APPENDIX M

Air Quality Assessment

FINAL REPORT

RTA Operations - Environmental Technology

Air Quality Assessment for the Proposed Additional Crossing of the Clarence River at Grafton

December 2003

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FINAL REPORT

Air Quality Assessment for the Proposed Additional Crossing of the Clarence River at Grafton

December 2003

Reference: 0010401AQrp2

For and on behalf of
Environmental Resources Management Australia

Approved by: Murray Curtis

Signed: 

Position: Project Director

Date: 25 November 2003

LIST OF TABLES

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EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd (ERM) has been commissioned by RTA Environmental Technology to investigate the selection of an additional crossing of the Clarence River at Grafton in terms of potential impacts upon local air quality.

It can be expected that emissions to the atmosphere would be emitted during the construction and operation phases of the additional crossing. Emissions to the atmosphere during the construction phase would predominantly be emitted from the exhaust of construction equipment and dust generated during earthworks and from exposed surface areas. Emissions to the atmosphere during operation would predominantly be emitted from the combustion of fuel used in vehicles. Typical emissions for both phases include carbon monoxide, nitrogen oxides, hydrocarbons, particulate matter and carbon dioxide.

This assessment is qualitative considering each of the seven localities in terms of greatest potential impact upon local air quality.

The 7 localities were assessed using a number of "air quality aspects" developed and graded according to importance or potential severity of the aspect. The aspects included:

- position of sensitive or critical receptors – localities with the greatest number of sensitive receptors in close proximity have been ranked high.

- assessment of greenhouse gas implications of each locality – localities with the greater travel distance and number of stops have increased potential for greenhouse gas generation and have been ranked high.

- assessment of meteorological conditions associated with each locality – localities situated in areas with increased potential for pollutants to travel over sensitive areas due to wind direction have been ranked high.

- semi quantitative assessment of the impacts on sensitive receptors from each locality - localities situated in areas with increased potential for pollutant generation and potential for pollutants to travel over sensitive areas have been ranked high.

Results of the assessment indicate that differences between each locality in terms of air quality are minimal during both the construction and operation phases of an additional crossing, with localities 6 and 7, likely to have the least potential to impact upon sensitive receptors and localities 4 and 5 likely to have the greatest potential impact on sensitive receptors.

1 INTRODUCTION

1.1 BACKGROUND

Environmental Resources Management Australia Pty Ltd (ERM) has been commissioned by RTA Environmental Technology to investigate the selection of locality options for an additional crossing of the Clarence River at Grafton, in terms of air quality.

This report details the air quality assessment of the seven locality options for the proposed additional crossing. The objectives of the assessment are to:

- determine the potential air quality impacts for the construction and operation of each selected locality across the Clarence River;
- determination of relevant air quality criteria/objectives/targets;
- identification of sensitive or critical receptors;
- assessment of potential pollutants
- assessment of the potential hazards/impacts for each locality; and
- form a comparison of different localities for route selection stage.

1.2 SCOPE OF THIS STUDY

Chapter 2 Locality Option Descriptions

Chapter 3 Summary of Potential Pollutants from Construction and Operation

Chapter 4 Air Quality Criteria

Chapter 5 Assessment Methodology

Chapter 6 Locality Option Comparison / Conclusion Discussion

2 LOCALITY OPTION DESCRIPTIONS

A description of each locality option is given in *Table 2.1* (refer also to *Figure 2.1*), with a comparison of sensitive receptors located in close proximity to each locality given in *Table 2.2*.

Table 2.1 Description of Locality Options

Locality Option	Origin	Destination
1	From Gwydir Highway to River via rural land crossing river via Susan Island	Direct onto Prince Street, Crossing Victoria, meeting Fitzroy
2	From Gwydir Highway along Abbot Street Abbot and Kennedy Street Abbot and Bank Street	Direct onto Villiers Street (School and Convent on either side of road) Crossing Victoria meeting Fitzroy
3a & 3b	Merge with existing route on Bent Street access	Merge with existing Fitzroy Street access
4	From Pacific Highway to River via rural land	Crossing McHugh Street crossing Breimba Street crossing Bromley/Sutton Street crossing Kent Street crossing Clarence Street meeting Villiers Street
5	From Pacific Highway to River via rural land	Crossing McHugh Street crossing Breimba Street crossing Kent Street Dobie and Waratah Place crossing Clarence Street Dobie and Weiley Ave meeting Villiers Street
6	From Pacific Highway to River via rural land	Crossing Villiers Street crossing Chapman Street crossing Prince Street crossing Queen Street crossing Mary Street (route passes hospital and Gaol) Arthur and Richards Lane crossing Alice Street meeting Turf Street
7	From Pacific Highway at Centenary Drive to River via rural land Crossing River via Elizabeth Island	Crossing Duke Street crossing Morrison Street, crossing Challinor Street crossing Queen Street crossing Mary Street crossing Alice Street crossing Davey Ave x 2 meeting Richmond Road

Table 2.2 Comparison of Sensitive Receptors for Each Locality

Locality Option	Number Sensitive Receptors	Distance (km) from Origin to existing Intersection
1	35	1.6km
2	36	1.5km
3a & 3b	52	2.25km
4	93	2.2km
5	85	2.25km
6	4	2km
7	5	2.5km

Note: Sensitive receptor counts were determined from point of origin to the nearest existing intersection. Numbers are indicative and based on a visual count of the information contained in the aerial photograph. Sensitive receptors include houses, schools and public places.

Figure 2.1 Aerial Photograph Showing Locality Options

3 POTENTIAL POLLUTANTS

3.1 INTRODUCTION

The following section details the potential pollutants from the construction and operation phases of the proposed additional crossing of the Clarence River at Grafton.

3.2 CONSTRUCTION

It can be expected that emissions to the atmosphere during the construction phase of an additional crossing would predominantly be emitted from the exhaust of construction equipment and dust generated during earthworks and from exposed surface areas.

Primary pollutants from internal combustion engines include dust, carbon monoxide, carbon dioxide, sulphur oxides and nitrogen oxides. Most of these emissions are emitted through the exhaust of an internal combustion engine but can originate from secondary sources such as fuel refilling activities. These secondary sources are considered negligible in terms of the potential total impact as a result of an additional crossing and have not been included in this study. However, it is recommended that safeguards be employed to ensure that impacts from secondary sources are minimised.

The majority of potential dust issues originate from earthworks associated with construction activities. Dust sources during construction are likely to include:

- bulldozing and grading;
- excavation;
- stockpiles and stockpiling activities;
- tunnelling;
- loading / unloading of equipment and construction supplies;
- vehicle movements;
- vehicle emissions; and
- wind erosion from exposed surfaces.

The scope of this assessment for the construction of an additional crossing has been directed at emissions of particulate associated with earthworks and is

limited to Total Suspended Particulate (TSP), Particulate Matter less than 10 micron (PM_{10}) and Particulate Matter less than 2.5 micron ($PM_{2.5}$). The assessment is a qualitative assessment, which investigates the proposed locality options in terms of potential air quality impacts to sensitive, and surrounding environments.

3.3 OPERATION

Emissions to the atmosphere during operation would predominantly be emitted from the combustion of fuel used in vehicles. Typical emissions include carbon monoxide, nitrogen oxides, hydrocarbons, particulate matter, carbon dioxide and lead. Again, this assessment is a qualitative assessment, which investigates the proposed locality options in terms of potential air quality impacts to sensitive, and surrounding environments.

3.4 POLLUTANTS OF CONCERN

The following section briefly describes the pollutants of concern and their associated health and amenity aspects.

3.4.1 Carbon Monoxide (CO)

Carbon monoxide can affect human health by reducing the amount of oxygen being carried by the blood. Carbon monoxide is present in the atmosphere naturally at concentrations typically between 0.01 and 0.02 parts per million (ppm) (Streeton, 1990).

Carbon monoxide is produced as an intermediate to the formation of carbon dioxide in vehicle engines and occurs due to inefficient combustion. High concentrations can occur in heavy motor vehicle traffic and poor dispersion conditions (Streeton, 1990).

3.4.2 Nitrogen Dioxide (NO_2) and Nitrogen Oxides (NOx)

Nitrogen dioxide is produced in the high temperature combustion of fuels by oxidation of atmospheric nitrogen. Exposure to high concentrations of nitrogen dioxide can have a range of health effects including lung damage and respiratory disease. Nitrogen oxides, when involved in chemical reactions in the atmosphere, contribute to the production of ozone and photochemical smog (Streeton, 1990).

Nitrogen oxides are a recognised air pollutant with the majority of emissions from vehicles and industries and have therefore been included as an air quality indicator. Nitrogen dioxide is the focus of the National Environment Protection Measure (NEPM) due to its human health effects (Streeton, 1990).

3.4.3 *Hydrocarbons other than Methane*

This group of chemicals includes benzene, formaldehyde, chlorinated hydrocarbons, polycyclic aromatic hydrocarbons, polychlorinated biphenyls and dioxins (Streeton, 1990). These compounds, either as gases or associated with fine particles have been identified as probable or confirmed human carcinogens.

Motor vehicles, industry and the domestic/rural/commercial sectors cause the majority of VOC emissions.

3.4.4 *Dust Fine Particles (PM_{10} and $PM_{2.5}$)*

PM_{10} (particles less than 10 microns in diameter) and $PM_{2.5}$ (particles less than 2.5 microns in diameter) concentrations are of interest because they can reach the lower parts of the respiratory system and may have health as well as amenity impacts. Particles above 10 microns (total suspended particles (TSP)) in diameter do not reach the critical areas in the lungs but can cause irritation and aesthetic nuisance (Streeton, 1990).

Most PM_{10} particles are caused by combustion from motor vehicles, fire, industrial and extractive processes. Sulphate and organic carbon from motor vehicles, fires and industrial processes constitute most of $PM_{2.5}$ concentrations. Very fine particles may also affect visibility, which is an obvious effect of air pollution.

3.4.5 *Carbon Dioxide (CO_2)*

Carbon dioxide is classified as a simple asphyxiant, when present in the atmosphere in high concentrations it can lead to a reduction of oxygen concentration by displacement or dilution. Its primary sources include emissions from industries, motor vehicles and agricultural sources.

3.5 *GREENHOUSE GASES*

The 'Greenhouse Effect' is a term used to describe the gradual warming of the earth due to increased concentrations of trace gases in the atmosphere. These gases are generally called 'greenhouse gases' and include carbon dioxide (CO_2), methane (CH_4), chloroflurocarbons (CFCs) and nitrous oxides (N_2O). Greenhouse gases act as a blanket, trapping energy given off by the surface of the earth to maintain temperatures at a level that supports human habitation.

Human activities such as the burning of fossil fuels, transport, land clearing, agriculture and landfills have boosted the production of these gases. It is widely believed that this concentration has, and will lead to a global increase in the earth's surface temperatures. This human induced phenomenon is known as the 'enhanced greenhouse effect'.

Australia, as part of the international community, has been attempting to minimise the emission of greenhouse gases and removal of vegetation to reduce the likelihood of adverse impacts arising from the enhanced greenhouse effect.

3.5.1 The National Greenhouse Strategy

The National Greenhouse Strategy (NGS) is the primary mechanism through which our international commitments will be met.

The Commonwealth and all State and Territory Governments have developed the Strategy, with assistance from the Australian Local Government Association and industry and community groups.

The Strategy reports that transport was responsible for 17 per cent of Australia's net greenhouse gas emissions and 24 per cent of emissions produced through activities involving the use of energy in 1996 (National Greenhouse Gas Inventory, 1996). Cars were responsible for 56 per cent of these emissions.

The NGS takes an integrated approach to transport, looking at land use, transport planning, demand management, encouraging public transport, cycling, walking and improving vehicle fuel efficiencies.

3.5.2 The NSW Greenhouse Strategy

In 1997 the NSW Government released a greenhouse strategy, *NSW Tackles Greenhouse*. The Strategy focuses on four main areas of human activity that produce emissions: energy, land management, transport and waste management.

The Strategy reports that the transport sector contributes approximately 12 per cent of NSW greenhouse gas emissions and is our third most significant source of emissions.

A significant part of actions to reduce emissions from the transport sector is the development of major new rail infrastructure projects and Transitways – rapid bus services, which in addition to reducing emissions will ensure service improvements throughout the network, adding to and improving cross regional links.

3.5.3 Greenhouse Gas Emissions in NSW

Total greenhouse gas emissions in New South Wales and the Australian Capital Territory in 1995 (excluding emissions associated with land clearing) were 127.1 million tonnes of carbon dioxide equivalent. This is an increase of 0.2 million tonnes from 1990 emission levels, an increase that is primarily attributed to increased emissions associated with fuel combustion and

transport. Transport accounts for approximately 15% of all greenhouse gas emissions. Road transport is the major contributor, accounting for approximately 75 per cent of carbon dioxide emissions, 76 per cent of methane and 96 per cent of nitrous oxide.

3.6 *EXISTING AIR QUALITY*

The following pie charts summarise the types of pollutants and associated sources emanating from the Grafton area. Source - National Pollutant Inventory. This should be located underneath the figure in smaller font.

Although the ultimate fate of these substances cannot be determined the level of industrial activity and the concentration of pollutants in the study area is low.

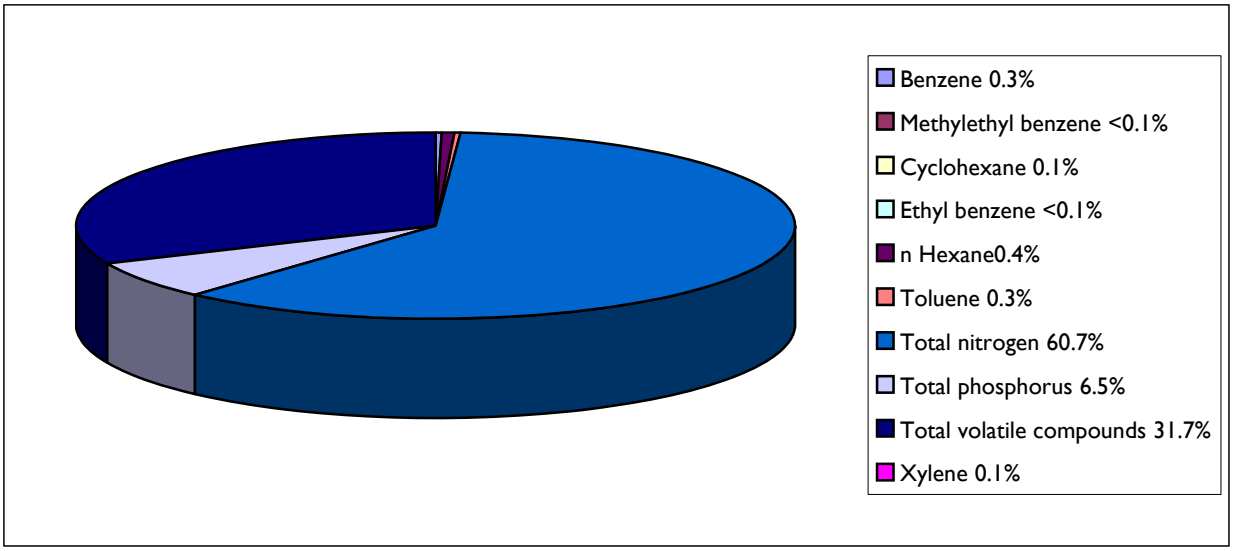

Figure 3.1 Total Emissions (%) of Substances Emitted in the Grafton Area

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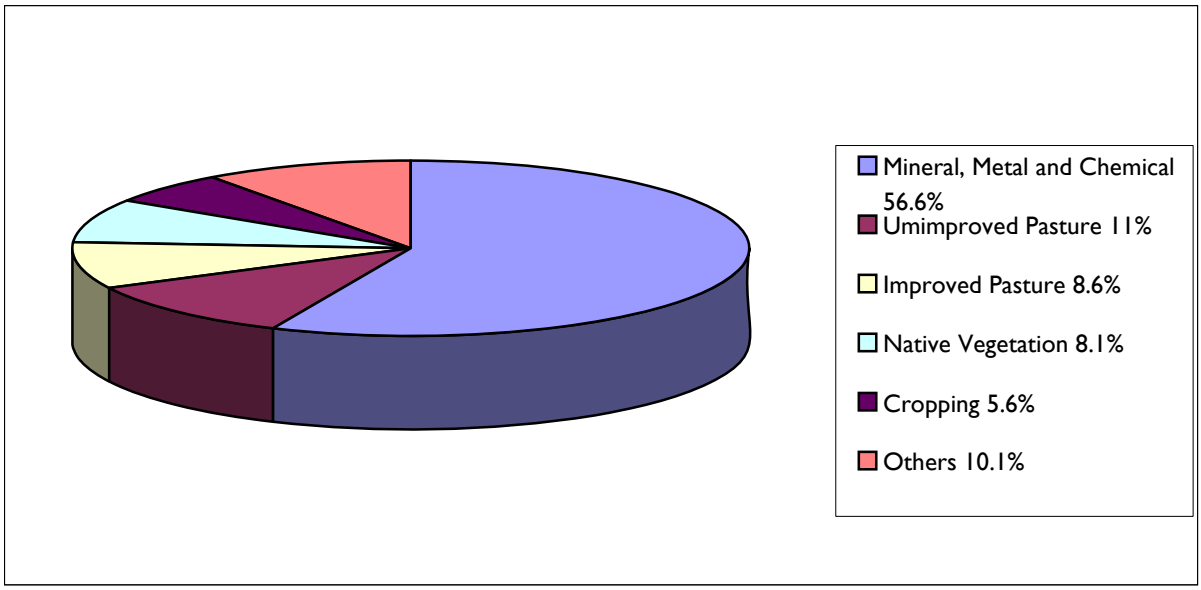


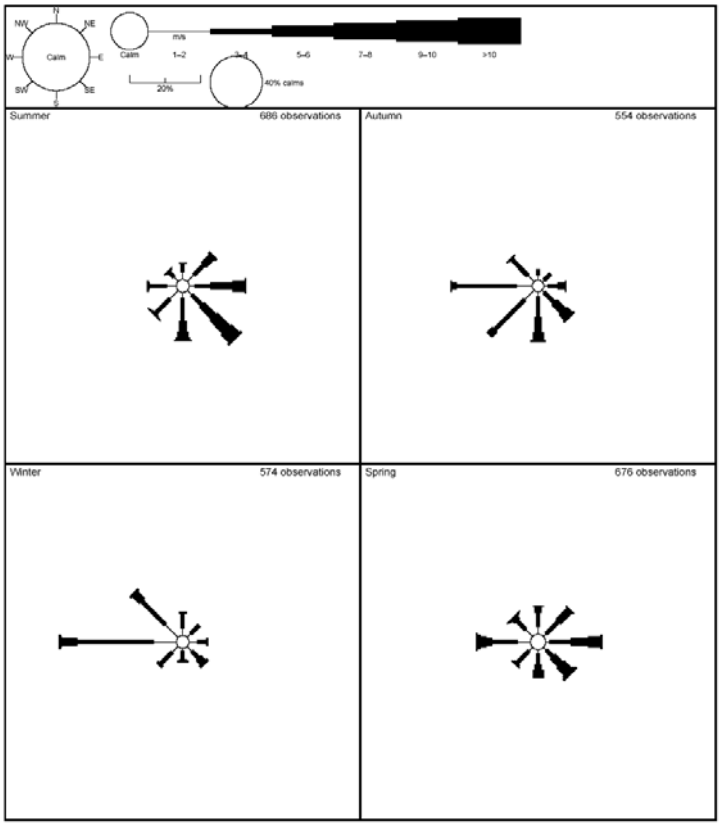
Figure 3.2 ***Total Emissions (%) of Substances Based on Industry Type***

3.7 *METEOROLOGY*

The following section summarises typical wind roses for the area.

The data from this station (Grafton, site number is 058077 situated at Latitude 29°37′21″ S and Longitude 152°57′38″E) are considered to be representative of the general wind conditions at each of the locality options.

Figure 3.3 below summarises seasonal wind rose data between September 2002 and August 2003 for the meteorological station at Grafton.



Source - Bureau of Meteorology, October 2003.

Figure 3.3 Grafton Seasonal Wind Roses September 2002 to August 2003

3.7.1 Summer

The prevailing winds are from the south east over much of the season as shown in the seasonal wind rose, *Figure 3.3*. Summer average wind speed for the Grafton area is estimated to be 5 to 8 m/s. Calm wind frequency is estimated at 5% of the time, indicating reasonably unstable conditions throughout the year.

3.7.2 Autumn

The prevailing winds are from the west over much of the season as shown in the seasonal wind rose, *Figure 3.3*. Autumn average wind speed for the Grafton area is estimated to be 3 to 4 m/s. Calm wind frequency is estimated at 5% of the time, indicating reasonably unstable conditions throughout the year.

3.7.3 Winter

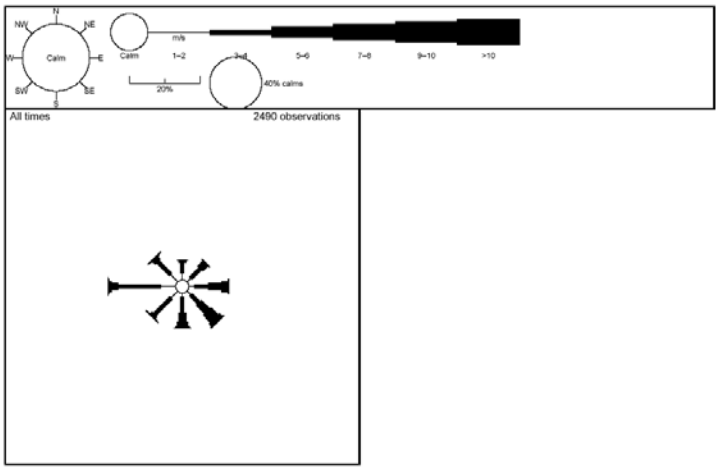
The prevailing winds are from the west over much of the season as shown in the seasonal wind rose, *Figure 3.3*. Winter average wind speed for the Grafton area is estimated to be 5 to 6 m/s. Calm wind frequency is estimated at 5% of the time, indicating reasonably unstable conditions throughout the year.

3.7.4 *Spring*

The prevailing winds are from the east and west over much of the season as shown in the seasonal wind rose, *Figure 3.3*. Spring average wind speed for the Grafton area is estimated to be 5 to 8 m/s. Calm wind frequency is estimated at 5% of the time, indicating reasonably unstable conditions throughout the year.

3.7.5 *Annual Wind Rose*

Figure 3.4 below summarises annual wind rose data between September 2002 and August 2003 for the meteorological station at Grafton.



Source - Bureau of Meteorology, October 2003.

Figure 3.4 Grafton Annual Wind Rose September 2002 to August 2003

The prevailing winds are from the west over much of the year as shown in the annual wind rose, *Figure 3.4*. Annual average wind speed for the area is estimated to be 3 to 4 m/s. Calm wind frequency is estimated at 10% of the time, indicating reasonably unstable conditions throughout the year.

4 AIR QUALITY CRITERIA

4.1 INTRODUCTION

Until recently the NSW Department of Environment and Conservation (DEC) noted air quality goals for nitrogen dioxide, carbon monoxide and particulate matter according to the World Health organisation (WHO), the United States Environment Protection Agency (USEPA) and the National Health and Medical Research Council of Australia (NHMRC). In 1999 the National Environment Protection Council (NEPC) adopted a set of national air quality standards as part of the National Environment Protection Measures (NEPM). In most cases DEC has adopted these standards for air quality.

The relevant air quality standards noted by DEC are listed below.

Table 4.1 NEPM Standards (Is there a date)

Pollutant	Averaging Period	Maximum Concentration	Maximum Allowable Exceedences
Carbon monoxide	15-min max	108 mg/m^3 (87 ppm)	Is this N/A
	1 hour	31 mg/m^3 (25 ppm)	Is this N/A
	8 hours	10.5 mg/m^3 (9.0 ppm)	1 day in a year
Nitrogen dioxide	1 hour	230 µg/m^3 (0.12 ppm)	1 day in a year
	1 year	58 µg/m^3 (0.03 ppm)	None
Photochemical oxidants (as ozone)	1 hour	0.10 ppm	1 day in a year
	4 hours	0.08 ppm	1 day in a year
Lead	1 year	0.50 µg/m^3	None
Total Suspended Particulate Matter (TSP)	1 year	90 µg/m^3	n/a
Particles as PM_{10}	1 day	50 µg/m^3	5 days in a year

5 ASSESSMENT

The following section summarises the assessment methodology and the results.

5.1 METHODOLOGY

The risks to air quality from an additional crossing of the Clarence River at Grafton would most likely occur during the construction phase in the short term. In the long term the additional crossing would improve the local air quality by alleviating traffic congestion during peak hours at the existing crossing. It is anticipated that the risks to air quality would not greatly influence the location of the additional crossing, as the risks are likely to be similar anywhere within the study area.

However, impacts are likely to be greater if an additional crossing is closer to sensitive areas or areas of high occupancy, during both the construction and operation phases. For this reason a number of "air quality aspects" have been developed and assigned a percentage according to importance or potential severity of the aspect as follows:

- position of sensitive or critical receptors (30%);
- assessment of greenhouse gas implications of each locality option (20%);
- assessment of meteorological conditions associated with each option (25%); and
- semi quantitative assessment of the impacts on sensitive receptors from each locality option (25%).

The level of potential impact upon air quality for each of the locality options were then ranked depending on the sensitivity of the immediate surrounding area. The following ranking has been employed.

- 1 = nil impact;
- 2 = low potential impact;
- 3 = potential impact;
- 4 = medium potential impact; and
- 5 = high potential impact.

The following section details the assessment criteria and the assessment utilised for each of the locality options for both the construction and operation phases of an additional crossing.

5.1.1 Position of Sensitive or Critical Receptors

Each locality option has been assessed in terms of the number and position of sensitive receptors. Sensitive receptors include houses, schools, and public places. The lowest number of sensitive receptors within close proximity to a locality has been ranked as very low potential impact or 1. The highest number of sensitive receptors within close proximity to a locality option has been ranked as high potential impact or 5.

The position of sensitive or critical receptors has been graded at 30% (or 3). Therefore, a ranking of 1 will be assigned the sum of 3 and 1 (3) and a ranking of 5 will be assigned the sum of 3 and 5 (15). The locality option with the highest numerical number would be the least desirable in terms of effects upon local air quality.

5.1.2 Assessment of Greenhouse Gas Implications of Each Locality Option

Each locality option has been assessed in terms of the approximate length of the bridge and number of stops required travelling the proposed journey. The larger the distance and the greater the number of stops, the greater the potential for greenhouse gas generation due to increased vehicle emissions. The lowest greenhouse generation potential has been ranked as very low potential impact or 1, and the highest potential impact ranked as high impact or 5.

The assessment of greenhouse gas implication of each locality option has been graded at 20% (or 2). Therefore a ranking of 1 will be assigned the sum of 2 and 1 (2) and a ranking of 5 will be assigned the sum of 2 and 5 (10). The locality option with the highest numerical number would be the least desirable, in terms of effects upon local air quality.

5.1.3 Assessment of Meteorological Conditions of Each Locality Option

Each locality option has also been assessed in terms of the meteorological conditions associated with the locality. It is expected that the microclimatic conditions are similar for each locality. However, the frequency and direction of certain climatic conditions can effect the direction of pollutant travel and therefore the ground level impact.

The greater the potential for pollutants to travel over sensitive areas due to wind direction, the greater the impact. The lowest potential impact has been ranked as very low potential impact or 1, and the highest ranked as high potential impact or 5.

The assessment of greenhouse gas implication of each locality option has been graded at 20% (or 2). Therefore a ranking of 1 will be assigned the multiple of 2 and 1 (2) and a ranking of 5 will be assigned the multiple of 2 and 5 (10). The locality option with the highest numerical number would be the least desirable, in term of effects upon local air quality.

5.1.4 Semi Quantitative Assessment of the Impacts on Sensitive Receptors from Each Locality Option

Each locality option has been assessed in terms of the pollutant impact. Semi quantitative assessment of the impacts associated with each locality option has been undertaken by investigation of the source and magnitude of potential combustion and construction emissions and the ability to either disperse before impacting upon sensitive receptors or mitigation at origin.

The greater the potential for pollutants to impact over sensitive areas, the greater the impact. The lowest impact will be ranked as very low potential impact or 1, and the highest ranked as high potential impact or 5.

The semi quantitative assessment of pollutants on sensitive receptors for locality options has been graded at 25% (or 2.5). Therefore a ranking of 1 is assigned the multiple of 2.5 and 1 (2.5) and a ranking of 5 assigned the multiple of 2.5 and 5 (12). The locality option with the highest numerical number would be the least desirable in terms of effects upon local air quality.

5.2 ASSESSMENT FOR CONSTRUCTION ACTIVITIES

The following table summarises the assessment results based on the criteria described above. The locality option with the highest numerical number would be the least desirable in terms of effects upon local air quality.

Table 5.1 Assessment for Construction Activities

Air Quality Aspect – Construction Phases					
Locality	Position Sensitive Receptors (Weighting 3)	Greenhouse Gas Implications (Weighting 2)	Meteorological Conditions (Weighting 2.5)	Semi Quantitative Assessment (Weighting 2.5)	Total
1	3 x 2 = **6**	2 x 2 = **4**	2.5 x 2 = **5**	2.5 x 2 = **5**	**20**
2	3 x 2 = **6**	2 x 2 = **4**	2.5 x 2 = **5**	2.5 x 2 = **5**	**20**
3a & 3b	3 x 2 = **6**	2 x 3 = **6**	2.5 x 2 = **5**	2.5 x 2 = **5**	**22**
4	3 x 4 = **12**	2 x 3 = **6**	2.5 x 2 = **5**	2.5 x 4 = **10**	**33**
5	3 x 4 = **12**	2 x 3 = **6**	2.5 x 2 = **5**	2.5 x 4 = **10**	**33**
6	3 x 1 = **3**	2 x 3 = **6**	2.5 x 2 = **5**	2.5 x 1 = **2.5**	**16.5**
7	3 x 1 = **3**	2 x 4 = **8**	2.5 x 2 = **5**	2.5 x 1 = **2.5**	**18.5**

5.3 ASSESSMENT FOR OPERATION ACTIVITIES

Table 5.2 Assessment for Operational Phase

Air Quality Aspect – Operation Phases					
Option	Position Sensitive Receptors (Weighting 3)	Greenhouse Gas Implications (Weighting 2)	Meteorological Conditions (Weighting 2.5)	Semi Quantitative Assessment (Weighting 2.5)	Total
1	3 x 2 = **6**	2 x 2 = **4**	2.5 x 2 = **5**	2.5 x 2 = **5**	**20**
2	3 x 2 = **6**	2 x 2 = **4**	2.5 x 2 = **5**	2.5 x 2 = **5**	**20**
3a & 3b	3 x 2 = **6**	2 x 3 = **6**	2.5 x 2 = **5**	2.5 x 2 = **5**	**22**
4	3 x 4 = **12**	2 x 3 = **6**	2.5 x 2 = **5**	2.5 x 4 = **10**	**33**
5	3 x 4 = **12**	2 x 3 = **6**	2.5 x 2 = **5**	2.5 x 4 = **10**	**33**
6	3 x 1 = **3**	2 x 3 = **6**	2.5 x 2 = **5**	2.5 x 1 = **2.5**	**16.5**
7	3 x 1 = **3**	2 x 4 = **8**	2.5 x 2 = **5**	2.5 x 1 = **2.5**	**18.5**

6 OPTION COMPARISON / CONCLUSION DISCUSSION

The numerical assessment of each option for both the construction and operation phases have been summarised below.

Table 6.1 Summary for Operational Phase

Air Quality Aspect – Summary		
Option	Total for Construction	Total for Operation
1	**20**	**20**
2	**20**	**20**
3a & 3b	**22**	**22**
4	**33**	**33**
5	**33**	**33**
6	**16.5**	**16.5**
7	**18.5**	**18.5**

Results of the assessment indicate that differences between each locality in terms of air quality are minimal during both the construction and operation phases of an additional crossing, with localities 6 and 7, likely to have the least potential to impact upon sensitive receptors and localities 4 and 5 likely to have the greatest potential impact on sensitive receptors.

As expected localities with the greater number of sensitive receptors rank high for potential impacts for both the construction and operation phases.

When considering the potential air quality impacts relating to feasible localities, locality 6 and 7 prove to be the most feasible area for minimising potential impacts. These two localities are furthest away from the central Grafton area and therefore have a limited number of nearby sensitive receptors.

Localities 4 and 5 are central to the Grafton area and have increased number of nearby receptors, therefore ranking high. These are considered to be less feasible localities and would probably require more stringent mitigation measures.

Localities 1, 2, 3a and 3b are again central to the Grafton area but considered to be moderately feasible localities and would probably require less stringent mitigation measures than localities 4 and 5.

GLOSSARY

BOM	Bureau of Meteorology
PM_{10}	Particulate Matter less than 10 micron
$PM_{2.5}$	Particulate Matter less than 2.5 micron
m/s	meters per second
TSP	Total Suspended Particulate
NEPM	National Environment Protection Measure
Wind Roses	Pictorial summary of wind direction and wind speed at a given location over a given period.

Please include

Sensitive receptors;

DEC;

WHO;

USEPA;

NGS;

Etc and should really include all elements.

REFERENCES

National Environment Protection Council website www.nepc.gov.au

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APPENDIX N

Short Listing Workshop

Roads and Traffic Authority
New South Wales

ADDITIONAL CROSSING OF THE CLARENCE RIVER AT GRAFTON

SHORTLISTING OF LOCALITIES

Workshop Report
November 2003

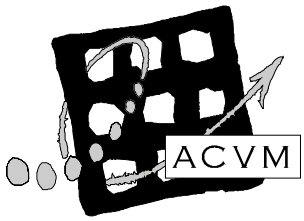

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Table of Contents

Report

This report summarises the findings of the Localities Short Listing Workshop held on 28 November 2003. Details of the workshop are included in the Appendices.

Background

The existing vehicular bridge over the Clarence River was completed in 1932 and since that time has served as the major link across the river between Grafton and South Grafton on the Summerland Way which leads from the Pacific Highway to Casino.

Traffic volumes including heavy vehicles using the bridge have increased over the years which has led to congestion, delays and conflicts. Also there are "kinks" on the existing bridge which is seen as a safety concern and a significant cause of delays.

In 2001 a community campaign for an additional crossing of the Clarence River at Grafton commenced. A public meeting in May 2002 lead the State Government to commission the Roads and Traffic Authority (RTA) to undertake a Feasibility Study and determine strategic locations for an additional crossing to service Grafton and the surrounding communities.

As a result of the Feasibility Study, and a commitment by the State Government to proceed with the next stage of planning, the RTA formed a project team to build on the work undertaken in the Feasibility Study. Investigations of the study area were undertaken and feasible localities were developed within the study area that would improve road safety, reduce traffic delays and provide improved access for the local and statewide road network.

The localities developed were between Susan Island and Elizabeth Island (see **Figure 1**) . In order to focus on developing the more feasible localities, the locality options developed to date are required to be shortlisted.

A shortlisting of localities workshop was seen as the appropriate strategic tool to bring together some of the key stakeholders involved in the project, to review and assess the localities developed in order to shortlist those worthy of more detailed investigation.

The Australian Centre for Value Management (ACVM) was commissioned to facilitate and report on the shortlisting workshop which was undertaken on **28th November 2003**. A list of participants who attended the workshop can be found in **Appendix 1**.

Workshop Objectives

The objective for the workshop, as presented to the participants, was to:

"Review and assess the preliminary localities investigated for the project in order to shortlist those worthy of more detailed investigation"

This report has been compiled by ACVM and seeks to provide an objective overview of the project aspects discussed and the workshop outcomes formulated by the end of the day.

Workshop Activities

The workshop process builds on the perspectives as well as the detailed and specialist knowledge which resides with the workshop participants. It then structures the analysis and locality review from a functional base (ie. what must the project achieve to be successful, how well does each locality achieve this?).

During the workshop, background material was presented (**Appendices 2 and 3**). The project purpose and objectives were clarified and the project givens and constraints highlighted.

The workshop group clarified, added to and finally agreed to assessment criteria (aligned to achieving the **project objectives**) as suitable to evaluate the localities.

Localities developed by the project team were presented (see **Figure 1**) and after discussion, no further options were put forward for assessment. The locality options in the assessment were:

- **Locality 1 & 2** – Upstream of the existing bridge to Susan Island
- **Locality 3** – At the existing bridge
- **Locality 4, 5, 6,& 7** – Downstream of the existing bridge to Elizabeth Island

The information shared by the group on the localities is in the ***Summary Table for Comparison of Localities*** shown in **Appendix 3**.

The Feasibility Study stated, *"The most feasible location appears to be in the vicinity of the existing bridge"*. Therefore, as there is an expectation that options adjacent to the existing bridge (**Locality 3**) would be further investigated, it was felt that this locality should be progressed to the next stage of investigation regardless of its merits or deficiencies.

This being the case, it was agreed that the assessment would be undertaken as a comparison of localities 1, 2, 4, 5, 6 & 7 relative to Locality 3 using the assessment criteria (see **Appendix 2**). This would determine which localities should move forward for further investigation.

The workshop discussions led the group to outcomes and conclusions as outlined below.

Workshop Outcomes

By the end of the workshop, the participants had:

- **Clarified** the project purpose and objectives to reflect what the project must do to be successful.

  The purpose of the project is to ***"Provide an additional crossing of the Clarence River in order to improve road safety, reduce traffic delays and provide improved access for the local and State road network between north and south of the Clarence River"***

  The **broad objectives** of the project are to:
  - Significantly improve traffic efficiency
  - Significantly reduce the potential for road accidents and injuries
  - Be socially acceptable to the regional and local community
  - Support economic development
  - Be managed in accordance with Ecologically Sustainable Development (ESD) Principles
  - Achieve maximum effectiveness of expenditure (ie. value for money)
- **Reviewed** the givens and constraints within which the project is being considered (see **Appendix 2**).
- **Clarified, added and finally agreed to** an assessment criteria (aligned with the **broad project objectives**) which would be used to evaluate the localities for shortlisting.

  1. Significantly improve traffic efficiency

  a. Reduce delays at the existing bridge (LOS "C" after 30 years)

  b. Provide vertical clearance for heavy transport on the Summerland Way

  2. Significantly reduce the potential for road accidents and injuries

  a. Reduce potential road accidents and injuries at new approaches and intersections

  b. Reduce through traffic to CBD

  3. Socially acceptable to regional and local community

  a. Minimise flooding impacts by the project

  b. Minimise (negative) impacts on the social environment (including visual impacts)

  c. Minimise (negative) impacts on access for the community

  4. Support Economic Development

  a. Provide opportunity for economic and tourist development for Grafton (and the Clarence Valley Region)

  5. Managed in accordance with ESD Principles

  a. Minimise (negative) impacts on the natural environment

  b. Minimise (negative) impacts on heritage (indigenous and non-indigenous)

  c. Minimise (negative) impacts of traffic noise on existing noise sensitive development

  6. Achieve maximum effectiveness of expenditure

  a. Provides BCR > 2, (if possible)
- **Reviewed** the localities developed by the project team (see **Figure 1 & Appendix 3**)
- **Noted** that:
  - In reference to the Feasibility study that locality 3 should be progressed to the next stage of investigation regardless of its merits or deficiencies
  - The assessment of the localities would be undertaken as a comparison of each locality relative to Locality 3 for each of the assessment criteria. This would allow determination of which localities should move forward for more detailed investigation.
  - For the purposes of shortlisting localities, no weighting of the criteria would be undertaken and hence it was assumed that all criteria were considered equal in importance at this stage of analysis
- **Drew** the following conclusions as a result of the evaluation process undertaken:
  - Based on the qualitative assessment undertaken, **Locality 2** and **Locality 3** contributed to the project objectives better than the other localities and are **recommended** to move forward for community input and more detailed investigation

  - The localities that were recommended to be eliminated had significant issues (ie. social, ecological, environmental, flooding, traffic efficiency, etc) and did not sufficiently meet the project objectives (from which the assessment criteria were taken)
  - Social impacts, noise, community issues and heritage concerns will be the biggest issues to address (other than technical constraints) during the next stage of project development
  - There is a need to more fully articulate the issues associated with Locality 3
  - The built environment in Grafton will have a big impact on where we can locate the additional crossing
  - The further that the additional crossing is away from the existing bridge lessens how well it can meet the project objectives
  - An additional crossing (away from the existing bridge) could place pressure on providing a third commercial node for Grafton which may segregate the community further (strategic view)

- **Were informed** at the conclusion of the workshop, the next steps in the process to progress the project. These were recorded as:
  - The recommendations from this workshop will be presented to the community workshops which will be undertaken on the 10 & 11 December 2003 for their input to this workshop's findings
  - There will an analysis of the community input to confirm/amend the recommendations of the workshop to determine the localities to move forward for further investigation
  - The localities to move forward will be investigated further with the results proceeding to public display of Route Options in February/March 2004
  - Community input to the Route Options display will be considered and feed into a Route Evaluation Workshop. This is likely to generate additional investigation and refinement
  - The announcement of preferred route is scheduled for mid 2004

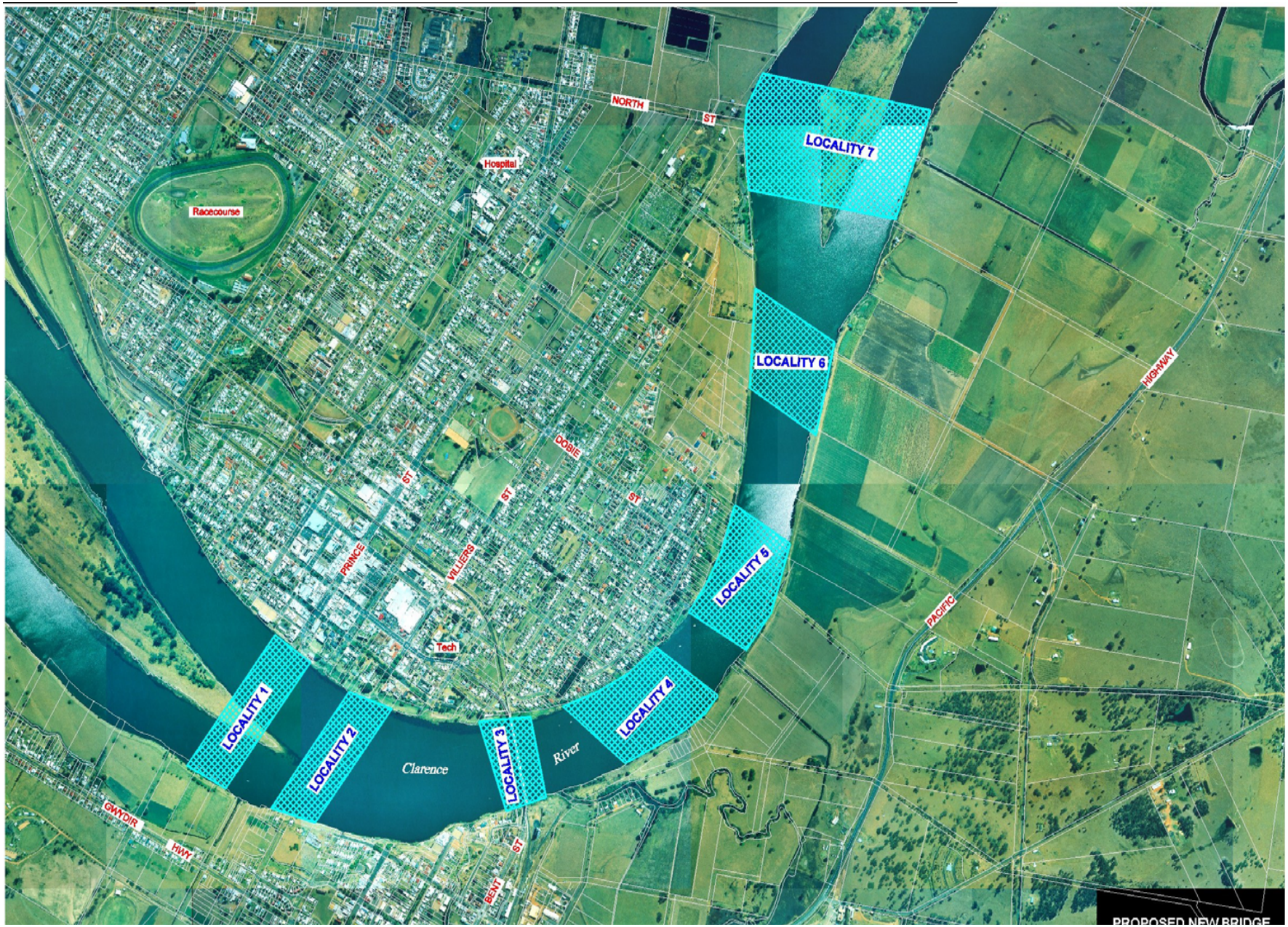

Figure 1: Sketch of Localities

Appendix 1. List of Participants

ADDITIONAL CROSSING OF THE CLARENCE RIVER AT GRAFTON
SHORTLISTING OF LOCALITIES WORKSHOP

PARTICIPANTS LIST

Peter Collins	Regional Manager, Northern Region RTA
Peter Black	Project Manager
Joe Canceri	Bridge Design
Trevor Smith	Road Design
Sonia Williamson	Communications
Simone Garwood	Environment
Bruce Parks	RTA Client Representative
Lance Vickery	RTA Client Representative
Bill Paterson	Hydrology
Brian Kerwick	Traffic and Transport
Darren Jurevicius	Air, Noise and Water Consultant
Vicki St Lawrence	Community Participation
Geoff Smythe	Planning and Social
Sharon Smith	Planning and Social
Col Harbidge	Grafton City Council
Bob Pavitt	Grafton City Council
David Andrews	Copmanhurst Shire Council
Tim Jenkins	Pristine Waters Council
Ross Prestipino	Facilitator

Appendix 2. Workshop Outputs

Workshop Outputs

The information presented in this Appendix is a consolidation of the general outputs and perceptions by the workshop group as they reviewed project elements such as the project objectives and investigations undertaken to date as well as the assessment of potential localities in order to shortlist the localities for more detailed investigation and public display.

Strategic Context of the Project

In order to allow the participants to obtain an understanding of the project's strategic context, Peter Collins, Manager Northern Region, RTA set the scene in which the additional crossing of the Clarence River at Grafton was being investigated. Key points raised in his presentation included:

- Why are we looking at an additional crossing of the Clarence River?
  - Community concern about delays and emergency access as well as the future development of Grafton and the Clarence Valley
  - Another crossing of the Clarence River has been discussed since the 1960s. The crossing is not just for Grafton but for the Clarence River Valley as part of the Summerland Way and the State Road Network
  - The existing bridge has served us well but the time is right to plan and determine the best site for an additional crossing because of:
    - Increasing delays, queuing is getting longer in the peaks
    - Level of service of the existing bridge is diminishing
    - Expansion of settlement and growth either side of the Clarence River
  - NSW State Government is committed to build the crossing
- How do we go about this?
  - Set the purpose and objectives of what we are trying to achieve by undertaking a project, identify potential localities and undertake a feasibility investigation
  - Undertake a detailed process of community consultation
  - Marry the technical feasibility of options with community desires (which may require compromise)
  - During this stage of the project, the objective is to select a preferred route. Further stages will include undertaking an environmental impact assessment, a detail design stage and finally proceeding to construction stage
- It should be noted that today, we are not selecting a preferred option but recommending shortlisting localities for more detailed investigation so that technically feasible localities can be put to the community for their input

Project Overview Presentation

An overview presentation of the project outlining the background, project objectives and potential assessment criteria was made by Peter Black, Project Manager, RTA. His presentation supplemented the background paper distributed to participants prior to the workshop. Key points made in his presentation included:

Project Background

- A Feasibility Study for the additional crossing of the Clarence River at Grafton was completed in March 2003. A key finding from that Study was that *"…….the most feasible location appears to be in the vicinity of the existing bridge……."* However, although this location is feasible, an additional crossing would still have significant impacts on the community such as traffic, social, noise and aesthetics. Locations upstream and downstream also appeared feasible as they generally met all the objectives of the feasibility study (with the exception of economic benefit to cost comparisons). These localities would have a number of adverse impacts particularly social impacts, environmental impacts and traffic noise
- State Government has committed $500,000 for the next stage of project development up to the selection of a preferred route
- Investigations have been undertaken during September to November 2003 in the study area so that a comparison to the Locality 3 against assessment criteria can take place with the intention of shortlisting localities to move forward for more detailed investigation and public display

Purpose and Broad Objectives

- The **purpose** of the project is to *"Provide an additional crossing of the Clarence River in order to improve road safety, reduce traffic delays and provide improved access for the local and State road network between north and south of the Clarence River"*

- The **broad objectives** of the project which will determine if we have successfully achieved our purpose are:

- Significantly improve traffic efficiency
- Significantly reduce the potential for road accidents and injuries
- Be socially acceptable to the regional and local community
- Support economic development
- Be managed in accordance with Ecologically Sustainable Development (ESD) Principles
- Achieve maximum effectiveness of expenditure

- There are a number of **supporting objectives** that are more specific and measurable as to how we could achieve the **broad objectives**. These were distributed to the workshop group during the workshop and are listed below:
  - Reduce delays at the existing Grafton Bridge and new bridge in peak hour to a Level of Service C (LOS) in 30 years after opening
  - Provide an effective link to the State Road network including the Summerland Way
  - Reduces the volume of through traffic, including heavy vehicles, in the CBD
  - Provides adequate vertical clearance for heavy transport on the Summerland Way
  - Develop a route option and intersection design that accommodates B-Double requirements
  - Implement a comprehensive program of community consultation and participation
  - Satisfy the technical and procedural requirements of the RTA with respect to the planning and design of the Project
  - Provide transport solutions that are complementary with land use and that take into account future development opportunities
  - Consider cyclists and public transport needs
  - Provide traffic management solutions for the connecting approaches to the additional crossing, including the impact on connecting intersections, in consultation with Grafton City Council, for 30 years after opening
  - Consider delay management strategies to minimise disruption to local and through traffic and maintain access to affected properties and land during construction
  - Provide flood immunity for the bridge for a 1:100 year flood event and the approaches to 1:20 event where economically justified
  - Provide navigation clearances for the additional crossing
  - Minimise flooding impacts caused by the project
  - Minimise the impacts on the natural environment to "less than significant"
  - Minimise the impacts on the social environment to "less than significant"
  - Minimise the impacts on heritage to "less than significant"
  - Develop a route option bridge design to give a minimum design speed of 60km/h and approach design commensurate with the urban environment
  - Minimise road traffic noise on existing residences with reference to the EPA Environmental Criteria for Road Traffic Noise
  - Ensure that the project incorporates urban design principles to reinforces the aesthetics of Grafton City
  - Provides a benefits to cost ratio of greater than 2
  - Provides improved opportunity for economic and tourist development for Grafton

Assessment Criteria

As a result, a number of draft assessment criteria were developed from the **supporting objectives** which could provide a variable response in achieving these objectives when undertaking comparisons of localities. The draft assessment criteria is listed below.

- ***Reduce delays at the existing Grafton Bridge in peak hour to a Level of Service C in 30 years after opening***
  - Assessment: Will the design meet a satisfactory level of service for road users by reducing the delays at the existing bridge?

- ***Provide adequate vertical clearance for heavy transport on the Summerland Way***
  - Assessment: Will the locality provide adequate vertical clearance for heavy transport on the Summerland Way?

- ***Reduce the potential for road accidents and injuries for the approaches to the additional crossing, including the connecting intersections***
  - Assessment: Will the locality reduce the potential for road accidents and injuries at the approaches and at the connecting intersections?

- ***Reduce the volume of through traffic, including heavy vehicles, from the CBD***
  - Assessment: Will the locality reduce the volume of through traffic, including heavy vehicles, from the Grafton and South Grafton business areas? A measure of effectiveness would be the volumes of through traffic that would be diverted away from the existing bridge.

- ***Minimise flooding impacts caused by the project***
  - Assessment: Will the locality have flooding potential by affecting upstream and downstream flood levels?

- ***Minimise the impacts on the social environment***
  - Assessment: What is the potential social impact of the locality? The following impacts are relevant to this assessment:
    - *Impacts on local demographics, health problems, air quality, psychological stress, intrusion, community severance, changes to access patterns, changes to residential amenity and character, displacement and provision of safe pedestrian crossings, paths and cycleways*

- ***Minimise the impacts on access for the community***
  - Assessment: What is the potential impact on access of the locality? The following impacts are relevant to this assessment:
    - *Impact on local access, including effects on local road access and access limitations to the new road; use of the road by cyclists and provision of safe pedestrian crossings and paths where necessary*

- ***Provide improved opportunity for economic and tourist development for Grafton***
  - Assessment: What is the potential for improved economic and tourist development? The following impacts are relevant to this assessment:
    - *Changes to industry and commerce, disruption or improvement to recreation and tourism, changes to access patterns*
    - *Impacts on settlement patterns and landuse in the area;*
    - *Impacts on businesses/service facilities dependant on Summerland Way traffic*

- ***Minimise impacts on the natural environment***
  - Assessment: What are the potential impacts of the locality on flora and fauna? Assessment should consider the impact of the locality on critical habitat, threatened species, populations or ecological communities, or their habitats.

- ***Minimise impacts on heritage***
  - Assessment: What is the level of direct impact on Indigenous and Non-Indigenous heritage with consideration of the following:
    - *The significance of indigenous cultural heritage sites and the direct impact of the localities on these sites;*
    - *The significance of non-indigenous cultural heritage sites and the direct impact of the localities on these sites.*

- ***Minimise impacts of road traffic noise on existing noise sensitive developments***
  - Assessment: What is the potential noise and vibration impact on the localities in accordance with reference to the EPA Environmental Criteria for Road Traffic Noise.

- ***Provide a benefits to cost ratio of greater than 2***
  - Assessment: Will the present value of benefits divided by the present values of costs have a value of greater than 2?

Project Purpose and Objectives

Having listened to the presentations, the group reflected on the project purpose and objectives (ie. what must the project achieve to be successful) as stated in the background paper. These were clarified within the group and are presented below with clarifications shown in italics.

The **purpose** of the project is to:

- **Provide an additional crossing of the Clarence River in order to improve road safety, reduce traffic delays and provide improved access for the local and State road network between north and south of the Clarence River**

The **broad project objectives** for the additional crossing of the Clarence River at Grafton are to:

- Significantly improve traffic efficiency
- Significantly reduce the potential for road accidents and injuries
- Be socially acceptable to the regional and local community
- Support economic development
- Be managed in accordance with Ecologically Sustainable Development (ESD) Principles
- Achieve maximum effectiveness of expenditure *(ie. value for money)*

Project Givens and Constraints

The group reviewed the givens and constraints within which the project is being considered. The givens/constraints are listed below as agreed to by the group. Items considered challengeable (or not given) and requiring further investigation as the project proceeds are shown in italics.

- *The "kinks" in the existing bridge will only be removed if a new bridge is built adjacent to the existing bridge (needs to be further investigated)*
- Centenary Drive will not be upgraded as part of this project
- The existing bridge is owned by Rail Infrastructure Corporation (RIC)
- The existing bridge will remain open for vehicular use regardless of the location of a new bridge over the Clarence River
- There will be a new bridge as part of the project (ie. no tunnel options due to environmental and cost constraints)
- Intersections can be upgraded and will cope with the future traffic load
- 95% of the traffic movements on the existing bridge are to/from the Grafton area
- The State Government has committed to fund the building of the additional crossing

Assessment Criteria

The group reflected on the draft assessment criteria presented earlier which could be used to evaluate the potential locality options later in the workshop. The group discussed the criteria obtaining clarification where required, adding and amending where appropriate (see italics) and finally agreeing that the assessment criteria summarised below could be used to evaluate the options and determine a shortlist for further investigation and display to the community.

The criteria as agreed by the group to be used in the assessment of localities were summarised as:

1. Significantly improve traffic efficiency

a. Reduce delays at the existing bridge (LOS "C" after 30 years)

b. Provide vertical clearance for heavy transport on the Summerland Way

2. Significantly reduce the potential for road accidents and injuries

a. Reduce potential road accidents and injuries at new approaches and intersections

b. Reduce through traffic to CBD

3. Socially acceptable to regional and local community

a. Minimise flooding impacts by the project

b. Minimise *(negative)* impacts on the social environment *(including visual impacts)*

c. Minimise *(negative)* impacts on access for the community

4. Support Economic Development

a. Provide opportunity for economic and tourist development for Grafton *(and the Clarence Valley Region)*

5. Managed in accordance with ESD Principles

a. Minimise *(negative)* impacts on the natural environment

b. Minimise *(negative)* impacts on heritage (indigenous and non-indigenous)

c. Minimise *(negative)* impacts of traffic noise on existing noise sensitive development

6. Achieve maximum effectiveness of expenditure

a. Provides BCR > 2, *(if possible)*

Presentation of Locality Options

The presentation of locality options as outlined in the background papers (distributed to participants prior to the workshop) was led by Peter Black, Project Manager RTA, with contributions by project team members as required in addressing various specialist areas (ie. transport, traffic, ecology, social impacts, heritage, geotechnical issues, heritage constraints flooding and economic impacts) of the various localities.

In summary, the localities (as shown in **Figure 1**) to be assessed against **Locality 3** were:

- **Localities 1 and 2** – Upstream of the existing bridge to Susan Island
- **Localities 4, 5, 6 and 7** – Downstream of the existing bridge to Elizabeth Island

The Feasibility Study stated, *"The most feasible location appears to be in the vicinity of the existing bridge"* and so it was agreed that locality 3 should move forward for more detailed investigation and community display together with the other shortlisted options as assessed by the group.

The information shared by the group on the localities are in the ***Summary Table for Comparison of Localities*** shown in **Appendix 3**.

After the presentation of the locality options and reflection by the workshop group, no further options were put forward for assessment.

Assessment of Localities

The assessment of the other localities was undertaken as a comparison relative to Locality 3 against each of the assessment criteria.

The localities were judged on a qualitative basis (pictorially) by the workshop group in comparison to Locality 3 against each criterion on the following scale:

Symbol	Explanation
✓	The locality option is **better than** Locality 3 when compared against this criteria
-	The locality option is the **same as** Locality 3 when compared against this criteria
X	The locality is **worse than** Locality 3 when compared against this criteria

After the evaluation, the group considered which localities rated (on balance) so poorly or inferior to other localities that they were not worthy of moving forward for further investigation and presentation to the wider community and should be eliminated.

Also it should be noted that for the purposes of the exercise (being to shortlist localities for further investigation), no weighting of the criteria was undertaken and hence it was assumed (at this stage of project analysis) that all criteria were considered equivalent in importance.

The assessment of the locality options against the criteria (agreed to earlier in the workshop) is shown in the table below. The conclusions drawn by the workshop group then follow.

Matrix for Assessment of Localities in Comparison to Locality 3

Criteria/Locality	1	2	4	5	6	7
1. Significantly improve traffic efficiency						
a. Reduce delays at existing bridge	X	X	X	X	X	X
b. Provide vertical clearance for heavy transport on Summerland Way	-	-	✓	✓	✓	✓
2. Significantly reduce accidents and injuries						
a. Reduce accidents and injuries at new approaches and intersections	-	-	-	-	-	-
b. Reduce through traffic to CBD	X	-	✓	✓	✓	✓
3. Socially acceptable to regional and local community						
a. Minimise flooding impacts by project	-	-	X	X	X	X
b. Minimise impact on the social environment	X	-	X	X	X	X
c. Minimise impacts on access for the community	X	X	-	-	-	-
4. Support Economic Development						
a. Provide opportunity for economic and tourist development for Grafton and Clarence Valley Region	X	-	X	X	X	X
5. Managed within ESD Principles						
a. Minimise impacts on the natural environment	X	X	-	-	-	X
b. Minimise impacts on heritage	X	X	✓	✓	✓	X
c. Minimise impacts of traffic noise on existing sensitive development	X	X	X	X	X	X
6. Achieve maximum effectiveness of expenditure						
a. Provides BCR > 2	-	-	-	X	X	X

Eliminating Localities and Issues to be Addressed

As a result of undertaking the qualitative assessment of localities, the group agreed to the following localities (on balance) not being worthy of further investigation (ie. eliminate) for the following reasons.

Eliminate Locality 1 – Why:

- Social implications:
  - Major precinct impacts and impacts on Memorial Park
  - Crown Hotel/river access impacts
  - Noise impacts
- Traffic impacts within the CBD
- Heritage issues (ie. significant listed property impacts)
- Ecology
- Major impact on CBD (traffic movements, social, environmental impacts)
- Engineering issues
- Noise impacts
- Impact on Susan Island/environmental issues

Eliminate Localities 4 and 5 – Why:

- Effect on safety with increased traffic in residential streets which have low traffic.
- Major flooding effects which may not be overcome
- Ramping effect of approach
- Disruption to north – south local access movements
- Community segregation
- Major social issues
- Doubling traffic noise
- Direct access onto highway requiring additional length of travel
- Does not significantly improve traffic efficiency on the existing bridge
- Very low Benefit Cost Ratio indicating poor value for money

Eliminate Locality 6 – Why:

- Low traffic volumes would use the additional crossing
- Poor connection to the road network
- Approaches may travel through an approved residential development
- Noise impacts on the hospital and other noise sensitive development
- Social issues
- Flooding impacts
- Does not significantly improve traffic efficiency on the existing bridge (too remote)
- Benefit Cost Ratio is less than 1 (indicating poor value for money)

Eliminate Locality 7 – Why:

- Low traffic volumes would use the additional crossing
- Industrial heritage issues
- Noise impacts
- Social issues
- Flooding impacts
- Does not significantly improve traffic efficiency on the existing bridge (too remote)
- Benefit Cost Ratio is less than 1 (indicating poor value for money)

Of the localities considered worthy by the group of moving forward for further investigation, some of the issues that need to be addressed were identified as:

Locality 2 – Issues to be addressed:

- Treatment of traffic at the intersection of Fitzroy and Villiers Streets needs to be addressed
- Noise impacts on the schools and music academy in this precinct as well as addressing other noise sensitive building/receptors on the southern side
- Connectivity and access to cross streets, relocation of traffic to other streets and associated road upgrades

- Addressing the treatment of the impacted Figtree at the western end of Villiers Street (environmental and heritage values)
- Increased clearance considered at the Villiers Street viaduct
- Heritage buildings and other heritage issues along the route
- Economic analysis
- Design heights to descend from the bridge deck down to Victoria and Villiers Streets
- Other design constraints

Locality 3 – Issues to be addressed:

- Increased clearance to be considered at the Villiers Street viaduct
- Design constraints
- Connectivity and access to cross streets, relocation of traffic to other streets and associated road upgrades
- Social impacts
- Traffic noise
- Heritage
- Removal of kinks

Conclusions Drawn from the Evaluation of Localities

As a result of the discussions during the evaluation process, the group began to focus their thoughts and drew some overall conclusions on the localities to be progressed for more detailed investigation and for community input and public display.

The group concluded that:

- Based on the qualitative assessment undertaken, Locality 2 and Locality 3 contributed to the project objectives better than the other localities and are recommended to move forward for community input and more detailed investigation
- The localities that were recommended to be eliminated had significant issues (ie. social, ecological, environmental, flooding, traffic efficiency, etc) and did not sufficiently meet the project objectives (from which the assessment criteria were taken)
- Social impacts, noise, community issues and heritage concerns will be the biggest issues to address (other than technical constraints) during the next stage of project development
- There is a need to more fully articulate the issues associated with Locality 3
- The built environment in Grafton will have a big impact on where we can locate the additional crossing
- The further that the additional crossing is away from the existing bridge lessens how well it can meet the project objectives
- An additional crossing (away from the existing bridge) could place pressure on providing a third commercial node for Grafton which may segregate the community further (strategic view)

Where to From Here?

At the conclusion of the workshop, the project manager presented to the workshop group the next steps in the process to progress the project. These were recorded as:

- The recommendations from this workshop will be presented to the community workshops which will be undertaken on the 10 & 11 December 2003 for their input to this workshop's findings
- There will an analysis of the community input to confirm/amend the recommendations of the workshop to determine the localities to move forward for further investigation
- The localities to move forward will be investigated further with the results proceeding to public display of Route Options in February/March 2004
- Community input to the Route Options display will be considered and feed into a Route Evaluation Workshop. This is likely to generate additional investigation and refinement
- The announcement of preferred route is scheduled for mid 2004

Appendix 3. Summary Table for Comparison of Localities *(supplied by the project team)*

SUMMARY TABLE FOR COMPARISON OF LOCALITIES

Criteria	Do Nothing	Locality 1	Locality 2	Locality 3	Locality 4	Locality 5	Locality 6	Locality 7
1. Transport and Traffic								
Volumes on various crossings **2003**. New Existing	- 26000	10000 16000	11000 15000	13000 13000	6000 20000	5000 21000	4500 22500	3000 23000
Volumes on various crossings **2033** New Existing ** Traffic on the existing bridge may not exceed 24,000 because it may transfer to other routes to avoid peak hour delays.	- 34000	12000 22000	13000 21000	17000 17000	10000 24000 **	9000 25000 **	8000 26000 **	6000 28000 **
Level of Service year **2033** peak New Bridge Existing Bridge Los A= Very Good, Los F= Very Poor Based on Florida DOT model for Urban Conditions with 9.5% peak hour flows	 **-** **F**	 **D** **E**	 **D** **E**	 **A** **A**	 **D** **E**	 **C** **E**	 **C** **E**	 **C** **E/F**
Average weekday traffic in streets forming possible connections to localities Existing traffic volumes **(2003)** Volumes with Do nothing **(2033)** Volumes with new bridge (**2033)**	 - - -	Sth of Fitzroy 5000 6500 12000	Sth of Fitzroy 3000 3000 13000	 26000 34000 34000	East of Villiers 3000 3500 13000	East of Villiers 3000 3500 12000	East of Villiers 3000 3500 11000	East of Villiers 3000 3000 9000
Height Restrictions at Viaduct * Feasible to be increased in Villiers St		4.0m	4.0m *	4.0m *	Nil	Nil	Nil	Nil
Suitable for large vehicles including B-Doubles * Kinks are an issue and tight turns at roundabouts ** Detour via Duke St would keep trucks out of CBD *** Additional truck traffic in residential streets	Yes *	Yes **	Yes	Yes *	Yes ***	Yes ***	Yes ***	Yes ***
Provision for cyclists and public transport by reducing delays for buses and improving access to growth area eg Clarenza.	Poor	Fair	Good	Good	Very Good	Good	Good	Fair
Work required on intersections in approaches to existing bridge - Villiers/Fitzroy - Bent/Through - Bent/Ryan N-No significant works needed, U-Major Upgrade by **2033**	 U U U	 N N N	 U N N	 U U U	 N N N	 N N N	 U U N	 U U U
Through traffic using Bridge and Summerland Way **2003** Large Trucks ** Through traffic without stopping comprises approx 50% of volumes shown		300 30	400 60	1000 100	250 40	250 40	250 40	250 40
Total Large Trucks **2033** New bridge Existing bridge Light trucks and buses excluded	 - 500	 130 370	 270 150	 250 250	 260 240	 260 240	 240 260	 190 310
Number of Buses **2033** New bridge Existing bridge	 - 400	 130 270	 200 200	 200 200	 170 230	 150 250	 140 260	 110 290
Accident Savings (5 Years) **2003** **2013** **2023** **2033** Accounts for changes in travel on existing accident numbers.		 -6 -7 -7 -7	 -8 -9 -9 -10	 -12 -12 -13 -15	 2 2 3 4	 3 4 5 6	 1 1 1 2	 -3 -4 -5 -6

Criteria	Do Nothing	Locality 1	Locality 2	Locality 3	Locality 4	Locality 5	Locality 6	Locality 7
2. Economics								
Return on investment Benefit cost ratio		1.9	2.0	2.8	1.4	0.8	0.8	0.9
Approx number of businesses	All	Up to 60	Up to 3	1	Up to 5	Up to 3	Up to 5	Up to 2
3. Social Impacts								
Approx number of residences impacted	0	0	Up to 10 + schools	Up to 12	80-90	80-90	50-60 + aged Units	30-35 + aged Units
Potential increase in road traffic noise		Up to 3dB(a)	Up to 3dB(a)	0 to 3dB(a)	10 to 12 dB(a)	10 to 12 dB(a)	10 to 12 dB(a)	10 to 12 dB(a)
Improves tourist accessibility and economic development.	Poor	Minor	Good	Very Good	Very Good	Good	Good	Minor
4. Environmental Impacts								
Direct and indirect impacts on habitats and wildlife corridors	Low	High	Medium	Low	Low	Low	Low	High
Non-indigenous heritage sites potentially affected	Nil	High	High	Medium	Low	Low	Low	High
Indigenous heritage sites potentially affected	Nil	High	Low	Low	Low	Low	Low	High
Potential impacts of flooding		Low	Low	Low	High	High	High	High
5. Cost ($M)		**45**	**45**	**40**	**45**	**40**	**50**	**55**