GATEWAY UPGRADE PROJECT

Greg H Smith
B.Tech(Civil)

In the foreground an artist impression of the Gateway Bridge duplication
(Courtesy of The Courier-Mail)
February 2005

Abstract
The $1.6 billion Gateway Upgrade Project will duplicate the Gateway Bridge and upgrade 19 km of motorway including a northern entry into Brisbane Airport. Key events in the history of the Gateway Bridge and motorway are traced. The design, construct and maintain (DCM) project is in the bidding stage and tenders close in March 2006. A separate lane will be provided on the eastern side of the duplicate bridge to cater for pedestrian and cycle traffic. The upgrade will support the development of Brisbane’s ‘Australia TradeCoast’ and ease traffic congestion in Brisbane.

Introduction
This introductory article is the first in a series of articles about the Gateway Upgrade Project (GUP). Later articles will focus on more detailed aspects of the construction process.

The $1.6 billion GUP was announced by the Queensland Government in February 2005. The GUP is currently the largest road and bridge infrastructure project in the state’s history and includes the following features:

- The project includes the construction of a duplicate Gateway Bridge. The exact design and construction methods for the duplicate bridge will not be finalised until such time as the contract is awarded
- The new bridge will cater for southbound traffic while the existing bridge will cater for northbound traffic
- The duplicate Gateway Bridge will be positioned approximately 50 m downstream from the existing structure and will have an identical side profile
- A separate 4.25 m wide lane will be provided on the eastern side to cater for pedestrian and cycle traffic. It will form part of the planned 150 km Moreton Bay cycleway stretching from Bribie Island to Redland Bay
- 14 km of the Gateway Motorway will be upgraded from Mt Gravatt-Capalaba Road to Kingsford Smith Drive
- A 5 km four-lane northern deviation north from the existing Gateway Bridge across the old and new airport sites to just south of Nudgee Road will be constructed. A second access point to Brisbane Airport will be provided

(See Figure 1).
As it has been twenty years since the completion of the Gateway Bridge, the history of the bridge will be briefly revisited in order to give a better understanding of the changes that have occurred since that time.

The Gateway Bridge was officially opened on 11 January 1986 with the final cost for the construction of the bridge, the approach roads, toll plaza, toll system and land resumptions being $140 million. The Gateway Bridge was built by a consortium led by Transfield (Qld) Pty Ltd, comprising Macdonald Wagner and Priddle Pty Ltd as the designer and Citi-National Ltd (who became Capel Court) as the financier. Industrial relations and safety records for the project were good with no major incidents occurring. Construction of the bridge was fast tracked, allowing for the design and construction to be concurrent resulting in the bridge being commissioned five months ahead of schedule.

The beginnings of the Gateway Bridge were not simple or easy. It had taken the government of the day fourteen years and several attempts at calling for tenders before a successful tender was submitted. Starting in 1964, the first tenders were for the financing, design and construction of a four-lane bridge or tunnel, with operation as a toll facility for a franchise period of forty years. Unfortunately only one tender was received due to the uncertainty of revenue to be generated from the traffic volumes. A similar situation occurred when tenders were again called in 1966.

A Brisbane Transportation Study in 1965 recommended another river crossing downstream from the Story Bridge that would service the development of industrial land happening north and south of the river. At that time, the Port of Brisbane was re-establishing itself closer to the mouth of the river adjacent to the industrial development, so a river crossing in the vicinity of this activity would have the potential to save significant time and money. A cross river bridge and motorway would provide a vital link between the Bruce Highway to the north and the Pacific Motorway to the south and ease congestion in the city of Brisbane by providing a much needed bypass.

Ultimately in 1978, Main Roads Department recalled tenders for the financing, design, construction, operation and maintenance of a tunnel or bridge with associated approaches, across the Brisbane River, between the suburbs of Eagle Farm in the north and Queensport in the south. In June 1980, negotiations were finalised and the contract was awarded to Transfield (Qld) Pty Ltd, who privately financed the project. To safeguard their borrowings, Transfield called on the government to guarantee their loans, as the projected revenue generation from toll collection was uncertain. The successful consortium rejected the tunnel proposal as being too expensive. They also changed the bridge design that was part of the tender documents, preferring a cantilever concrete box girder bridge, prepared by V.S.L. Australia in association with V.S.L. International in Switzerland.

Work began on the six-lane bridge in August 1980, with the completion scheduled for December 1985. The existing and new Gateway Bridge are restricted by certain design criteria including:

- A height clearance of 55 m over the high tide mark of the Brisbane River, to allow the largest of ships to pass safely under the bridge
- A clear span width of at least 230 m so ships of varying size and width could safely manoeuvre under the bridge
- A maximum 80 m height of the superstructure (including the height of the lamp posts and direction signs) so as not to interfere with flight paths of aircraft taking off or landing at Brisbane Airport

At the time of its completion, the bridge boasted a number of Australian and world class achievements, including:

- The longest cantilevered concrete box girder main river span, at a length of 260 m
- An erection truss weighing 650 t
- Stressing cables in the approach spans were the highest loaded cables in a structure in Australia, with 2,200 t of 12 mm low relaxation stressing strand
- Bridge bearings, with a maximum tested load of 4,300 t, were the biggest pot bearings made in Australia.

**Figure 1. Indicative new motorway route**
Why build a second bridge and motorway?
There are strong economic and social justifications for building a duplicate bridge and upgrading the motorway. The major justifications are:

1. Vehicle movements — When the Gateway Bridge was opened in 1986, it carried 17,000 vehicles per day or 5.6 million per year. Since then, vehicle movements have increased to 31.4 million per year in 2005, and are currently growing at 5% annually (see Figure 2). The current average usage of the bridge is 100,000 vehicles per day.

2. The emergence of Brisbane’s ‘Australia TradeCoast’ — Australia TradeCoast is an 8,000 hectare site located around the mouth of the Brisbane River comprising the Port of Brisbane, Brisbane Airport Corporation and various industrial estates. It is estimated that 40% of the traffic across the Gateway Bridge comes from the Australia TradeCoast region, with 25% travelling to and from Brisbane Airport. In addition, Australia TradeCoast generates 5% of the employment for the Brisbane region, which is expected to increase to 8.5% by 2021. Already this area is contributing $4.3 billion to the national economy and by 2011 this is expected to increase to $5.8 billion annually.

The duplication of the Gateway Bridge, upgrading and realignment of the connecting motorway is essential in facilitating economic development and managing traffic congestion on this important trade route.

What are some of the differences?
With the new project, Queensland Motorways Limited (QML), the owner and operator of the existing Gateway Bridge, will deliver the GUP on behalf of the state government and in partnership with the private sector. The financing of the new project is a fundamental area of difference. QML is sourcing the funds for the project through loans directly from Queensland Treasury Corporation, with Main Roads providing the guarantees on the debt incurred. Under a separate agreement with the state, QML will be granted a franchise to own and operate the facility for thirty years with toll revenue funding the loan repayment.

Another key difference was the legislative requirement to complete an Environmental Impact Statement (EIS), which was not required in the 1980s. During the EIS phase, studies were undertaken to examine the specific impacts of the project including noise, air quality, water quality, flora, fauna, wetlands and cultural heritage. The EIS was also opened for public comment and issues raised were then addressed through a Supplementary EIS (SEIS). Both the EIS and the SEIS were then submitted to the coordinator-general for evaluation. Finally after eighteen months of environmental studies and community consultation, the coordinator-general’s approval was received in July 2005.

The most substantial difference to the original project will be the delivery mechanisms. The GUP will be the first project to be delivered in Queensland through a design, construct and maintain contract based on a project specific ‘deed type’ contract. Under this type of fixed price contract, the risks associated with the investigation, design, construction and ten-year maintenance period following completion, are transferred to the private sector. This was the option chosen by the government during the business case as it represented the best value for money and had the potential to deliver considerable savings to the state of Queensland.

When the Gateway Bridge was opened in 1986 the toll fees were ‘cash only’. This was expanded in later years to cover new methods of payment, including electronic tolling. One of the major technology advances for both bridges will be the introduction of “SmartRoad” concepts such as full electronic tolling collection (ETC) and intelligent transport systems (ITS). By the time the GUP is completed, full ETC will be a feature on both bridges as a result of the introduction of a high speed, automatic electronic toll collection system. This system is designed to operate at motorway speeds, eliminating the need for slowing down or stopping, and helping to create free-flow traffic conditions, even during peak periods. The backbone of the ITS will be the “STREAMS” traffic management system utilising the latest traffic management hardware such as variable message signs, variable speed limit and close circuit television to monitor the operations of the motorway.

The Project will feature “progressive openings” as defined separable portions are completed. Five separable portions have been identified in the Project. The timeline for the delivery of these separable portions is shown in figure 3.
Progress to date – Procurement Phase

Registration of Interest

QML sought ‘registrations of interest’ in February 2005 from suitably qualified organisations. Five international and national consortia later registered an interest in the project. In September 2005, three consortia were invited to tender for the project, namely:

- Leighton Abigroup Joint Venture
- Thiess Boulderstone Hornibrook Joint Venture
- The Coastlink Consortium, comprising Bouygues Travaux Publics of France and Macmahon Contractors

Tender evaluation

Tenders will close for the project in March 2006. The evaluation of the tenders is a complex process and will take approximately six months. The evaluation will involve multiple teams reviewing various aspects of the submissions against some seventeen selection criteria.

These evaluation teams will comprise representatives from QML, Main Roads’ Engineering & Technology Division, Organisational Positioning & Stakeholder Management Division and Metropolitan Division groups, Queensland Treasury as well as the advisors to the project including Evans & Peck (technical), Connell Wagner (engineering and environment), Allens Arthur Robinson (legal), Mason Wilson Twiney (traffic) and PricewaterhouseCoopers (financial). The entire evaluation process is overseen by probity advisors, Doyles Construction Lawyers. It is expected that a contract will be awarded by the end of September 2006.

Conclusion

The duplication of the Gateway Bridge combined with the realignment and upgrading of the motorway will reduce traffic congestion and support the rapid development that is occurring in the Brisbane “Australia Trade Coast” as well as the southeast corner of Queensland.

The magnitude and complexity of the project will create a considerable resource demand on QML, Main Roads and the construction industry in general and I am sure that the extended GUP team are looking forward to the challenges this project will create.
### Gateway Bridge Data [8]

<table>
<thead>
<tr>
<th>Description</th>
<th>Measurement</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum height</td>
<td>65 m</td>
<td>Stress bar</td>
</tr>
<tr>
<td>Shipping vertical clearance</td>
<td>59 m</td>
<td>Load on each river pier</td>
</tr>
<tr>
<td>Width</td>
<td>22 m (6 lanes)</td>
<td>Land fill – northern approach</td>
</tr>
<tr>
<td>Main span</td>
<td>260 m</td>
<td>Land fill – southern approach</td>
</tr>
<tr>
<td>Length between abutments</td>
<td>1,627 m</td>
<td>Asphalt</td>
</tr>
<tr>
<td>Concrete – in place</td>
<td>48,000 m$^3$</td>
<td>Cement treated base</td>
</tr>
<tr>
<td>Concrete - precast</td>
<td>15,000 m$^3$</td>
<td>Toll plaza</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>9,900 t</td>
<td>Check engineer</td>
</tr>
</tbody>
</table>

#### References


#### Acknowledgements

The article was supported by research conducted by Paul Dobbyn and other members of the GUP team. A wide range of personnel from both Main Roads and external organisations have assisted the GUP team in establishing the project. Additionally, the learnings from previous projects such as the Gateway Bridge, Pacific Motorway, Port of Brisbane Motorway and other recent large projects have provided invaluable information for this project.