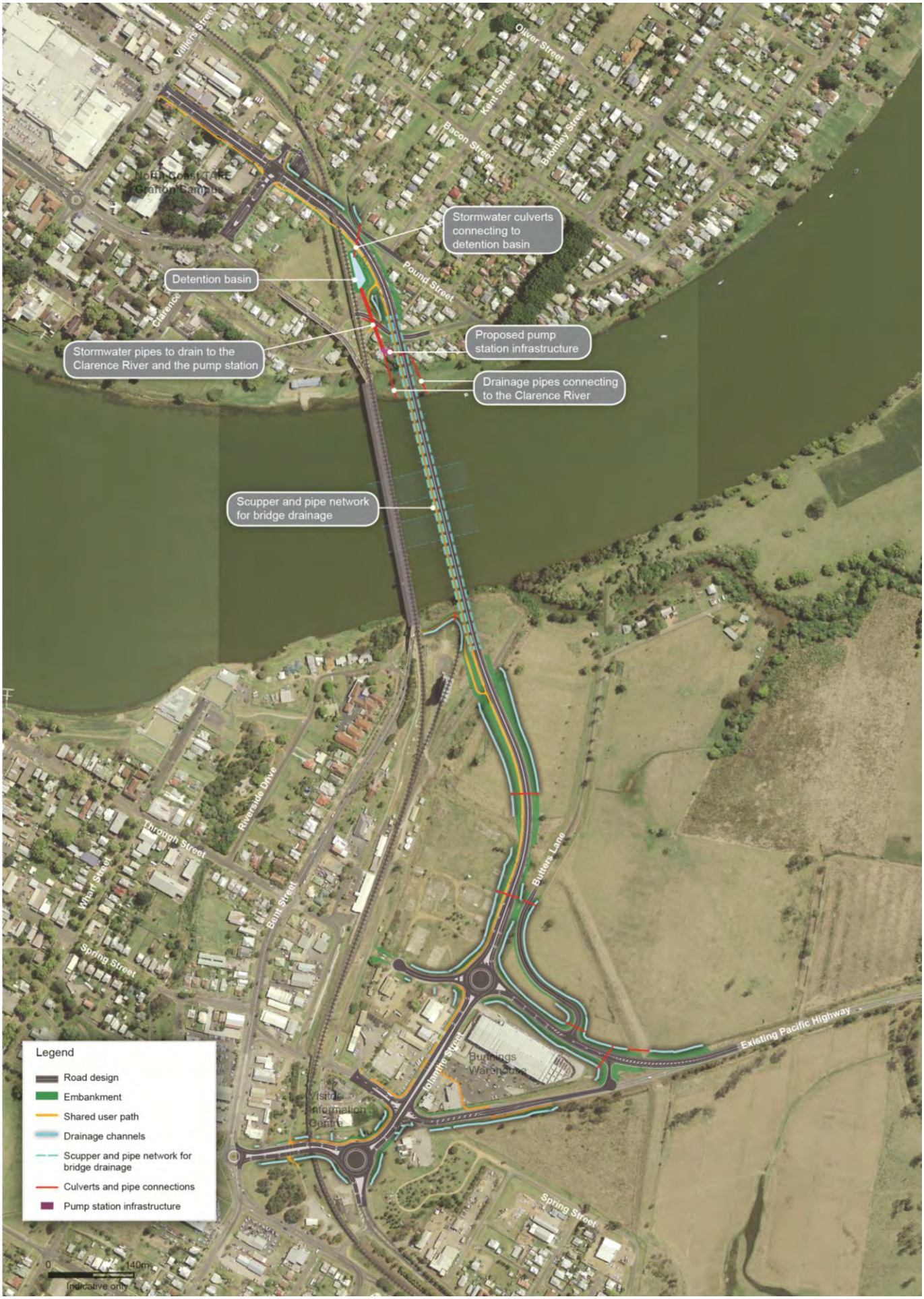

Figure 5-10 Stormwater management proposed for the project

Note: Design is subject to further refinement during the detailed design stage

5.2.9 Lighting

As the bridge and bridge approach would be close to residential buildings on the Grafton approach, the lighting produced by the bridge would be designed to avoid any undesirable light spill to the surrounding residential developments in accordance with the principles of *AS4282 Control of the Obtrusive Effects of Outdoor Lighting* (1997). Poles and lighting fixtures would designed in a manner consistent with Council's suburban street lighting on both sides of the Clarence River.

Appropriate lighting would be provided to cater for all users (road users, pedestrians and cyclists) and scenarios (intersections, crossings, pathways). The road lighting would be in accordance with *AS1158.1.1:2005 Vehicular Traffic (Category V3) Lighting*. The pedestrian and cycle path lighting would be provided in accordance with *AS1158.3.1:2005 Pedestrian Area (Category P2) Lighting*. Pedestrian crossing lighting would be designed in accordance with *AS 1158.4:2009 Pedestrian Crossings (Category PX1) Lighting*.

The lighting design would also be influenced by the *Crime prevention and the assessment of development applications Guidelines under section 79C of the Environmental Planning and Assessment Act 1979* (DUAP, 2001). Lighting design would be further developed during detailed design.

Project impacts generated from lighting are assessed in Section 8.8, Section 8.9 and Section 9.1.

5.2.10 Street furniture

Street furniture would include:

- Road signage within the new road corridor including regulatory signage and directional signage
- Traffic safety barriers necessary to protect hazards in the verge including fill embankments. Traffic barriers would be concrete or steel as required. Suitable traffic barriers and parapets would be provided over the bridge
- The pedestrian and cycle path along the bridge would have a balustrade to provide safety for pedestrians and cyclists
- Fencing along the pedestrian and cycle path and at the top of fill embankments on the Grafton and South Grafton bridge approach roads for safety requirements
- Fencing around the stormwater detention basin in Grafton
- Traffic lights in Grafton at the intersection at Pound Street and Clarence Street. In South Grafton, two signalised pedestrian crossings would be provided to improve safety for pedestrians crossing Iolanthe Street and Gwydir Highway
- Lighting poles and fixtures would be located in the verges as required.

Further details on street furniture are presented in Section 8.8 and *Appendix J, Technical Paper: Urban Design and Landscape Concept Report (including landscape character and visual impact assessment)*.

5.2.11 Utility services

This section provides details on the allowance made for utility services and the electrical services likely to be required for the project. For information on impacts to utility infrastructure including relocation of utilities refer to Section 8.6.

Allowance for utilities

The proposed bridge would provide an opportunity for a utilities corridor to accommodate future utility upgrades across the Clarence River including the proposed National Broadband Network services. Any specific requirements of the

National Broadband Network provider would be confirmed during detailed design, but an allowance would be made for two 100-millimetre ducts for telecommunication cables.

It is anticipated that cables would be laid across the span of the bridge without requiring intermediate cable access or pulling chambers. These details will be confirmed during the detailed design phase of the project.

Electricity would be provided to the bridge and bridge approaches as required to provide power for:

- Functional road lighting
- Functional footpath lighting
- River-based lighting
- Architectural lighting
- Traffic control
- Signage.

5.2.12 Property acquisition and ownership transfer

The acquisition boundary for the proposed project has been developed based on the requirement to have sufficient space for construction and operation of the project.

The project would require acquisition of land in Grafton and South Grafton. Details of the directly affected properties are provided in Section 8.7 and *Appendix I, Technical Paper: Socio-economic, property and land use*. Directly affected properties are those that require full or partial acquisition of the property for the project. Affected property owners have been consulted as part of the preparation of this EIS (refer to Chapter 7).

Land would be acquired and compensation paid in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. Each acquisition would be considered on its individual merit. A copy of the *Roads and Maritime Land Acquisition Policy* is available at the Roads and Maritime website:

http://www.rms.nsw.gov.au/roadprojects/community_environment/land_acquisition.html

Management and disposal of any excess land would be assessed after construction. Excess land use strategies would be investigated in consultation with Clarence Valley Council. Strategies could include land transfer to the control or ownership of Clarence Valley Council and/or releasing land to the public for redevelopment.

5.2.13 Operational traffic arrangements

This section provides details of the operational traffic arrangements for the existing and proposed bridges. It also provides a discussion of the interaction between the project and existing public, freight and maritime transport services. Refer to Section 8.1 and *Appendix D, Technical Paper: Traffic and Transport* for a detailed assessment of traffic and transport impacts resulting from the project.

Operational traffic arrangements

The existing bridge would be retained with one northbound lane and one southbound lane.

The new road bridge and approaches would become part of the Summerland Way, the north-south State Road (Route No 83) which runs from the Mount Lindesay Highway near Woodenbong in the vicinity of the Queensland border to Grafton. B-doubles and semi-trailers would be required to use the new bridge. At this stage it is not anticipated that time-of-day restrictions would be placed on heavy vehicle use of

the proposed bridge. Buses, emergency vehicles and smaller heavy vehicles would be able to use either bridge.

The Pacific Highway would continue to be the priority designated freight route for heavy vehicles travelling between Sydney and Brisbane.

Interaction between the project and existing public transport services

The project would create an additional crossing over the Clarence River at Grafton which could be used by existing bus operators between Grafton, South Grafton and beyond. Feedback provided by bus operators in the area indicates they would continue using the existing crossing at this stage, to remain consistent with existing bus routes. Should bus operators choose to use the new bridge in the future, sufficient road reserve has been allocated on Iolanthe Street, South Grafton and Pound Street, Grafton for the provision of bus stops.

Further to this, the proposed pedestrian and cycle path would connect to the existing South Grafton bus interchange via a new path along the Gwydir Highway between the Pacific Highway and Bent Street.

Existing train services stopping at Grafton station would not be affected by the project.

Interaction between the project and existing freight transport services

The project would interact with existing freight transport services by becoming the designated heavy vehicle route in Grafton (refer to Figure 8-1 in Section 8.1).

Use of the proposed bridge and approach roads would not be constrained by kinks, narrow lanes or 25/26 metre long B-double trucks peak hour restrictions as currently occurs on the existing bridge.

Interaction between the project and existing maritime transport services

Existing and likely future maritime transport is discussed in Section 8.1.

The project would provide sufficient horizontal and vertical clearance over the navigable channel of the Clarence River to maintain existing maritime traffic movements.

Access to existing boat launching facilities close to the bridge approaches may need to be restricted during construction but would be reopened once the bridge is operational. Existing boat launching facilities would not be affected by the operational stage of the project, but some mooring licences close to the new bridge may be moved further downstream.

5.3 Design criteria

5.3.1 Engineering design criteria

The key engineering design criteria outlined in Table 5-5 provided the basis of design for the project.

Table 5-5 Engineering design criteria

Item	Criteria
Design speed for bridge	70 km/h
Posted speed limit for bridge	60 km/h
Traffic lane width for bridge	3.5 m

Item	Criteria
Bridge road shoulder width	2 m (both carriageways on the northern and southern approach roads)
Vertical clearance of bridges from pavement (along Pound Street)	5 m minimum 5.3 m desirable minimum
Vertical clearance of bridges from pavement (along Greaves Street)	4 m desirable minimum
Design vehicle	25 m B-double (main alignment) 19 m articulated truck (all other roads, except Clarence Street which is designed for a 12.5 m rigid truck).
Navigational clearance requirements (metres above mean high water springs)	9.1 m vertical clearance Two channels with a minimum horizontal clearance of 35 m each.
Pedestrian and cyclist access	Provision of a 3.1 m wide pedestrian and cycle path on the western (upstream) side of the bridge.
Flood immunity	Bridge flood-free for a 100-year flood event and for the bridge approach roads flood-free for a 20-year flood event.

5.3.2 Urban design objectives and design principles

Urban design objectives and principles were developed to guide the development of the concept design for the proposed project (refer to *Appendix J, Technical Paper: Urban design and landscape concept report (including landscape character and visual impact assessment)*). These urban design objectives and principles would be reviewed and, if required, refined during detailed design.

The project design would also be influenced by the *Crime prevention and the assessment of development applications Guidelines under section 79C of the Environmental Planning and Assessment Act 1979* (DUAP, 2001).

5.4 Detailed design requirements

The concept design presented in this EIS may be refined during detailed design. Refinements to the concept design may occur as a result of submissions received as part of the ongoing community consultation and submissions process, and from any additional information received (eg additional geotechnical data gathered following project approval).

To ensure that the development of the detailed design adequately incorporates the key principles established during this study and inherent in the concept design, the detailed design would be required to:

- Be consistent with the design criteria and design principles on which the concept design was based, as described in this EIS and any subsequent submissions report
- Address any additional or unresolved issues associated with the development of the concept design proposed in this EIS and any subsequent submissions report

- Meet any conditions of approval arising from the approval process, unless changes to the conditions of approval are subsequently agreed
- Incorporate community and government agency requirements through the ongoing implementation of the project's consultation plan
- Avoid and/or minimise environmental impacts wherever possible
- Develop and refine mitigation measures
- Appropriately develop and incorporate the urban design and landscape strategy presented in *Appendix J, Technical Paper: Urban Design and Landscape Concept Report (including landscape character and visual impact assessment)* and summarised in Section 8.8
- Establish detailed proposals for the construction delivery method. These would address constructability, traffic and safety considerations during construction, geotechnical issues, all relevant specifications and design requirements, current guidelines and policies, and practicality/cost-effectiveness
- Address risk management during construction and operation
- Provide a level of definition sufficient to support a construction contract that would meet all Roads and Maritime requirements for the completed project
- Ensure that the detailed design allows for safe and cost-effective maintenance of the project during operation in accordance with occupational health and safety requirements and relevant Roads and Maritime specifications.

6 Project description – construction

This chapter describes how the project is proposed to be built. It includes a description of construction, sequencing and ancillary facilities that would be required during construction.

Table 6-1 shows the Director-General's environmental assessment requirements relevant to the project description and where they are addressed in this chapter.

Table 6-1 Director-General's environmental assessment requirements relevant to the project description – construction

Director General's environmental assessment requirements	Where addressed in EIS
The Environmental Impact Statement (EIS) must be prepared in accordance with, and meet the minimum requirements of, Part 3 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (the Regulation), including: 2. The content listed in clause 7 of Schedule 2 of the Regulation.	Section 6.1 and Section 6.2
A detailed description of the project, including: - Location and operational requirements of construction compounds	Section 6.3, Section 0, Section 6.5 and Section 6.6

6.1 Construction delivery and timing

6.1.1 Construction delivery

Roads and Maritime would consider and select the most suitable procurement method for project construction delivery. The preferred procurement method would be selected and implemented in compliance with this EIS and the conditions of approval for the project.

Roads and Maritime would be responsible for overseeing the construction, including inspections, monitoring and auditing work performed by the construction contractor(s).

6.1.2 Construction timing

A construction program for the project has not yet been determined. However, it is expected that construction would take about three years. The NSW Government has nominated the end of 2019 as the desired completion date for the project. The actual timing of construction, opening to traffic and completion would depend on the availability of construction funding.

The construction program in Figure 6-1 is indicative only and may change based on further work during detailed design. The timing and duration of construction activities may also be influenced by:

- Wet weather periods
- Changes to construction methods and/or materials.

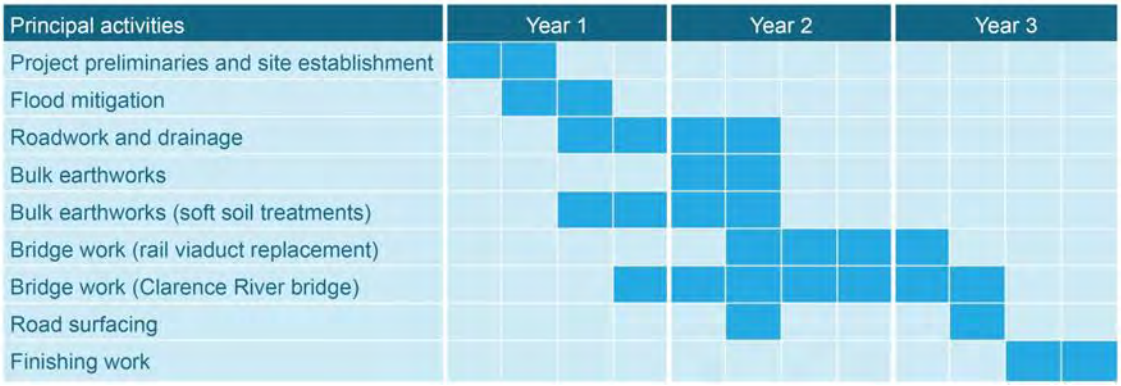

Figure 6-1 Grafton Bridge project indicative construction timeline

6.2 Construction activities

6.2.1 Overview

The project would be built using conventional methods used on most major road and bridge construction projects. These methods may be modified to address site-specific environmental or engineering constraints. The typical construction sequence and activities shown in Table 6-2 are based on standard construction practices and are informed by the concept design for the project.

The activities and typical construction plant and equipment listed in Table 6-2 provide sufficient detail to allow an assessment of the likely nature and extent of environmental impacts during construction. It is not a full list of works, activities, plant and equipment, and it is possible that activities would not occur in the precise order listed.

The construction contractor would refine construction methods during detailed design in view of the site constraints and in accordance with any conditions of approval.

Table 6-2 Typical construction activities and plant

Component	Typical activity	Typical plant and equipment
Preliminary activities and site establishment	Property acquisition and adjustments, including property access changes Detailed geotechnical investigations and survey Dilapidation surveys General site clearance, site establishment work, fencing and signage Establishment of temporary construction facilities and compound sites including the site office Temporary traffic management arrangements Progressive installation of environmental controls including temporary or permanent fencing, and erosion and sediment control measures Construction of temporary drainage controls Clearing and removal of vegetation Diversion of utilities	Trucks Generators Light vehicles Excavators Chainsaws Mulchers Water carts Cranes Drilling rigs

Component	Typical activity	Typical plant and equipment
Flood mitigation works	Clearing of vegetation (where required) Stripping of topsoil Placement and compaction of earthwork Reinstatement of topsoil and planting / grass seeding to establish vegetation Upgrade of flood mitigation structures Adjustments to minor structures within built areas Adjustment of control gates and regulatory devices	Excavators Dump trucks Compactors Graders Loaders Water carts Profilers Bulldozers Vibratory rollers
Roadwork and road surfacing	Stripping of topsoil, removal of trees and other vegetation Construction of temporary local traffic management diversions Placement and compaction of earthwork Road widening, including construction of box cuts and road surfaces Staged construction on local roads Installation of traffic signals, roadside furniture and lighting Installation of road markings Construction of any retaining walls and subsurface drainage Construction of road surface Construction of pedestrian and cycle path Progressive landscaping and tree planting	Chainsaw Graders Backhoes Trucks Water carts Vibratory compactors Bitumen sprayers Vibratory rollers Rubber tyred rollers
Drainage	Construction of drainage, including kerb and gutter (where required) Major drainage work – eg cross-drainage structures and Pound Street drainage, including the pump station Installation of cross-drainage, including culverts and inlet and outlet work, such as channel diversions and scour protection Installation of longitudinal and vertical drainage in cuttings and embankments Construction of diversion and catch drains along the formation and sedimentation control basins or swales (where required)	Trucks Bulldozers Excavators Concrete pumps Concrete trucks

Component	Typical activity	Typical plant and equipment
Bulk earthwork	Stripping topsoil and stockpiling it for reuse in landscaping Materials haulage Soft soils treatment Construction of embankments Stockpiling	Trucks Bulldozers Excavators
Bridge work	Establishment of batching plant Preparation of bridge work areas including temporary piling pads, access platforms Installation of bridge foundations (driven or bored piles, pile caps and footings) Construction of new bridge superstructure and piers Replacement of ARTC rail viaduct at Pound Street Construction of bridge superstructure including deck and pavement work (cast in-situ or pre-cast bridge elements) Construction of noise barrier	Batching plant Piling rigs Concrete pumps Concrete trucks Cranes Barge(s) Excavators Trucks Small equipment
Finishing work	Remove temporary work Restoration and landscaping of temporary sites General site clean-up Restoration of topsoil and revegetation of batters Removal of temporary environmental controls Site clean-up and demobilisation, including restoration of ancillary sites and construction access roads (where required)	Trucks Generators Light vehicles Cranes

The activities listed in Table 6-2 are described in more detail below.

6.2.2 Project preliminaries and site establishment

Before the main construction activities begin, there would be some mobilisation and site establishment activities, as listed in Table 6-2. The purpose of these activities would be to prepare the site, gather additional survey and geotechnical information, and install any environmental controls required during construction. The construction of permanent and temporary road and utilities diversions would also be completed during this preliminary stage. Refer to Section 9.2.3 for details of utility and services infrastructure relocations.

6.2.3 Flood mitigation

As discussed in Section 8.2 (Flooding and hydrology), a flood impact assessment was carried out for the project. Based on this assessment upgrades to the existing flood levee system are required to mitigate potential flood impacts.

The existing levee system consists of a combination of earth embankments, concrete and block walls, and existing buildings.

The indicative construction timeline presented in Figure 6-1 shows that the levee system would be upgraded before any construction work occurs within the Clarence River (such as piling work for the new bridge).

The likely construction activities would depend on the existing levee type and the proposed method for raising the levee. The likely construction activities could involve:

- Stripping topsoil and storing it at stockpile sites
- Removing vegetation and unsuitable material
- Stabilising and preparing existing material for placement of new material
- Placing and compacting fill material to the required level
- Reviewing ground conditions for the construction of new concrete walls and for raising existing concrete walls
- Excavating for footings of new concrete walls and removing unsuitable material. Suitable material would be re-used (where possible) for raising earth embankments
- Building new concrete walls and raising existing concrete walls. This work would involve placing steel reinforcement, erecting formwork and pouring concrete.

Where the levee consists of existing infrastructure (for example, a building) a specific design for the upgrade / modification works would be developed, with appropriate mitigation measures, during detailed design as outlined in Section 8.8.

6.2.4 Bulk earthwork

Bulk earthwork would be required to achieve a stable formation suitable for the approach roads to the bridge, land based piers and other project structures. The bulk earthwork activity would include the use of imported fill material (refer to Section 6.5.1) and would be carried out using conventional cut and fill techniques in which material is carted from each cut using excavators and trucks to fill areas requiring additional material.

Bulk earthwork activities would include:

- Stripping topsoil and stockpiling for reuse in landscaping
- Hauling materials from excavated cuttings and external sources to fill embankment locations
- Pre-loading on localised areas of soft soils (see below)
- Constructing fill embankments
- Stockpiling material for use on the project
- Installing longitudinal and vertical drainage alongside embankments.

Soft soil treatment

Site investigations have identified the possible presence of soft soils within the Clarence River floodplain, particularly around South Grafton.

Soft soils are low to very low in strength, have high compressibility and are prone to settlement. When an embankment or structure is placed on soft soils, the soil could shift or settle downwards, damaging the embankment or structure. Areas of soft soil within the project footprint may require treatment as part of the construction work. There are a number of soft soil treatment methods available that may be used on the project. These include:

- Pre-loading, with and without wick drains: This involves constructing an embankment on areas of soft soils. The embankment is allowed to settle over time. The embankment includes the final design height plus a ‘surcharge’ for settlement. Wick drains are artificial drainage paths comprising a central plastic

core, surrounded by a thin geo-synthetic filter jacket. These drains are inserted into the existing ground to help remove water from within the soft soils and speed up the settlement process

- Dynamic replacement: This involves replacing some soft soils with a material that is not prone to settlement. Soft soils are excavated and new material is placed and compacted in the areas that have been excavated. This process is used to create a network of stiffer material over which a compacted embankment can be constructed. This can be done in a shorter period than pre-loading
- Deep soil mixing: This involves consolidating soft soils in situ by mixing a binding agent such as lime or lime cement with the soil. This process allows a compacted embankment to be constructed over the consolidated soft soils. This process can be done in a shorter timeframe than pre-loading but is more costly
- Stone columns: This involves introducing crushed stone into soft soils using a vibro-phone. The crushed stone is progressively compacted as it is introduced. This improves the load bearing capacity of the soft soil areas. This process can be done in a short timeframe, but a significant volume of high quality crushed rock is required.

The actual soft soil treatment method to be used would be confirmed during detailed design and would depend on time available, site constraints and value for money. The most commonly adopted option is pre-loading.

6.2.5 Roadwork and road surfacing

Roadwork would involve:

- Constructing the road formation by excavating existing materials or by placing fill embankments
- Placing and compacting road base, sub-base and select material layers
- Placing and compacting the road surface layer (typically asphalt) over the road base, sub-base and select material layers. This would include placing a seal between the base layer and the road surface layer
- Constructing concrete kerb and gutter
- Constructing concrete medians and roundabouts
- Forming verges between the kerb and gutter and property boundaries
- Constructing concrete footpaths and cycle paths
- Installing traffic signals and road lighting.

The road surface would be either asphalt, concrete or any other suitable material to be confirmed during detailed design. Once construction of the road surface is complete, road furniture such as guard fencing, guide posts, traffic signs and road surface markers would be installed, and lines would be marked on the road.

6.2.6 Drainage

Drainage structures (including pits, pipes, culverts and open drains/swales) would be built progressively in conjunction with the roadwork (refer to Section 6.2.5). Construction activities would vary depending on the type of drainage facility (which would be a combination of new drainage facilities and modifications to existing drainage facilities). Indicative construction activities for drainage work are provided in Table 6-3.

Table 6-3 Indicative construction activities for drainage work

Drainage facility	Indicative construction activities
Road drainage (piped network)	• Excavation of trenches for pipe drainage networks • Installation of precast concrete pipes (a crane or similar would lower the pipes into place) • Construction of new concrete drainage pits • Modification of existing drainage pits to provide new pipe connections • Backfilling of trenches and compaction of earthwork • Installation of lintels, grates and kerb inlets.
Road drainage (open channels)	• Shaping of swales using earthwork equipment • Revegetation of the open channel drains/swales • Construction of local scour protection measures, such as rock protection, where needed.
Cross-drainage culverts	• Excavation and shaping of existing ground to prepare base for cross-drainage culverts • Construction of concrete slab for the base of box culverts, including formwork, reinforcement and pouring of concrete • Installation of precast concrete pipe and concrete box culverts (a crane would lower the pipes and boxes into place) • Backfilling of trenches and compaction of earthwork around the culverts • Installation of flap (non-return) valves at the outlet of the drainage structures where required • Installation of headwalls at culvert inlets and outlets • Construction of local scour protection measures, such as rock protection at inlets and outlets of the structures.
Detention basin and pump station (Grafton)	• Excavation and shaping of stormwater detention basin • Construction of stormwater pumping station • Vegetation of detention basin • Installation of the pump station, including pumps, sumps, connection to power source and installation of back-up generators. • Commissioning trials of newly installed equipment and systems

6.2.7 Bridge work

The project includes a bridge across the Clarence River (including approach viaducts) and the replacement of a section of the rail viaduct where it crosses Pound Street. Construction of these bridges would typically involve:

- Construction of bridge foundations and substructures including piles, pile caps, piers and abutments

- Installation of bridge deck (super structure)

More information on the construction of each bridge is provided in the following sections.

Clarence River Bridge

The construction of the bridge foundations and substructures (including piles, pile caps, piers and abutments) would use standard techniques. The actual construction activities and sequence would be determined by the construction contractor and informed by the EIS, approval conditions and detailed design. The likely sequence would involve:

- Constructing the northern and southern abutments directly from the approach embankments
- Constructing a temporary jetty on the southern bank of the Clarence River for launching barges
- Constructing four piers on land. Piling rigs would be set at each pier on existing ground (where suitable) or via working platforms. Piles would be installed using piling rigs and driving hammers
- Casting pile caps on land, in situ, below the existing surface. Piers would be constructed from the top of the pile caps
- Constructing five piers in the river. It is anticipated that pile casings would be transported to each pier via barge, lowered into place and hammered into bedrock. An auger would then be used to extract any mud and to drill to the required depth into rock. Spoil from this process would be stored on the barge
- Constructing piles. This would involve the lowering of steel reinforcement into the casing, with concrete poured in to construct the piles. Water within the casing would be displaced by the concrete and could be stored on the barge if necessary. The pile casing would be left in place
- Casting pile caps at the top of the piles located in the river. The top of the piles would be encased and sealed, and any water pumped out. Piers would be constructed from the top of the pile caps.

Various bridge types have been considered for the project and are outlined in Section 4.3. The choice of bridge type, that is, a concrete box-girder bridge, was based on relevant performance criteria and a balance between engineering, urban design, environmental and cost considerations.

The bridge superstructure, including the bridge deck and the girders that support the deck, would be built once the supporting sections of the substructure are complete. Two different superstructure types are proposed.

- Super T on the approach viaducts from the abutments at either end
- Concrete box girder between the approach viaducts.

The actual construction methodology for the bridge would be developed by the construction contractor and informed by the EIS, approvals conditions and detailed design.

Construction of the super T sections is likely to involve installation of precast super T girders followed by construction of the bridge deck. The likely sequence would involve:

- Transporting precast super T girders to the bridge site
- Lifting girders directly onto the abutments and piers using a crane. Temporary bracing may be required between the girders
- Casting the deck, in situ, which may require temporary formwork. Typically, the formwork would be supported directly from the bridge girders.

The concrete box girder section of the bridge would likely be built using a balanced cantilever method because of the long spans (up to 74 metres). Balanced cantilever construction would likely involve:

- Installing the deck segments (typically three to five metres long) on either side of the pier. Each segment would be stressed back to the adjoining bridge element (either the pier or adjoining deck segment). Bridge deck segments would be progressively added to each side of the pier outwards, generally maintaining a balanced load, cantilevering out from each side of the pier
- Closing the spans with an in-situ deck 'stitch' once the cantilevers from adjacent piers are completed
- Post-tensioning the box girders to make the bridge continuous.

The segments of the concrete box girder may involve either precast or cast-in-situ construction. These options are briefly described in Table 6-4.

Table 6-4 Overview of precast and cast-in-situ bridge deck segments

Construction type	Description
Precast box girder segments	Box girder segments would be constructed and cured at a precast facility. A facility (casting yard) could be set up within the proposed ancillary site in South Grafton (refer to Section 6.3.4) or an existing precast facility could be used and the segments transported to site on trucks or trains.
Cast-in-situ box girder segments	Each box girder segment would be cast in situ on the bridge. When the concrete has developed a predetermined strength, the segment would be post-tensioned to the rest of the bridge and casting of the next segment would begin. Moving gantries on the deck would help to move the formwork along the deck on nearby spans, maintaining a balanced load. A temporary jetty would be constructed on the southern bank of the Clarence River for this incremental launching method. Refer to Figure 6-4 for the indicative location of the temporary jetty.

An example of the balanced precast cantilever construction method is shown in Figure 6-2 and an example of an insitu balanced cantilever construction method is shown in Figure 6-3.

Figure 6-2 Example of balanced precast cantilever construction method – Brisbane Airport Roundabout Upgrade (Source: Arup, 2010)

Figure 6-3 Example of insitu balanced cantilever construction method – Sea Cliff Bridge (Source: DLH Alliance, 2004)

Pound Street viaduct replacement

The existing rail viaduct section across Pound Street in Grafton would be replaced with a new structure to provide sufficient vertical clearance for the upgrade of Pound Street. This would involve demolition of about 50 metres of the existing three span concrete arch structure and likely construction of a new single span steel truss structure.

The construction activities and sequence for the Pound Street viaduct would be determined by the construction contractor, informed by the EIS, approval conditions and detailed design. The likely sequence would involve:

- Installing piles on either side of the existing pier and abutment; constructing pile caps over the new piles and a new blade wall in front of the existing pier and abutment; and installing and levelling bearings on top of the new pier/abutment
- Constructing the new steel truss bridge offline at the Pound Street ancillary site next to the existing viaduct in Grafton (refer to Figure 6-4); including assembling cranes and temporary scaffolding and supports under the existing viaduct
- Taking possession of the existing railway line. The duration of the possession would be confirmed during detailed design and in consultation with ARTC. It could potentially occur over a long weekend
- Removing existing track and ballast
- Demolishing the existing concrete bridge
- Lifting the new bridge into place onto newly constructed piers and bearings; erecting precast deck panels; installing waterproofing membrane and ballast; installing sleepers and rails; and connecting to existing rails
- Demolishing two disused piers located below the new rail viaduct.

It is anticipated that Pound Street between Kent Street and Clarence Street would need to be closed during the Pound Street viaduct replacement work and the northern approach road works. Access would be maintained to properties throughout this closure as outlined in Section 8.1.

6.2.8 Finishing work

These are the work tasks required for the completion of the project and before the opening of the bridge. Finishing work tasks include:

- Installation of lighting, street furniture, traffic barriers, noise barrier, pedestrian balustrades, etc
- Remove temporary work structures, ancillary sites, stockpile areas and general site clean-up
- Restoration of temporary sites
- Landscaping works including the restoration of topsoil and revegetation of batters
- Removal of erosion and sediment control measures.

6.3 Ancillary facilities

A range of construction related facilities would be required to build the project. These ancillary facilities would include some or all of the following:

- Site compounds
- Concrete batching plant
- Stockpile areas
- Precast facilities
- Flood mitigation stockpile sites.

These ancillary facilities are described below and potential locations are shown on Figure 6-4 and Figure 6-5. Initial site work in these areas would involve site clearing, installing appropriate environmental controls and providing hardstand areas for storage, parking and access roads. The actual locations and layout of ancillary facilities would be determined by the construction contractor.

Figure 6-4 Indicative locations of ancillary facilities

Note: Ancillary facilities are subject to further refinement during the detailed design stage.

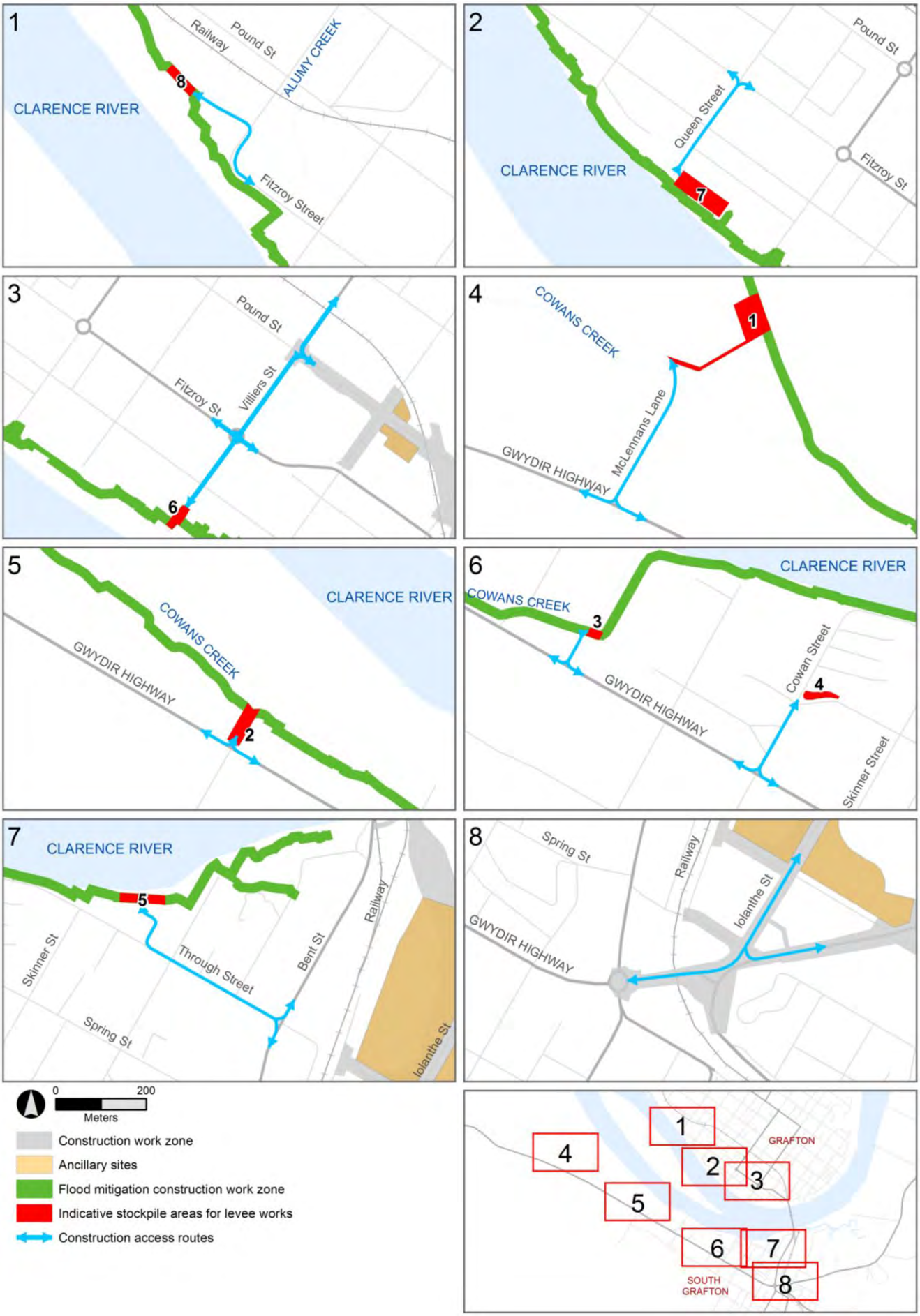

Figure 6-5 Construction access routes for ancillary sites and stockpile areas

Note: Ancillary sites, stockpile areas and construction access routes are subject to further refinement during the detailed design stage.

6.3.1 Site compounds

Site compounds are located within ancillary sites (refer to Figure 6-4) and include offices, workforce facilities (such as parking, lunchrooms and toilets), workshops and storage areas for plant and construction materials. A main ancillary site is likely to be located in South Grafton (about 90,000 square metres in size) and a smaller compound is likely to be required in Grafton for the construction of the northern abutment, the Pound Street railway viaduct replacement and road upgrades in Grafton (about 4,500 square metres in size).

These site compounds may be co-located with batch plants and are likely to be sited near major construction activities to minimise construction traffic. All site compounds would be fenced for security and safety purposes.

6.3.2 Concrete batching plant

It is possible that a concrete batching plant would be required to build the bridge. The plant would be installed as required by the construction contractor and where external sources are unable to meet the production rates required for the project, or where on-site production would be more cost effective than importing from external sources.

The construction contractor would determine the location of the batching plant. It is likely that the plant would be co-located with the South Grafton ancillary site.

6.3.3 Stockpile areas

Stockpile areas (refer to Figure 6-5) would be required to temporarily store:

- General fill material. Imported fill would be required for the project (refer to Section 6.5.1). The fill stockpile areas would likely be within the construction footprint and the need for stockpiling would depend on the sequence of construction
- Spoil. The excavation of existing ground and road surfaces would create excess spoil material that may need to be stockpiled. Some of it would be re-used as general fill for other parts of the project; the rest would be unsuitable spoil material and would be appropriately disposed (unsuitable spoil material may consist of soil, sand, clay, and asphalt). The spoil stockpile areas would be located within the ancillary facilities shown in Figure 6-4, as well as other areas within the construction footprint (including along sections of the flood levee that need to be raised for the project)
- Mulch. Minor stockpiles of mulch are likely to result from the removal of top layers of soil from the ground surface and from the slashed vegetation from clearing.

Refer to Section 6.6.2 below which addresses waste management issues associated with construction of the project.

6.3.4 Precast facilities

Precast facilities may be required to build the bridge across the Clarence River. These facilities could be used to build the bridge deck segments and super T girders ready for assembly.

A precast facility would require an area of about 400 by 100 metres, and would likely be located in South Grafton within the ancillary facilities shown in Figure 6-4. The need for precast facilities would be determined by the construction contractor and would depend on the bridge construction method adopted, value for money and the availability and proximity of alternative precast facilities.

6.3.5 Assessment of ancillary facilities against standard conditions of approval

The former Department of Planning and Infrastructure (now Department of Planning and Environment) published draft conditions for State significant linear infrastructure approvals in March 2012. These conditions outline the expected criteria that would be applied to the project for locating ancillary facilities. The conditions state that the location of ancillary facilities shall:

a) Be located more than 50 metres from a waterway

b) Be located within or next to land where the State significant infrastructure is being carried out

c) Have ready access to the road network

d) Be located to minimise the need for heavy vehicles to travel through residential areas

e) Be sited on relatively level land

f) Be separated from nearest residences by at least 200 metres (or at least 300 metres for a temporary batching plant)

g) Not require vegetation clearing beyond that already required by the State significant infrastructure

h) Not impact on heritage items (including areas of archaeological sensitivity) beyond those already impacted by the State significant infrastructure

i) Not unreasonably affect the land use of nearby properties

j) Be above the 20-year average recurrence interval flood level unless a contingency plan to manage flooding is prepared and implemented

k) Provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours.

Table 6-5 provides an assessment of currently proposed sites against the criteria set by Department of Planning and Environment.

As required by the Department of Planning and Environment model conditions for linear infrastructure, where the criteria cannot be met, an assessment demonstrating that there would be no significant adverse impact from the ancillary facility's construction or operation must be provided.

Potential impacts from the ancillary facilities in relation to nearby residences (noise and vibration), heritage values, ecology, flooding and traffic are discussed in Chapter 8 of this EIS. Measures to mitigate and/or manage adverse impacts from ancillary facilities are listed in Chapter 10.

Table 6-6 cross references management measures identified in Chapter 10 that will be implemented to manage impacts resulting from the ancillary facilities. No specific measures have been identified beyond the measures cross referenced in Table 6-6.

Table 6-5 Assessment of ancillary facilities based on standard condition criteria

Site	Meet the criteria? (Y/N)										
	a	b	c	d	e	f	g	h	i	j	k
Ancillary sites in Grafton and South Grafton (see location in Figure 6-4)											
South Grafton ancillary site	Y	Y	Y	Y	Y	N About 150 m from nearest residence	Y	Y	Y	N Protected by existing levee	Y
Pound Street ancillary site	Y	Y	Y	Y	Y	N About 20 m from nearest residence	Y	Y	Y	N Protected by existing levee	Y
Stockpile areas along proposed flood mitigation works (see location in Figure 6-5)											
Stockpile area 1	N Access is about 15m from Cowan's Creek	Y	Y	Y	Y	N About 75m from nearest residence	Y	Y	Y	N Protected by existing levee	Y
Stockpile area 2	N About 15m from Cowan's Creek	Y	Y	Y	Y	N Nearby to residential properties	Y	Y	Y	N Protected by existing levee	Y
Stockpile area 3	N Nearby to waterway within Arden Street road corridor	Y	Y	Y	Y	N About 35m from nearest residence	Y	Y	Y	N Protected by existing levee	Y
Stockpile area 4	N Nearby to a small waterway at the corner of Cowan and Spring Street	Y	Y	Y	Y	N About 15m from nearest residence	Y	Y	Y	N Protected by existing levee	Y
Stockpile area 5	N About 10m from Clarence River	Y	Y	Y	Y	N About 17m from nearest residence	Y	Y	Y	N Protected by existing levee	Y

Site	Meet the criteria? (Y/N)										
	a	b	c	d	e	f	g	h	i	j	k
Stockpile area 6	N About 40m from Clarence River	Y	Y	Y	Y	N Nearby to Sisters of Mercy Grafton Congregation, about 80m from Quality Inn, about 100m from nearest private residence	Y	Y	Y	N Protected by existing levee	Y
Stockpile area 7	N About 20m from Clarence River	Y	Y	Y	Y	N About 17m from nearest residence	Y	Y	Y	N Protected by existing levee	Y
Stockpile area 8	Y	Y	Y	N Travel required through about 3 blocks of residential area	Y	N About 135m from nearest residence	Y	Y	Y	N Protected by existing levee	Y

Table 6-6 Relevant environmental management measures for ancillary facilities

Expected criteria	Relevant environmental management measures to manage potential environmental impacts (Refer to Table 10 2 in Chapter 10)
a) Be located more than 50 metres from a waterway.	SW3, SW4, SW5, SW6, SW7, SW8, SW11, SW13, SW14, SW15, SW16, SW17, SW18, SW19, SW20 and SW21
b) Be located within or next to land where the State significant infrastructure is being carried out.	All sites are located within or next to land where the State significant infrastructure is being carried out. No additional mitigation measures are required.
c) Have ready access to the road network.	All sites have ready access to the road network. No additional mitigation measures are required.
d) Be located to minimise the need for heavy vehicles to travel through residential areas.	TT5, TT6 and TT7
e) Be sited on relatively level land.	All sites are located on relatively level land. No additional mitigation measures are required.
f) Be separated from nearest residences by at least 200 metres (or at least 300 metres for a temporary batching plant).	NV4, NV5, NV6, NV7, NV8, NV9, NV10, NV11, NV12, NV13, NV14, NV15, NV17, SE6, SE9, SE13, V5, AQ1 and AQ2.
g) Not require vegetation clearing beyond that already required by the State significant infrastructure.	All sites would not require vegetation clearing beyond that already required by the State significant infrastructure. No additional mitigation measures are required.
h) Not impact on heritage items (including areas of archaeological sensitivity) beyond those already impacted by the State significant infrastructure.	All sites would not impact on heritage items beyond those already impacted by the State significant infrastructure. No additional mitigation measures are required.
i) Not unreasonably affect the land use of nearby properties.	All sites would not unreasonably affect the land use of nearby properties. No additional mitigation measures are required.
j) Be above the 20-year average recurrence interval flood level unless a contingency plan to manage flooding is prepared and implemented.	FH1
k) Provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours.	All sites would provide sufficient area for the storage of raw materials. No additional mitigation measures are required.

6.4 Workforce and construction work hours

The size and composition of the construction workforce would vary throughout the construction period depending on the activities being carried out and possible staging of the project.

An estimated peak workforce of about 70 to 90 people is anticipated. The average size of the construction workforce on-site would be about 55 people including management staff and subcontractors.

6.4.1 Construction work hours

The proposed working hours for the project are the standard approved working hours for construction projects, namely:

- Weekdays: 7am to 6pm
- Saturdays: 8am to 1pm
- Sundays and public holidays: no work.

The majority of construction activities would be carried out during the proposed working hours. There would be certain activities that would need to be carried out outside of these standard working hours. These 'out of hours' periods would be needed to reduce impacts on adjoining properties and reduce disruption for the travelling public and rail operations.

The *Interim Construction Noise Guidelines* (DECC, 2009) have been developed by a number of State Government agencies to provide guidance on managing noise from construction work in NSW. Section 2.3 of the guidelines provides details on the five categories of work that might be carried out outside the recommended standard hours. These categories are:

- The delivery of oversized plant or structures that police or other authorities determine require special arrangements to transport along public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Maintenance and repair of public infrastructure where disruption to essential services and/or considerations of worker safety do not allow work within standard hours
- Public infrastructure works that shorten the length of the project and are supported by the affected community
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

In addition, the guidelines state that, public infrastructure works are one of the five categories of works that might be undertaken outside the recommended standard hours. This need is typically based on a requirement to sustain the operational integrity of public infrastructure, as work to restore operation of the infrastructure provides a benefit to the greater community (that is, more than just local residents).

Construction activities on the project Building the new bridge (eg the lifting and setting of bridge elements) and fall under the above categories include:

- Delivering materials (such as oversize elements of plant and large construction equipment) required outside these hours by the police or other authorities for the safety of road users and the public
- Delivering materials to reduce traffic volumes across the Clarence River, the Pacific Highway, Gwydir Highway and Summerland Way
- Upgrading local roads in Grafton and South Grafton to minimise impacts on-road users, local businesses and the TAFE

- Building the new bridge (eg the lifting and setting of bridge elements)
- Replacing the Pound Street viaduct. This is an operating rail line that would need to be closed while the viaduct is being replaced. Work would need to be carried out 24 hours per day to minimise the time that the rail line is closed
- Tying in the project with the existing Pacific Highway (tie-in work would need to maintain the safety of the travelling public)
- Managing traffic and traffic switches to reduce inconvenience to road users, avoid traffic delays during daytime or peak traffic periods, and provide safety for construction workers working on the existing highway
- Relocating utilities near existing roads to avoid and minimise disruptions for utility customers
- Construction compound operations to support any activities that may be undertaken out of hours
- Refuelling activities and plant maintenance
- Work required in an emergency to avoid the loss of lives, property and/or to prevent harm
- Short-term major traffic diversions, including full or partial road closures
- Work that would not cause construction noise disturbance at any sensitive receivers
- Work as agreed between Roads and Maritime and potentially affected sensitive receivers
- Deliveries to the ancillary facilities
- Concrete paving, concrete saw-cutting, and concrete batch plant activities.

An assessment of the likely noise impacts resulting from these activities is presented in Section 8.4 and *Appendix F, Technical Paper: Noise and vibration*. The assessment identifies the management measures that would be implemented to minimise these impacts. Before construction takes place a process of consultation would be implemented with potentially affected receivers.

With the exception of emergencies, construction activities would not take place outside standard hours without prior notification to local residents, businesses and Clarence Valley Council in accordance with the *Roads and Maritime Noise Management Manual Practice Note VII*.

Specific activities requiring special circumstances are described below.

Concrete paving

- Roads and Maritime has specifications for concrete paving that relate to temperature and rainfall. For jointed concrete base, the specifications prohibit the placement of concrete during rain or when the ambient air temperatures are below five degrees or above 32 degrees. As hot weather affects the quality of the concrete pavement, paving in the early evening and into the night is preferred as it takes advantage of cool night-time temperatures
- It is likely that concrete paving would need to be carried out during summer. Due to climatic conditions experienced in the region during summer, where daytime temperatures often exceed the maximum temperature threshold of 32 degrees, concrete paving would need to occur during the day, evening and night-time period.

Concrete saw-cutting

- In some places, the project would use plain concrete pavement, which is an unreinforced pavement. To manage cracking associated with drying and

shrinkage, saw cutters are used to cut the pavement. The timing of concrete cutting is governed by the hydration rate of the concrete and may require cutting at anytime within four and 24 hours after paving, with a 'cutting window' as short as 30 minutes. As the timing of the cutting is critical to the quality of the pavement and acceptability of the finished product, concrete saw-cutting may be needed at any time including outside standard construction hours. Concrete saw-cutting is a construction activity that is transient in nature, and each saw cut would be of a short duration.

Concrete batch plants

- In addition to normal daytime operation for concrete structures, the concrete batch plants would need to operate in conjunction with paving work during the evening and night-time. There may also be a need to cast some elements in situ, which could require the plant to operate continuously for up to 24 hours. To keep up with the materials demand during these peak periods of concrete production, the batch plant would also require material deliveries outside normal working hours. Due to the regional location of the project, the timing of deliverables may be determined by the pattern of supplier fleet movements (at night).

6.5 Construction resources

Typical materials that would be used for the construction of the project include:

- Earthwork materials, such as topsoil, general fill and select fill
- Aggregates for drainage, and producing concrete and asphalt and spray seals
- Sand for drainage and concrete, and producing asphalt
- Cement and fly ash for producing concrete
- Concrete for drainage, road surfaces, bridge work and miscellaneous work such as barrier kerbs, kerbs and gutters, paving and signpost footings
- Road base for constructing flexible road surfaces
- Bitumen for spray seals and producing asphalt
- Precast concrete elements for drainage (culverts, pits and headwalls), bridge work (piles, girders and parapets) and miscellaneous work
- Steel for bridge girders, barrier railings and concrete reinforcement.

Indicative quantities of the main materials are listed in Table 6-7. The possible material source locations are discussed in Section 6.5.1. Main material quantities and material source locations will be subject to refinement during the detailed design. At this stage it is not known the quality and quantity of local fluvial sand and gravel resources to be used for the construction of the project.

It is anticipated the project would not generate significant amounts of spoil. Cutting would be confined to a small section of Greaves Street beneath the proposed bridge northern approach and a small section of Pound Street beneath the existing railway viaduct.

Table 6-7 Indicative quantities of materials required for construction

Material	Approximate quantity
Roadwork	
Earthwork (cut to fill)	20,000 cubic metres
Earthwork (imported fill)	90,000 cubic metres

Material	Approximate quantity
Concrete	16,900 cubic metres
Sprayed bituminous surfacing	111,100 cubic metres
Densely graded base (DGB)	11,100 cubic metres
Steel reinforcement	20 tonnes
Bridge work	
Concrete	19,000 cubic metres
Steel reinforcement	3800 tonnes
Bridge deck wearing surface	1260 cubic metres
Concrete for bridge piles	1000 cubic metres
Steel reinforcement for bridge piles	160 tonnes
Flood mitigation works	
Imported fill	84,000 cubic metres
Concrete	500 cubic metres

6.5.1 Source of materials

There are a number of existing, approved or potential quarries near the project area, and it is expected that sufficient material resources are available in the local area to build the project. These sites are shown in Figure 6-6. Quarry status and potential materials to be obtained are summarised in Table 6-8. Although the identified quarries have been limited to the Clarence Valley local government area, there are many other quarries further afield in Coffs Harbour and the greater Northern Rivers region, if local resources prove insufficient.

The contractor would be required to source general fill material and concrete components (eg aggregates) from local quarries or concurrent projects in the Northern Rivers region (eg the Pacific Highway upgrade). Further investigations would be completed during detailed design to determine the source of each material.

The haulage of materials would follow construction access routes as outlined in Figure 6-5.

Table 6-8 Source of materials within the Clarence Valley local government area

Quarry	Location	Main commodity	Comment
Grafton Quarry (Boral)	Clarence River, Grafton	Construction sand and gravel	Five sites within the Clarence River. Life effectively unlimited (with replacement), close to the project.

Quarry	Location	Main commodity	Comment
Wants Pit	Sherwood Road, Glenreagh	Construction sand	Also known as Wants Sand Pit (Clarence Valley Resource Audit). Operating intermittently. Resource unquantified.
Glenreagh Pit	Coramba/Grafton Road, Glenreagh	Construction sand	Incorporated in the Glenreagh Potential Resource Area (Clarence Valley Resource Audit). Resource unquantified but potentially large.
McLennans Quarry	Gwydir Highway, Jackadgery	Can make full range of construction materials including heavy duty road surface materials	Also known as Duncans Pit (Clarence Valley Resource Audit). Resource possibly 10 million tonnes. 50-year life at extraction limit of 200,000 tonnes per annum.
Tuckers Quarry	Near Orchard Road, Grafton	Ironstone quarry, developing as sandstone quarry	Recent production of 50,000 tonnes per annum. Sandstone resource up to 50 million tonnes.
Shark Creek Quarry	Shark Creek Lane, Gulmarrad	Coarse aggregate	Resource 1.6 million tonnes. Only hard rock source of complying coarse aggregate (established by Roads and Maritime testing) close to the Pacific Highway between Ballina and Woolgoolga.
Stokes Sand Pit	No information	Construction sand	Proposed production rate of 40,000 tonnes per annum. Residual sand resource about 2 million tonnes.
Jackys Creek	Old Glen Innes Road, Grafton	Prepared road base	Recent production rate of 50,000 m^3 pa (loose). Next to Jackys Creek Potential Resource Area (Clarence Valley Resource Audit).

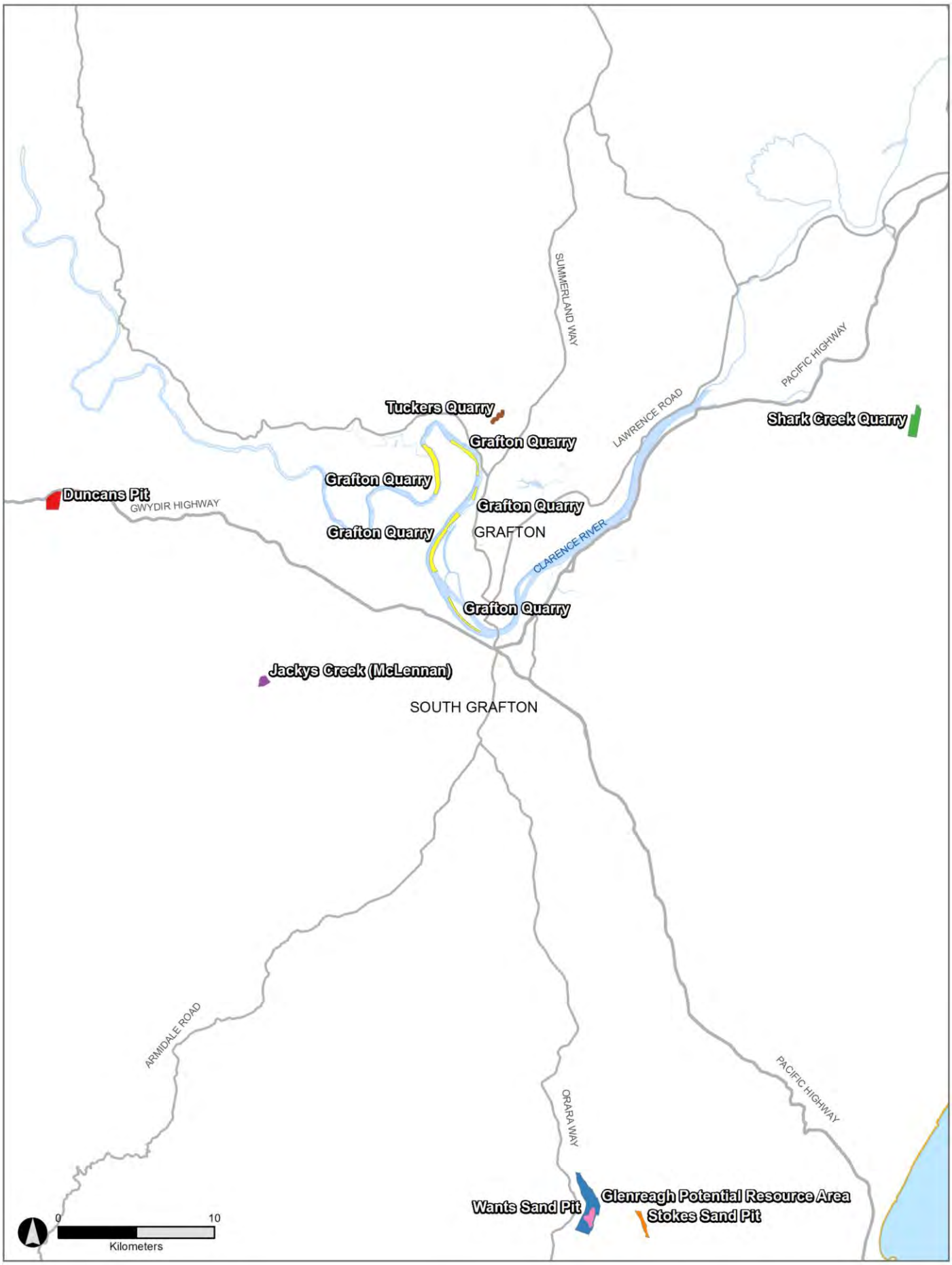

Figure 6-6 Source of materials in the Clarence Valley local government area

6.5.2 Water and energy use

Local water and energy resources would also be required for the construction of the project, as outlined in this section.

Water

Water would be required for:

- Compacting and stabilising earthwork
- Suppressing dust
- Watering landscaped areas
- On-site concrete batching
- Washing plant and machinery
- Site amenities (eg wash basins).

Water quality requirements vary for different activities:

- High quality water is needed for mass concrete production, and is required to meet *Australian Standard 1379 (AS1379) Specification and Supply of Concrete.* High quality water could be sourced from Council's town water supply system or any other suitable source
- Lower quality water is needed for compaction control, landscape watering and dust suppression; this water could be sourced from local rivers, streams and recycled water.

Indicative water requirements have been estimated in megalitres and are listed in Table 6-9. The actual daily water usage would vary with the weather conditions and the type of activities in progress.

Table 6-9 Indicative water requirements for construction

Construction activity	Estimated water consumption during construction (megalitres)
Earthwork	4
Dust control	5
Landscape watering	6
On-site concrete production	8
Road surface construction	1

Energy

It is estimated that about eight million litres of fuel would be used during construction. Key activities that would require fuel include:

- Vegetation clearing
- Demolition of existing structures
- Earthwork and rock cuttings, including transportation of excavated materials to fill embankments
- Bridge construction
- Batching plants
- Road surfacing

- Landscaping.

Electricity needs on the construction site would be minor, and temporary construction offices would be connected to the local power grid. However, some generators would be used to provide emergency power supply.

The project's contribution to the generation of greenhouse gas is assessed in Section 9.1.

6.6 Construction management

6.6.1 Traffic management and access

The construction of the project would require construction traffic to use various local and regional roads in order to access the project area, including but not limited to:

- Summerland Way, Fitzroy Street, Kent Street, Villiers Street and Pound Street in Grafton
- Bent Street, Pacific Highway, Gwydir Highway, Iolanthe Street, Ryan Street and Spring Street in South Grafton.

The haulage of earthwork and construction materials would take into account bridge access restrictions and would avoid peak periods to minimise impacts on traffic and access and would follow construction access routes as outlined in Figure 6-5.

The construction of the proposed bridge would largely occur away from roads with existing high traffic volume and there would be minimal traffic impacts.

A construction environmental management plan would be prepared for the project including traffic management measures to be employed to manage short-term traffic impacts expected during construction. These measures would be developed in accordance with the Roads and Maritime guideline, *Traffic Control at Work Sites* (RTA, 2010). Impacts on traffic and access as a result of the construction of the project are outlined in Section 8.1.

Changes to traffic and access conditions

Road network upgrades in South Grafton and Grafton may require temporary road and lane closures or reductions in traffic capacity, and restrictions on on-street parking access and/or pedestrian and cycle path access. Appropriate traffic control measures would be determined on a site-by-site basis and would include a combination of temporary lane closures, temporary fencing, visual barriers such as witches hats, traffic controllers and signage.

Maritime traffic and access

The project includes the construction of a temporary jetty immediately downstream from the new bridge (refer to Figure 6-4). The jetty would be used to launch construction barges and for the delivery of materials.

Subject to the construction methodology chosen and construction contractor program or works, temporary working platforms may also be constructed. These platforms would be located within the construction work zone and would extend from the existing banks into the river to enable stable and safe access to construction barges, and piling areas as required. Any temporary working platforms would be designed in accordance with the following principles:

- Be constructed of hard, sound, durable rock free of fine particles and not contaminated with foreign materials
- Be designed to allow for effective and regular clean-up of sediment and spill management

- Be designed to prevent small rock or fine capping materials from being washed out of the platform
- Be designed and operated in a manner that minimises the re-suspension of sediments or substrates
- Remain in the waterway for the minimum time possible
- Be protected with large rock armouring as required to ensure durability during a 1:10 year average rainfall interval flood event as a minimum
- Be protected by anti-pollution booms and heavy duty silt curtains which are designed, installed/anchored and maintained specific to the waterway. Anti-pollution booms and heavy duty silt curtains would be installed before the commencement of any work that may generate sedimentation
- Facilitate appropriate water flow to safely convey water and reduce impacts in high flow events, including but not limited to downstream bank and bed scouring and associated deposition
- Include appropriate fish passage treatments.

In designing any temporary working platforms consideration would be given to the following factors:

- Tidal range, variation and flow velocity
- River flow velocity during non-flood events
- Flooding characteristics including but not limited to afflux constraints (eg proximity of sensitive receivers), catchment size, flow velocity during a 2-year, 10-year and 20-year average recurrence interval flood events, associated potential scour impacts and flood evacuation procedures
- River morphology including but not limited to bed shape, depth, major flow channels and substrate type
- Navigational requirements including but not limited to visibility, speeds and navigational channels
- Commercial and recreational uses of the waterway including but not limited to fishing, water skiing or other leisure activities
- Procurement and delivery of working platform materials and components including but not limited to mobilisation, proximity to existing river structures, transportation/access for barges, access to clean rock (ie hard, sound, durable rock free of fine particles and not contaminated with foreign materials)
- Maintenance works and associated management (eg refuelling, routine maintenance and spill management)
- Rehabilitation requirements associated with decommissioning
- Applicability of industry innovations and/or sustainability initiatives (eg reuse of materials).

Any temporary working platforms would be developed and designed in consultation with the appropriate regulatory agencies to ensure that potential impacts from the installation, operation and decommissioning of the working platforms are managed to minimise impacts on the surrounding waterways.

Maritime traffic generated during construction of the platforms would be limited to construction barges, vessels used for installing and decommissioning the sediment control devices and vessels delivering materials.

The proposed bridge would pass close to the existing boat moorings immediately downstream of the existing Grafton Bridge. These moorings would need to be relocated during construction. Roads and Maritime would consult with the owners of

the moorings during the detailed design stage and before construction. Moorings would be reopened after completion of the bridge, although some may be relocated away from the bridge.

Maritime access along the Clarence River at Grafton would be maintained throughout construction. However, the placement of the new bridge piles and piers would temporarily restrict transit route options. Also, construction barges used during piling would temporarily obstruct vessels.

Access to ancillary facilities

Access routes to ancillary facilities are presented in Table 6-5.

It is anticipated that the two adjoining sites at the South Grafton ancillary facility would be accessed via Iolanthe Street. The adjoining site located east of Iolanthe Street would also have an access point from the Pacific Highway.

The two adjoining sites at the Pound Street viaduct ancillary facility would have access via Pound Street and Villiers Street.

Access to stockpile area 1 would be via McLennans Lane. Access to stockpile areas 2 and 3 would be via the Gwydir Highway. Stockpile areas 4 and 5 would be accessed via Cowan Street and Through Street respectively. Stockpile areas 6, 7 and 8 would be accessed via Villiers Street, Queen Street and Fitzroy Street respectively.

Access to ancillary sites and stockpile areas are discussed in detail in Section 8.1.

6.6.2 Waste management

Construction of the project would produce a number of waste streams as described in Section 9.3. Spoil and waste disposal would be managed by appropriately licenced waste contractors, with temporary spoil stockpiles to be included within the nominated ancillary sites. Key temporary spoil storage sites would be located within the ancillary sites shown in Figure 6-4 and Figure 6-5.

The proposed location and design of temporary spoil and surplus material storage sites would be assessed against environmental considerations. The selection of these temporary spoil storage sites would include the following key considerations:

- No vegetation clearing beyond that already required by construction of the project
- Located more than 100 metres from a Class 1 waterway
- Located in areas of low heritage significance (stockpile areas would not require excavation of natural surface).

Spoil and waste disposal would be carried out in accordance with the management measures for waste disposal in construction presented in Section 9.3.

6.6.3 Soil and erosion controls

Soil and erosion controls would be implemented during construction to reduce the potential for impacts on waterways. A detailed assessment of soil and erosion issues is provided in Section 8.10.

Appropriate erosion and sediment controls would be designed and constructed in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004; DECC, 2008). These controls would be established before the start of construction and maintained in effective working order for the duration of the construction period until the site is stabilised.

7 Consultation

This chapter provides an overview of the consultation activities that have been, and will continue to be, carried out for the project.

One of the project objectives is to involve all stakeholders and consider their interests. Roads and Maritime has achieved this objective throughout the various project stages via the implementation of the project's *Community Liaison Plan* (Roads and Maritime, 2013) (refer to Section 7.2). Various consultation activities and tools have been implemented under the plan before and during the development of the EIS (refer to Section 7.3 and Section 7.4). Through these activities and tools, feedback has been gathered from government agencies, stakeholders and the community in regards to the project (refer to Section 7.5). Feedback received has been considered during the preparation of this EIS and the project's concept design.

Roads and Maritime will continue to consult government agencies, stakeholders and the community during the next stages of the project. The implementation of a community consultation strategy will assist this process. The strategy clearly establishes procedures for distributing information, receiving and responding to feedback; and establishes procedures for resolving community complaints (refer to Section 7.7.3).

Table 7-1 lists the Director-General's environmental assessment requirements relevant to consultation, and where they are addressed in this chapter.

Table 7-1 Director-General's environmental assessment requirements relevant to consultation

Director General's environmental assessment requirements	Where addressed in EIS
During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners.	
Local, State and Commonwealth government authorities include: - Environment Protection Authority. - Office of Environment and Heritage (including Heritage Division). - The Heritage Council of NSW. - Department of Primary Industries. - NSW Office of Water. - Clarence Valley Council.	Section 7.4.3 and Section 7.6.1
Consultation with specialist interest groups, including Local Aboriginal Councils and Aboriginal stakeholders.	Section 7.4.1, Section 7.4.2, Section 7.5 and Section 7.6.2
Consultation with utilities and service providers.	Section 7.4.3 and Section 7.6.1
Consultation with the public, including community groups and adjoining and affected landowners.	Section 7.4.1, Section 7.4.2 and Section 7.6.2

Director General's environmental assessment requirements	Where addressed in EIS
The EIS must describe the consultation process and the issues raised, and identify where the design of the project has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.	Section 7.3, Section 7.4 and Section 7.5
A draft Community Consultation Strategy identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback and procedures for resolving community complaints. Key issues that should be addressed in the draft Strategy should include: - Traffic management (including property access, pedestrian access). - Landscaping/urban design matters. - Construction activities including out-of-hours work. - Noise and vibration mitigation and management.	Section 7.7.3 and Appendix C

7.1 Consultation objectives

The project objectives discussed in Section 3.3 include a consultation objective for the project:

Involve all stakeholders and consider their interests.

Supporting objectives for this consultation objective are to:

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

7.2 Community Liaison Plan

Roads and Maritime has been implementing a *Community Liaison Plan* (Roads and Maritime, 2013) throughout the various project stages, including: route options development, assessment and selection of the preferred option, concept design, and preparation of the EIS. The plan has been updated for each project stage, with updates occurring in July 2010, December 2010, September 2012 and November 2013.

The *Community Liaison Plan* outlines:

- Strategies for community liaison and consultation, and how the project team will engage with the community during the concept design and preparation of the EIS
- Communication activities to implement these strategies
- How the community liaison process will be monitored, evaluated and reported back to the community
- How community issues, ideas and concerns, along with information from the technical and environmental investigations, will help the project team to prepare the concept design and EIS.

The *Community Liaison Plan* outlines the following priorities:

- Engage with the local council and the business community, as well as potentially directly affected landowners and other key stakeholders
- Clearly explain the need for and purpose of a second crossing and its relationship to any future upgrading of the Summerland Way
- Engage with the community to refine the preliminary concept design
- Provide a clear description of the project, its potential impacts and measures which Roads and Maritime will propose to manage any adverse impacts. This will be documented in the EIS, to be prepared in accordance with the Director-General's environmental assessment requirements under Part 5.1 of the *Environmental Planning and Assessment Act 1979*
- Engage with the community and key stakeholders to better understand their issues and concerns and provide opportunities for feedback.

The *Community Liaison Plan* states that a range of consultation and communication tools will be used to inform and involve the community and provide opportunities for the community to provide feedback. The consultation approach will be transparent and potentially refined over time based on community feedback. The plan will continue to apply to all stages of the project to ensure the continued implementation of adequate and appropriate consultation with stakeholders.

Consultation for the EIS has been consistent with the guidelines contained in the Roads and Maritime document, *Community Engagement and Communications: A resource manual for staff* (Roads and Maritime, October 2012).

7.3 Community and stakeholder consultation before the preparation of the EIS

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 Roads and Maritime (formerly Roads and Traffic Authority) announced a revised approach to engage more effectively with the community and stakeholders in identifying a preferred route for an additional crossing. The steps followed to identity the preferred option are outlined in Figure 7-1.

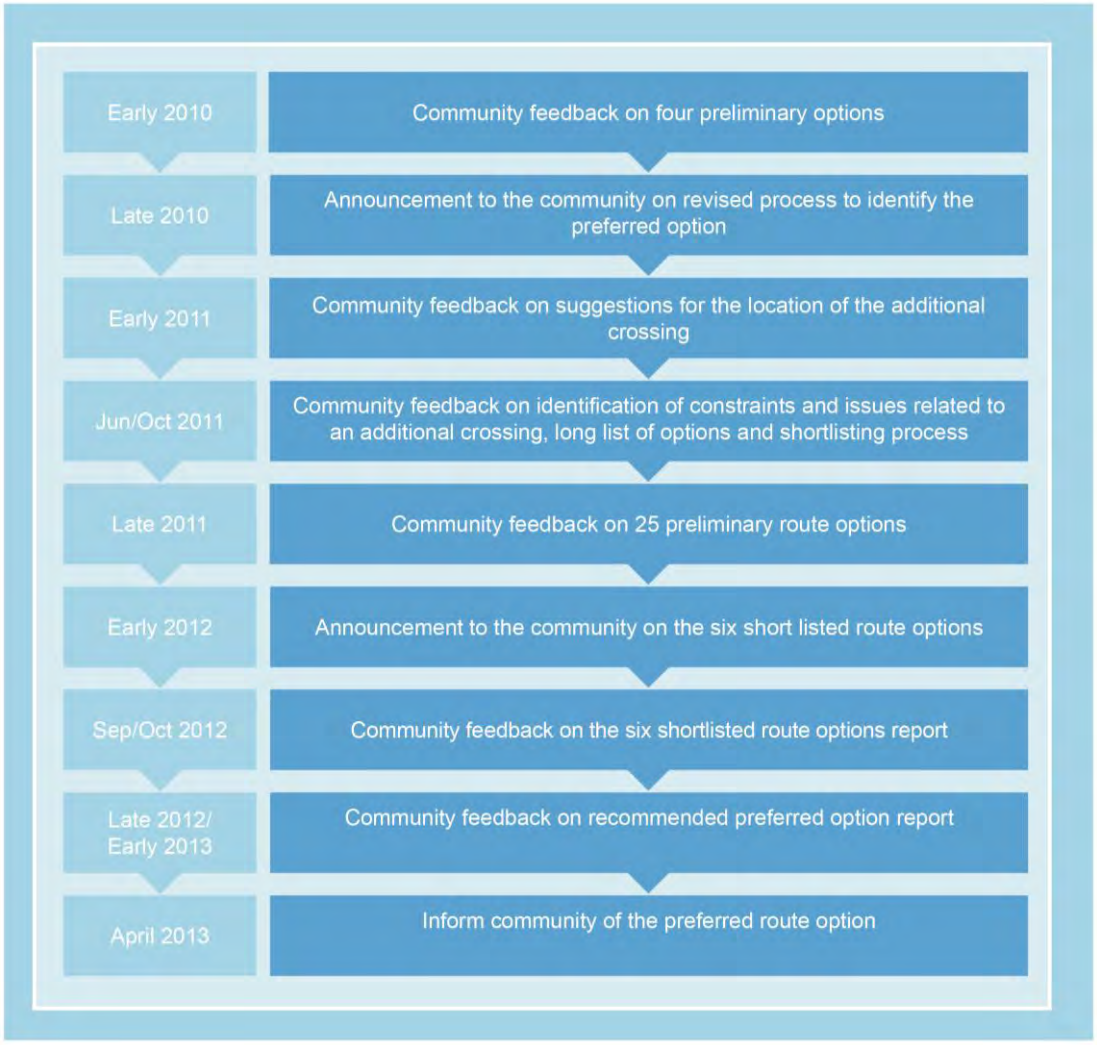

Figure 7-1 Consultation process before the EIS

Consultation carried out before the EIS involved a range of communication activities to seek input, identify issues and help identify the preferred option. Refer to Section 4.2 for more information on the option development process for the project. Communication activities included:

- A dedicated project website (www.rms.nsw.gov.au/graftonbridge)
- A dedicated project telephone line (1800 633 332)
- A dedicated project email address (graftonbridge@rms.nsw.gov.au)
- 'Community update' newsletters at key stages of the project
- Project update letters from the project manager and project director
- Online interactive maps and traffic modelling videos
- Online discussion forums
- Public forums
- Community and stakeholder briefing sessions
- Radio forums
- Public displays of studies and investigation reports
- Staffed and unstaffed project displays at various locations
- Information sessions

- Telephone surveys and telephone contact with property owners potentially directly affected
- Aboriginal community consultation, including consultation with the Grafton Ngerrie Local Aboriginal Land Council, following the procedures outlined in the Roads and Maritime document, *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (Roads and Maritime, 2011a) and the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* 2010 (DECCW, 2010)
- Invitations to comment on the published reports at key stages of the project. Feedback on the published reports was received at the staffed displays, information sessions, via the project website, mail, the toll-free project information line, email and hand delivery
- Roads and Maritime staff available to talk with the community, directly affected and nearby landowners one-to-one at the Prince Street, Grafton office
- Face-to face-meetings with government agencies and stakeholder groups.

Roads and Maritime has considered all issues raised by the community and stakeholders during the consultation process. Where possible, these issues were addressed during the route selection process and incorporated into the preferred option. The consultation process and the results of consultation are detailed in the following reports:

- *Preferred Option and Submissions Report* (Roads and Maritime, 2013)
- *Recommended Preferred Option Report: Appendix 1 Route Options Submissions Report* (Roads and Maritime, 2012)
- *Draft Route Options Community Feedback Report* (Roads and Maritime, 2012)
- *Route Options Development Report, Volume 1 – Main Report: Appendix 1 Community feedback January to June 2012* (Roads and Maritime, 2012)
- *Preliminary Route Options Report – Final, Volume 1 – Main Report: Appendix 3 – Community Feedback* (Roads and Maritime, 2012)
- *Postal Survey December 2010 to March 2011 Feedback Report* (Roads and Maritime, 2011)
- *Telephone Survey Report* (Roads and Maritime, 2011)
- Online Business Survey Report (Roads and Maritime, 2011).

These reports are available on the project website at www.rms.nsw.gov.au/graftonbridge or by contacting the project team.

7.4 Community and stakeholder consultation during the preparation of the EIS

Consultation for the EIS started in September 2013 when the community was informed that the project was being assessed as a State significant infrastructure project. The State significant infrastructure application was made publicly available on the Department of Planning and Environment website.

The consultation for the EIS built on earlier consultation processes for the project, ensuring key stakeholders and the community were informed and able to provide input to the EIS.

The EIS consultation process was guided by the Roads and Maritime document, *Community Engagement and Communications: A resource manual for staff* (Roads and Maritime, 2012) and is consistent with the Director-General's environmental assessment requirements for consultation.

7.4.1 Stakeholders consulted

Stakeholders consulted by Roads and Maritime during the preparation of this EIS are listed in Table 7-2. Stakeholders include State government agencies, Aboriginal stakeholders, utility service providers, community groups and affected landowners.

Table 7-2 Stakeholders consulted

Stakeholder group	Stakeholder
Government agencies	Department of Planning and Environment Environment Protection Authority Office of Environment and Heritage including the Heritage Division and Heritage Council of NSW Trade and Investment (Crown Lands Division) Department of Primary Industries (Fisheries, Office of Water and Agriculture) NSW Office of Water Clarence Valley Council Roads and Maritime Services (Maritime) Transport for NSW Emergency Services (including NSW Police, NSW Fire Brigade, NSW Ambulance, SES) Australian Rail Track Corporation.
Aboriginal stakeholder	Grafton Ngerrie Local Aboriginal Land Council (refer to Section 7.5)
Utility service providers	Clarence Valley Council (water, sewerage, stormwater) National Broadband Network Other providers.
Community	Directly affected landowners and tenants Adjoining landholders and tenants North Coast TAFE Transport and heavy vehicle operators Local environmental groups Recreational river user groups Local businesses of Grafton and South Grafton Grafton Chamber of Commerce & Industry South Grafton Progress Association Tourism operators River Historical Society Interest groups and resident groups.

7.4.2 Key consultation activities

Roads and Maritime used a range of consultation methods and activities to engage and inform stakeholders during the preparation of this EIS. These methods and activities, and their timing, are presented in Table 7-3 and described in the sections below.

Table 7-3 Key consultation activities during preparation of the EIS

Activity/Method	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Community and stakeholder management system	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Project website, phone line and email	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Interactive maps	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Project manager's update		✓		✓				✓					
Community update		✓		✓									
Community information displays (staffed)					✓								
Community information displays (unstaffed)					✓	✓	✓	✓	✓	✓	✓	✓	✓
Newspaper advertisements and media release				✓									
Stakeholder database email		✓		✓				✓					
Letters to directly affected landowners				✓									
Consultation with registered Aboriginal stakeholder		✓	✓	✓		✓	✓						
Consultation with various community stakeholders	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Community and stakeholder management system

The project has a dedicated community and stakeholder management system which has been used to record and manage communication with the community, stakeholders and government agencies. The system was also used for the ongoing logging, tracking and monitoring of all correspondence, enquiries and complaints related to the project.

Dedicated project website, phone line and email address

The dedicated project website, set up at the beginning of the project, continued to be used during the preparation of the EIS. The website provides useful information to the community including project status, project manager's updates, maps, latest news, documents and reports, and project contact details. The website was also used to promote the display of the project's preliminary concept design for the EIS.

The project's dedicated toll-free phone line (1800 633 332) and email address (graftonbridge@rms.nsw.gov.au) have continued operating during the preparation of the EIS to optimise community input. The phone line was answered during business hours (8am–5pm weekdays) while the voicemail service was activated outside business hours, enabling callers to leave a message that could be returned the next business day.

In November 2013, the Roads and Maritime project manager for the Grafton Bridge project provided a project update to the community seeking community comment on the preliminary concept design for the EIS. This update is still available on the project website and was sent via email to the stakeholder database.

Online interactive maps

The project's website provides an interactive online map showing the preliminary concept design for the EIS that enabled community members to view the project design.

Community update

In September 2013 Roads and Maritime published a community update announcing the preparation of the EIS for the project.

In November 2013 Roads and Maritime published a community update providing information on the status of the project and seeking feedback on the preliminary concept design for the EIS. The update invited comments to be delivered by post, email, phone or hand by 20 December 2013.

The September and November 2013 community updates are available on the project website or by contacting the project team.

Community information displays

Staffed community information displays were held at the Grafton community information centre (59 Duke Street, Grafton) on Thursday 12 December and Friday 13 December 2013. Staffed displays provide an opportunity for the community to speak with members of the project team, discuss the preliminary concept design for the EIS, provide feedback or ask project related questions.

Static (unstaffed) displays of the preliminary concept design for the EIS were provided at the following locations:

- Roads and Maritime Services Motor Registry Office, 3 King Street, Grafton
- Roads and Maritime Services Regional Office, 76 Victoria Street, Grafton
- Ulmarra Petrol Station/Post Office, Pacific Highway, Ulmarra
- South Grafton News and Gifts, 38 Skinner Street, South Grafton
- General Store Coutts Crossing, Armidale Road, Coutts Crossing
- Junction Hill Family Store, 5 Casino Road, Junction Hill.

A display of the preliminary concept design was also placed in Roads and Maritime's Pacific Highway office at 21 Prince Street, Grafton. Project team members were available during business hours if members of the public wished to discuss the project in detail, or provide feedback.

Newspaper advertisements and media release, stakeholder database email and letter to directly affected landowners

Roads and Maritime informed the community about the preliminary concept design for the EIS via newspaper advertisements and a media release published in the *Daily Examiner*, *Clarence Valley Review* and *Coastal View*.

Concurrently, Roads and Maritime sent an email invitation to attend the staffed displays and provide feedback on the preliminary concept design to members of the community registered in the stakeholder database. Personalised letters and copies of the community update were also posted to property owners who would be directly impacted by the preliminary concept design.

Consultation with various community and stakeholders

Other consultation activities with stakeholders included:

- Individual meetings and follow-up correspondence and/or phone calls with directly affected landowners and adjoining landowners
- Meetings with local businesses including businesses along Iolanthe Street, South Grafton; and Pound Street, Grafton

- Meetings with the North Coast TAFE
- Meetings with individual community members who had requested more information specific to the project, such as impacts on amenity, and potential mitigation measures
- A letter drop to businesses in the Iolanthe Street precinct regarding potential changes to access and on-street parking
- A meeting with the local preschool to allow the children to express their ideas regarding the bridge and contribute as members of the community on aspects of the project.

7.4.3 Consultation with government agencies and public utility providers

Department of Planning and Environment convened a planning focus meeting in Grafton on 16 September 2013, which was attended by representatives from various government agencies including Office of Environment and Heritage and Clarence Valley Council.

In addition to the planning focus meeting, meetings, email correspondence and phone discussions were held with various agencies and public utilities to discuss the project and get feedback on potential issues of concern and to resolve such issues. Table 7-4 provides a summary of the organisations and agencies consulted, and how and when they were consulted during preparation of this EIS.

Table 7-4 Consultation with government agencies and public utilities

Name	Consultation
Department of Planning and Environment	• 20 November 2013: meeting
Environment Protection Authority	• 4 February 2014: meeting
Office of Environment and Heritage (including the Heritage Division)	• 5 September 2013: meeting • 9 October 2013: email correspondence • 20 November 2013: meeting • 4 December 2013: email correspondence • 5 March 2014: letter • 19 June 2014: letter
Heritage Council of NSW	• 20 November 2013: meeting
Department of Finance and Services (Crown Lands Division)	• 31 January 2014: meeting
Department of Primary Industries (Fisheries, Office of Water and Agriculture)	• 18 March 2014: meeting
NSW Office of Water	• 27 March 2014: letter
Clarence Valley Council	• 10 December 2013: meeting • 6 February 2014: meeting • 10 February 2014: meeting with planners and councillors

Name	Consultation
Road and Maritime Services (Maritime)	• 3 March 2014: meeting
Transport for NSW	• Ongoing
Emergency Services (including NSW Police, NSW Fire Brigade, NSW Ambulance, SES)	• 19 March 2014: Meeting with SES • Consultation with other Emergency Services carried out during route development phase.
Australian Rail Track Corporation	• 1 October 2013: meeting • 28 November 2013: letter on preliminary concept design • November–December 2013: Correspondence and phone calls during geotechnical investigations • January–February 2014: Emails and phone calls for EIS investigations
Clarence Valley Council (water and sewer)	• Regular consultation carried out with the appropriate representatives from Clarence Valley Council.
Public utility services	• Ongoing

7.5 Consultation with Aboriginal stakeholders before and during EIS

7.5.1 Consultation framework

Roads and Maritime has consulted with the Aboriginal community throughout the development of the project to identify cultural heritage values and the potential impacts of the project. Consultation has been in accordance with:

- *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (Department of Environment and Conservation, 2005)
- *RTA Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (RTA, 2008); the procedure was updated in November 2011, and consultation subsequently followed the updated process
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010).

7.5.2 Consultation methodology

Aboriginal community consultation involved the following steps:

Notification, identification and registration of stakeholders

Roads and Maritime notified, identified and registered relevant stakeholders to be consulted in accordance with the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (RTA, 2008). This step involved:

- Sending letters to relevant agencies and organisations to notify them of the project and determine the relevant knowledge holders within the Grafton and South Grafton area. The letters were sent between 8 and 10 March 2010. A second letter was sent on 22 December 2010

- Publishing public notices (notice given to the public regarding the project) on 1 March 2010. These were reissued on 22 January 2011
- Registering stakeholders. Two responses were received from Aboriginal stakeholders wishing to register for consultation, these were: the Grafton Ngerrie Local Aboriginal Land Council and an individual stakeholder. Following attempted correspondence with the individual stakeholder in December 2010, Roads and Maritime was advised that the individual stakeholder had recently passed away. As such, the Grafton Ngerrie Local Aboriginal Land Council is the only registered Aboriginal party for the project.

Consultation during route selection

The Grafton Ngerrie Local Aboriginal Land Council was consulted for the route options identification, development, assessment and selection of the preferred option for the project. Consultation occurred between May 2011 and April 2012 (refer to Chapter 4 for more information on the route selection process).

Consultation consisted of Aboriginal focus group meetings to:

- Identify relevant knowledge holders
- Determine the extent of Aboriginal cultural constraints relevant to the project
- Identify impacts and issues pertaining to each option.

Aboriginal consultation activities and outcomes are documented in the *Route Options Development Report Technical Paper: Aboriginal Heritage* (Biosis, 2012) and summarised in Table 7-5.

Table 7-5 Aboriginal consultation during route selection

Activity and date	Outcome
Aboriginal focus group meeting 10 May 2011	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 to investigate the extent of several Aboriginal cultural sites, particularly: • The Golden Eel site • Elizabeth Island • Susan Island.

Activity and date	Outcome
Aboriginal focus group workshop 28 June 2011	Several areas were identified as culturally significant and requiring further consultation to determine constraints. Grafton Ngerrie Local Aboriginal Land Council indicated it would consult with community members regarding the cultural significance of the following areas and constraints on route options: • Elizabeth Island • Alipou Creek • Swan Creek. Grafton Ngerrie Local Aboriginal Land Council indicated it would provide a report on the cultural constraints, but this was not provided. It was indicated at the workshop that Elizabeth Island may be important to men as well as, or instead of, women. Susan Island is not impacted by any of the route options and would not require further investigation. The restricted site cards for sites 12-6-0326 and 12-6-0327 could not be obtained in time for the workshop.
Aboriginal Focus Group meeting 1 July 2011	The following feedback was received at the meeting with Local Aboriginal Land Council representative: • Elizabeth Island was identified as a sacred Aboriginal men's site with high significance for the Aboriginal community. As such, no disturbance should occur on any part of the island, and any preliminary route option that would impact on Elizabeth Island should be removed from the list of options • 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 cannot be impacted on. 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 once the alignment options are narrowed down and plans refined • 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 were identified as impacting on Aboriginal places and objects of cultural significance, as traditional Aboriginal people were nomadic. All country was identified as significant, in addition to the spirituality entwined throughout the landscape. Therefore, it was considered impossible for development not to impact on Aboriginal culture and heritage.

Activity and date	Outcome
Council feedback on the Draft Preliminary Route Options Report, Technical Paper: Aboriginal Heritage (Biosis, 2011)	The following feedback was received via email from the CEO of the Grafton Ngerrie Local Aboriginal Land Council: • The Local Aboriginal Land Council expressed concern about the level of detail provided in the report on the location of Aboriginal artefacts and places. Following discussion, it was agreed that a public and private version of the report would be produced. The Land Council requested that Figure 3 of the 2011 report and precise locations of Aboriginal artefacts and places be removed from the public version of the report • The Land Council indicated it would like to assess low impact areas such as buildings and roads if these are to be disturbed in any way, as the Aboriginal community was not afforded the chance to assess these areas when they were initially developed. Due to the high significance of the area it was considered highly likely that Aboriginal heritage sites would be present • The Land Council also asked that the following statement be added to the report: "It is the Grafton Ngerrie Land Council's opinion that all developments will impact on Aboriginal Culture and Heritage as all country whether it has been developed or not it is of significance to Aboriginal people and we must be afforded the opportunity to be fully involved in all aspects of the development and construction of the additional crossing of the Clarence river at Grafton." • Feedback received was incorporated in the final issue of the report.
Aboriginal Focus Group meeting 10 November 2011	The group discussed the potential impacts and issues of each option. The group provided indicative scoring for Aboriginal heritage values for each of the route options on a corridor by corridor basis, and provided reasoning for the scoring. Grafton Ngerrie Local Aboriginal Land Council raised concerns about the initial alignment of Option C (now the preferred option), due to the proximity of the proposed bridge to Alipou Creek and the Golden Eel site in South Grafton. These concerns were considered and addressed by Roads and Maritime by refining the alignment to increase the separation between the proposed bridge and the Golden Eel site.

Consultation for the preparation of the cultural heritage assessment for the EIS

Consultation during this stage focused on Option C (refer to Chapter 4 for more information on the route selection process) and, subsequently, the project that is subject to this EIS and the proposed Aboriginal cultural heritage assessment process and methodology.

Consultation activities comprised face-to-face meetings, follow-up phone calls and email correspondence. These activities are summarised in Table 7-6.

Table 7-6 Aboriginal consultation during preparation of the cultural heritage assessment

Activity and date	Outcome
Aboriginal focus group meeting with Grafton Ngerrie Local Aboriginal Land Council representative 17 January 2013	The meeting discussed: • The modified Option C route, which had been identified as the preferred option • Preliminary strategies to protect the Golden Eel site during construction as well as during the EIS investigations • Interpretative signage • Managing culturally sensitive information appropriately. Roads and Maritime was requested to provide maps for the January Elders Council.
Aboriginal focus group meeting with Grafton Ngerrie Local Aboriginal Land Council representative 30 April 2013	The Grafton Ngerrie Local Aboriginal Land Council noted that the preferred route option was discussed at the latest Council meeting. While some members of the land council were concerned about potential impacts on the Golden Eel site, overall there was a feeling that the land council could work with the modified version of Option C and still protect the mouth of the Alipou Creek, which has significant associations with Golden Eel site. Options for mitigating impacts from both construction and early geotechnical work were discussed, including fencing off the area around the mouth of Alipou Creek to avoid possible disturbances. Further, the possibility of a plaque and seating area that would signify the importance of the area to the local Aboriginal dreamtime stories was proposed by the Council. Subsequently, Roads and Maritime erected a temporary pedestrian-proof fence to separate the study area and Alipou Creek to avoid potential impacts from the EIS investigations. It was agreed this approach should also be used during construction.
Aboriginal focus group meetings with Grafton Ngerrie Local Aboriginal Land Council representative 17 July 2013 17 September 2013	These meetings discussed the project methodology pack, which was provided to Grafton Ngerrie Local Aboriginal Land Council on 17 July 2013. The pack outlines the proposed Aboriginal cultural heritage assessment process and methodology.
Local Aboriginal Land Council feedback on the project methodology pack 24 September 2013	The Grafton Ngerrie Local Aboriginal Land Council emailed a written response on the project methodology pack on 24 September 2013. The response did not raise any issues or concerns with the proposed project methodology. However, it requested that if artefacts/objects were found/located during the investigation: • The Local Aboriginal Land Council Board of Directors be consulted and a meeting organised to discuss, in consultation with Aboriginal site officers, any further actions to be carried out with artefacts/objects.

Activity and date	Outcome
Aboriginal focus group meeting with Grafton Ngerrie Local Aboriginal Land Council representative 6 February 2014	This meeting discussed the following matters: • The proposal for a temporary boat launching facility to be used during the construction of the project. The land council was asked if it had any comments on this facility • The shift of the bridge alignment about 3 metres closer to the Alipou Creek. The land council was provided with a map and asked if it had any comments on this change in alignment. Roads and Maritime requested a meeting be organised with the Grafton Ngerrie Local Aboriginal Land Council elders to discuss the Alipou Creek area and the elders' knowledge of cultural significance. Roads and Maritime requested written feedback on these items on 6, 12 and 18 February 2014. Grafton Ngerrie Local Aboriginal Land Council responded on 12 February 2014 to indicate that these information requests were being followed up, but no further information was provided.
Phone discussion with Grafton Ngerrie Local Aboriginal Land Council 18 March 2014	This phone conversation between Roads and Maritime and the Grafton Ngerrie Local Aboriginal Land Council CEO discussed the information on the Golden Eel site already made available to the project, the recognition of the site's cultural significance in project documents and the EIS, the protection of the area provided during EIS investigations and the mitigation measures to be implemented during project construction. Given the issues covered in this discussion, and given that Aboriginal elders had not yet responded to the request by Roads and Maritime for a meeting, it was agreed during the phone discussion that a meeting with Aboriginal elders was not necessary.

Feedback on the Draft Aboriginal Cultural Heritage Assessment Report

A draft of the *Aboriginal Cultural Heritage Assessment Report* provided in Appendix H was provided to the only registered Aboriginal party for the project (the Grafton Ngerrie Local Aboriginal Land Council) on 22 May 2014 for review and comment.

A period of 28 days was given to provide comments. Feedback received from the Local Aboriginal Land Council was as follows:

- The council is keen to see some interpretive signage opportunities around the bridge and noted opportunities for this are already included in *Appendix H, Technical Paper: Aboriginal Cultural Heritage Assessment*
- The council is keen to ensure a pedestrian proof fence is provided during construction to protect the Alipou Creek area and noted this mitigation measure is already included in *Appendix H, Technical Paper: Aboriginal Cultural Heritage Assessment*
- The council wishes to include in *Appendix H, Technical Paper: Aboriginal Cultural Heritage Assessment* opportunities for council site officers being used on site during construction to assist in identifying items of Aboriginal cultural heritage significance. Roads and Maritime acknowledges this request but considers council site officers would not be required during construction as the project area is considered to have low potential for Aboriginal archaeological sites. Nonetheless, in the event that unexpected Aboriginal cultural material or skeletal remains are encountered, Roads and Maritime would implement the *Standard Management Procedure for Unexpected Archaeological Finds* (Roads and

Maritime, 2012). This procedure outlines the involvement of Aboriginal registered parties during construction where required (refer to Section 8.6).

7.6 Summary of issues raised during EIS consultation and preliminary concept design display

Communication and consultation activities during the route development and preliminary concept design phases provided the project team with an understanding of the context of the key stakeholders and their expectations. Issues raised by the community, State government agencies, Aboriginal stakeholders, utility service providers, community groups and affected landowners have been recorded and have informed the concept design and preparation of this EIS.

It is anticipated input from the community during the EIS consultation period will continue to inform the detailed design of the project. The following sections present a summary of the issues raised.

7.6.1 Issues raised by government agencies and public utility services

A summary of the issues raised by government agencies and utility service providers during the consultation held by Roads and Maritime and where they are addressed in this EIS are presented in Table 7-7.

Table 7-7 Issues raised by government agencies

Project related issues raised	Where addressed in EIS
Department of Planning and Environment	
Ensuring Aboriginal and non-Aboriginal archaeological assessment methodology is designed appropriately for the project	Section 8.5, Section 8.6, Appendix G and Appendix H
Environment Protection Authority	
Ensuring adequate water quality monitoring during the project	Section 8.10
Ensuring contaminated land is assessed with further investigations and remediation if required	Section 8.10
Ensuring mitigation measures are included for out of standard work hours to reduce noise disruption to community	Section 8.4
Office of Environment and Heritage (including Heritage Council of NSW)	
Reduce impacts on Alipou Creek and the Golden Eel site Reduce impacts on areas of Aboriginal archaeological potential	Section 8.6 and Appendix H

Project related issues raised	Where addressed in EIS
Integration of project with respect to non-Aboriginal heritage Reduce impacts to existing bridge (State listed heritage item) Reduce direct impacts on non-Aboriginal heritage items and relics Reduce impacts on areas of non-Aboriginal archaeological potential Ensure a maritime archaeological survey is carried out to identify items which may be impacted	Section 8.5 and Appendix G
Reduce impacts on significant trees Reduce impacts on the Endangered Ecological Community freshwater wetland on coastal floodplain Reduce impact on threatened microbats	Section 8.9 and Appendix L
Reduce impacts on properties outside the levee and provide mitigation measures for these properties Ensure adequate drainage strategy for the low point on Pound Street, Grafton Reduce downstream flooding impacts	Section 8.2 and Appendix D
NSW Finance and Services (Crown Lands Division)	
Assess impacts on Crown land leasing and acquisition requirements	Section 8.7
Department of Primary Industries (Fisheries, Office of Water and Agriculture)	
Ensuring consultation with local fishing businesses	Section 8.7
Ensuring techniques are used to avoid or minimise impacts on fish and fish habitat where piles are located close to the bank within a waterway.	Section 8.9
NSW Office of Water	
No issues were raised	
Clarence Valley Council	
Ensure project integration with Council's strategic planning	Section 3.1
Project boundaries for incorporation into the local environmental plan	Chapter 5
Identify project constructability method to minimise impacts Identify potential ancillary facility locations to minimise impacts Estimated construction workforce figures	Chapter 6

Project related issues raised	Where addressed in EIS
Minimise impacts to access and connectivity during construction and operation of the project Ensuring pedestrians and cyclists safety between different land uses and residential areas	Section 8.7 and Appendix D
Reduce impacts on the maritime traffic	Section 8.1 and Appendix D
Ensure consultation with business owners on Pound Street Ensure consultation with maritime users	Section 8.7 and Chapter 7
Minimise impacts on Council owned land	Section 8.7
Minimise impacts to flood evacuation route Ensure modelling is done for smaller to larger flood events Identify extent of upstream flood mitigation measures required Minimise impacts of the piers on river flow direction (turbulence)	Section 8.2 and Appendix E
Minimise noise impacts generated by traffic	Section 8.4 and Appendix F
Identify and minimises urban design issues on Grafton's northern approach Minimise visual impacts Identify opportunities to improve amenity of entrance to Grafton	Section 8.8 and Appendix J
Road and Maritime Services (Maritime)	
Ensure consultation with river uses regarding the project	Chapter 7
Ensure adequate lighting on the new bridge and piers so river users are aware of the location	Section 5.2.9
Transport for NSW	
Ensure project meets future traffic growth	Chapter 4, Section 8.1 and Appendix D
Ensure project includes growth predicted in Clarenza	Chapter 3, Section 8.1 and Appendix D
Emergency Services	
Ensure no worsening in regards to evacuation routes	Section 8.1, Section 8.2 and Appendix D
Australian Rail Track Corporation	
Ensure impacts on a heritage items within ARTC land are assessed	Section 8.5 and Appendix G

Project related issues raised	Where addressed in EIS
Ensure impacts of replacing Pound street viaduct are assessed	Section 6.2.7 and Chapter 8
Public utility services	
Accommodate NBN cable on the new bridge	Section 9.2
Department of Education and Communities (TAFE)	
Ensure safe access to and from the TAFE for all users	Section 5.2.2, Section 5.2.5 and Section 8.1
Ensure similar number of parking is maintained around the TAFE	Section 8.1
Ensure project addresses construction and operational traffic noise	Section 8.4

7.6.2 Issues raised by the community and other stakeholders

A summary of all the issues raised by the community and other stakeholders during the preliminary concept design display and the EIS consultation held by Roads and Maritime, and where they are addressed in this EIS, are listed in Table 7-8. A community feedback report was also published on the project website. Feedback received by Aboriginal stakeholders is discussed in detail in Section 7.5.

Table 7-8 Summary of community and stakeholder issues

Issues raised	Where addressed in EIS
Timeline and constructability	
Comments regarding timing for the new bridge in starting construction soon so there are no more delays in building bridge.	Chapter 6.1.2
Traffic, transport and access	
There was concern about loss of parking spaces outside Pound Street businesses.	Section 8.1 and Appendix D
Ensure access to Pound Street businesses is maintained during construction	Section 8.1 and Appendix D
Suggestion with the southern end of Pound Street being cut off from the rest of Pound Street, affecting connectivity, provisions should be made on alternate streets to accommodate increased traffic.	Section 8.1 and Appendix D
Comments were made regarding the need to link the pedestrian and cycle path between the existing and new bridges.	Section 5.2.5, Section 8.1 and Appendix D
Greaves Street, Grafton should be made into a cul de sac to stop traffic using this once Kent Street and Pound Street are cut.	Section 8.1and Appendix D

Issues raised	Where addressed in EIS
No traffic signals in Grafton, and if pedestrian/cycle paths were needed these should be provided with overpasses.	Section 4.3.5
The number of traffic lanes on the new bridge should be increased for the future and if the existing bridge falls down.	Section 5.2.1, Section 8.1 and Appendix D
There was concern that emergency vehicles would suffer as a result of the bridge location – would be better served with out of town option.	Section 8.1
Several comments were made about roundabouts in South Grafton, and trucks rolling over when using them.	Section 8.1 and Appendix D
River access and use	
Location of construction work zones and timing of construction	Section 6.3 and Section 6.1.2
Impacts on existing sailing courses and safety issues related to navigation	Section 8.1.4, Section 8.1.5 and Section 8.7.4
Consultation during the EIS exhibition and construction	Section 7.7
Ensure adequate pier spacing for river-based competition events	Section 5.2.1
Flooding and hydrology	
Evacuation routes for residents along Butters Lane, South Grafton, during construction need to be accommodated.	Section 8.1
Residents in Butters Lane were concerned about river scour and during floods more of the bank being eroded due to the new bridge.	Section 8.2 and Appendix E
Socio-economic, property and land use	
Concern that there would be fragmentation of residential properties in Grafton as a result of the new bridge.	Section 8.7 and Appendix I
Questions were raised about the use of excess land in Grafton following the project completion, given there would be areas around Greaves Street left vacant.	Section 8.7 and Appendix I
Soil, sediments and water	
Impacts on turbidity of the Clarence River.	Section 8.10
Visual amenity, built form, urban design	
Suggestion to use Jacaranda trees in the landscape plan.	Section 8.8 and Appendix J

7.7 Future consultation

Following the exhibition of this EIS, Roads and Maritime will continue to identify and manage issues of interest or concern to the community during the assessment and approval process and, if the project is approved, during its construction. The aims of ongoing communications and consultation are to provide the community with:

- Accurate and accessible information regarding the processes and activities associated with the project
- Information in a timely manner
- Appropriate avenues for providing comment or raising concerns which are well publicised to the community
- A high level of responsiveness to issues and concerns raised throughout development and delivery of the project

7.7.1 Consultation during the exhibition of the EIS

The EIS will be placed on public exhibition by Department of Planning and Environment for a minimum of 30 days. As a minimum it will be available for viewing at previously used locations, including:

- Roads and Maritime Services Pacific Highway Office, 21 Prince Street, Grafton
- Roads and Maritime Services Regional Office, 76 Victoria Street, Grafton
- Clarence Valley Council, 2 Prince Street, Grafton
- Clarence Valley Council, Maclean office, 50 River Street, Maclean
- Maclean Library, Stanley Street, Maclean
- Grafton Library, 126-144 Pound Street, Grafton.

The EIS will be also available for viewing at the Roads and Maritime and the Department of Planning and Environment websites.

Roads and Maritime will be holding staffed displays and stakeholder/community meetings during the exhibition of the EIS to enable community members to ask questions and to provide feedback to the project team. Staffed displays will be held at local community facilities accessible to the Grafton and South Grafton communities and other interested stakeholders.

During the EIS exhibition, the community, government agencies and other interested parties are being invited to make written submissions on the project to Department of Planning and Environment.

7.7.2 Consultation and assessment after the exhibition of the EIS

Following the exhibition of this EIS, the Secretary will provide copies of submissions to Roads and Maritime or a report containing a summary of the issues raised. The Secretary may then require Roads and Maritime to prepare a submissions report to respond to the issues raised in submissions, and may require a preferred infrastructure report to outline any proposed changes to the proposed project. If significant changes to the project are proposed, the Secretary may make the preferred infrastructure report publicly available.

The Secretary will prepare an environmental assessment report and provide it to the Minister for Planning. The Minister for Planning will then decide whether or not to approve the project as well as any relevant conditions to be attached.

7.7.3 Community consultation strategy during construction

Should the project be approved, Roads and Maritime would continue to consult with community and stakeholders during the construction stage.

Roads and Maritime has prepared a draft community involvement plan to inform and engage community and stakeholders in a constructive, transparent and fair process. The plan encourages public participation at the next phases of the project, including building and commissioning.

Under the plan, community and stakeholder involvement is tailored to each phase of the project, enabling appropriate consideration and balancing community and stakeholders' social, economic, environmental and functional issues to achieve the best project outcomes.

Community involvement for further stages of the project is presented in *Appendix C: Draft Community Consultation Strategy*. The strategy outlines community and stakeholder involvement tailored to each phase of the project, enabling appropriate consideration and balancing of community and stakeholders' social, economic, environment and functional issues to achieve best project outcomes.

A foundation of ongoing two-way communication during the preconstruction and construction phases of the project will be used to effectively address and manage issues as they emerge and support the delivery of optimum outcomes for the project, stakeholders and the broader community.