



Hawkesbury City Council

Attachment 1 to item 189

Windsor Bridge Over the Hawkesbury
River Options Report -
Dated August 2011

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Transport
Roads & Traffic
Authority



Windsor Bridge over the Hawkesbury River

Options report

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Windsor Bridge Replacement Options Report
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australian
made



carbon
neutral



mill
certified



renewable
energy



sustainable
forest



EXECUTIVE SUMMARY

Background

The Hawkesbury River Bridge at Windsor (here after referred to as Windsor Bridge) crosses the Hawkesbury River from Bridge Street, Windsor. Opened in 1874, Windsor Bridge is the oldest existing crossing of the Hawkesbury River and parts of the bridge are now over 130 years old. Windsor Bridge is deteriorating due to age and heavy usage. It does not meet current road design standards and significant maintenance issues continue to develop. The bridge is regularly inspected to ensure safety for use and heavy vehicle traffic is now limited to 40km/h. Windsor Bridge is below the 1-in-2 year flood event level while the surrounding approach roads provide access at a 1-in-5 year flood level.

In June 2008, in recognition of the need to replace Windsor Bridge, the NSW Government announced it had committed \$25 million for a replacement bridge. The RTA undertook investigations into potential options a new of refurbished bridge. The purpose of this report is to outline the RTA's consideration of options and the development of a preferred option.

Options identification and assessment

Nine potential options to upgrade or replace the existing bridge were identified. This included 8 options to replace the bridge and one to upgrade the existing bridge.

- Option 1 – a replacement high level bridge around 35 metres downstream of the existing bridge as an extension of Old Bridge Street (originally Bridge Street). It would provide sufficient clearance for services vehicles and buses along The Terrace.
- Option 2 – a replacement low level bridge around 35 metres downstream of the existing bridge as an extension of Old Bridge Street. It would provide a clearance of around 3.5 metres for light vehicles only along The Terrace.
- Option 3 – a replacement bridge around 10 metres upstream of the existing bridge. It would primarily use the existing Bridge Street road alignment.
- Option 4 – a replacement bridge that is an extension of Baker Street, Windsor. The bridge would connect within Macquarie Park on the northern bank.
- Option 5 – a replacement bridge that is an extension of Kable Street, Windsor. The bridge would connect within Macquarie Park on the northern bank.
- Option 6 – a replacement bridge beginning with a new T-intersection on Windsor Road, creating a new road crossing over South Creek. The road then heads north parallel to Palmer Street, leading to the bridge over the Hawkesbury River.
- Option 7 – a replacement bridge running down the existing Court/North Street in Windsor, before turning north along Palmer Street to the bridge over the Hawkesbury River.
- Option 8 – a replacement bridge through Pitt Town and connecting to Wilberforce, removing a crossing at Windsor.
- Option 9 – retaining and refurbishing the existing bridge. Two potential methods were identified to carry out the refurbishment works.

Community consultation was part of the investigation process and has informed the selection of a preferred option. Community updates were distributed and information sessions were held for the community to provide input into the consideration of the nine options. Following this process, a government stakeholder workshop was held to consider issues relating to each option.

A number of preliminary investigations were undertaken to better consider issues associated with some of the options. This included Aboriginal and non-Aboriginal heritage investigations, traffic investigations, landscape character and urban design investigations, socio-economic investigations, and pedestrian/retail surveys. Preliminary costs for the options were also investigated.

Some of the options were further refined to better accommodate traffic growth in the short term and long term. This included providing signalised intersections on the northern banks, replacing the George Street/Bridge Street roundabout with traffic signals for options 1, 2 and 3, and providing a signalised intersection with Windsor Road for option 6 to allow for future traffic increases. The options were also refined to provide for three lanes of traffic on the replacement bridge.

Non-Aboriginal heritage considerations – Thompson Square

The Windsor area is of high heritage significance as an early Australian town that has retained much of its original layout and many historic buildings within a picturesque rural setting. When the town was formally founded by Governor Macquarie in 1810 it had already developed as a civic centre for the dispersed farming community along the Hawkesbury River. Thompson Square is the only town square that remains from the original five 'Macquarie Town' urban plans designed by Governor Macquarie. It was formed from a utilitarian space that had developed to allow access from the ridgeline main road to the water's edge, as most of the commercial traffic was water based. The formalised Thompsons Square was defined and bounded by Georgian style buildings from the period. Thompson Square and the surrounding buildings are listed on the NSW State Heritage Register as being of state heritage significance.

The current approach to the Windsor Bridge runs through the centre of Thompson Square. It is noted on the heritage listing that the existing road alignment detracts from the heritage significance of the square.

Options 1, 2 and 3 propose a replacement bridge crossing which would include road approaches through Thompson Square. It is recognised that these options will result in adverse heritage impacts to Thompson Square but do provide an opportunity to improve the existing urban layout of the square and bridge approaches.

The former Heritage Branch of the Department of Planning (now part of the Office of Environment and Heritage) and the Heritage Council of NSW have been consulted during the development of the options and would continue to be consulted as part of the future environmental impact assessment of the preferred option. The Heritage Council of NSW does not support any option in Thompsons Square.

Preferred option

The RTA has identified option 1 as the preferred option. Option 1 provides a new high level structure immediately downstream of the existing bridge connected by a new approach road located on the eastern side of Thompson Square. The bridge height would accommodate a 1-in-5 year flood event. The existing bridge and road alignment through Thompson Square would be removed providing for a larger area of consolidated open space within Thompson Square. However, it is acknowledged that there would be adverse heritage impacts associated with the preferred option, particularly on Thompson Square and the surrounding heritage buildings. The preferred option would also likely have some noise, vibration, socio-economic and visual amenity impacts.

This option performs best on value for money and performs well in relation to most of the project objectives. The project can be delivered in two stages based on traffic demands and available funding.

- The section between Wilberforce Road and George Street including construction of a new bridge is estimated at \$31 million.
- Future works including traffic signals at the George Street/Bridge Street intersection and modification of lanes on Fitzroy Bridge (South Creek) are estimated at \$14 million. These would only be constructed based on traffic demands and available funding.

The total estimated project cost for the both stages is \$45 million (2011 dollars).

What happens next?

The RTA is currently seeking comments on the preferred option. Written comments are welcome to the project manager:

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Or email comments to Windsor_Bridge@rta.nsw.gov.au

Comments are needed by **Friday 9 September 2011**.

A State significant infrastructure application under Part 5.1 of the *Environmental Planning and Assessment Act 1979* will be submitted to the Minister for Planning seeking detailed requirements for preparation of an environmental impact statement. Comments received from the community and other interested parties will inform development of a concept design and the preparation of the environmental impact statement.

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Table of Contents

1	Introduction.....	1
1.1	Background.....	1
1.2	Existing bridge.....	2
1.3	Need for bridge works.....	3
1.4	Project objectives.....	4
1.5	Purpose of this report.....	5
2	Options.....	6
2.1	Identification of options	6
2.2	Description of preliminary options.....	7
2.2.1	Option 1 – downstream high level bridge.....	7
2.2.2	Option 2 – downstream low level bridge.....	7
2.2.3	Option 3 – bridge immediately upstream of the existing bridge	7
2.2.4	Option 4 – Baker Street.....	8
2.2.5	Option 5 – Kable Street.....	8
2.2.6	Option 6 – Palmer Street.....	9
2.2.7	Option 7 – Court/North Street onto Palmer Street.....	9
2.2.8	Option 8 – Pitt Town Road.....	10
2.2.9	Option 9 – refurbish the existing bridge.....	10
3	Site context and preliminary studies.....	14
3.1	Non-Aboriginal history.....	14
3.2	Aboriginal heritage	22
3.3	Biodiversity.....	24
3.4	Flooding	25
3.5	Socio-economic profile	26
3.5.1	Pedestrian survey.....	27
3.5.2	Survey of businesses and local patrons	29
3.5.3	Tourism and recreation – Hawkesbury River	32
3.6	Noise and vibration.....	34
3.7	Urban design.....	34
3.7.1	Landscape character	34
3.7.2	Preliminary urban design objectives and principles	37
3.8	Land use	39
3.9	Traffic	40
3.9.1	Survey of existing traffic.....	42

3.9.2	Modelling of option 1	42
3.9.3	Modelling of option 6	43
3.9.4	Summary of traffic findings	43
3.9.5	Intersection scenarios for option 1	44
4	Consultation	46
4.1	Community consultation	46
4.2	Submissions	47
4.3	Issues	48
4.3.1	Issues	48
4.3.2	Description of community issues	49
4.3.3	Description of government issues	53
4.4	Other options suggested by community members	56
4.5	Stakeholder options review workshop	58
4.5.1	Initial review	58
4.5.2	Detailed review	59
4.5.3	Outcome of stakeholder workshop	62
5	Refinement and evaluation of options	63
5.1	Refinement of options	63
5.1.1	Option 1	63
5.1.2	Option 3	63
5.1.3	Option 6	64
5.2	Preliminary cost of each option	66
5.3	Comparison of options	67
5.3.1	Positives and negatives	67
5.3.2	Comparison of options against the project objectives	76
6	Conclusion	78
6.1	Decision making process	78
6.2	Preferred option	79
6.3	Description of the preferred option	79
6.4	Staging of works for the preferred option	80
6.4.1	Stage 1	80
6.4.2	Stage 2	81
6.5	Next steps	83
7	References	84

List of Figures

Figure 2.1: Options 1 to 9 (excluding 8)	12
Figure 2.2: Option 8	13
Figure 3.1: Listed heritage items near to options 1 to 9 (excluding 8)	17
Figure 3.2: Listed heritage items near to option 8	18
Figure 3.3: Floor space by businesses, Windsor town centre	26
Figure 3.4: Data collection sites for pedestrian survey (2009)	28
Figure 3.5: Patrons' survey sample, place of residence (share of sample)	30
Figure 3.6: Bird's-eye view of the Windsor town centre	32
Figure 3.7: Map of Hawkesbury River, Windsor (NSW Maritime 2011) – key below	33
Figure 3.8: Area included in the traffic model	41
Figure 3.9: George Street and Bridge Street – Scenario 1	45
Figure 4.1: Livingston Road and Pitt Town Bottom Road alternatives	57
Figure 6.1: Bridge cross-section for stage 1	80
Figure 6.2: Bridge cross-section for stage 2	81
Figure 6.3: Option 1 – Stage 1 and stage 2 (future works) development (preliminary design)	82

List of Tables

Table 1.1: Project objectives	4
Table 3.1: Listed heritage items surrounding Windsor Bridge options	19
Table 3.2: Flood levels from previous flooding events in Windsor	25
Table 3.3: Estimated annual retail turnover, Windsor Town Centre	27
Table 3.4: Summary of pedestrian survey results	28
Table 4.1: Submissions	47
Table 4.2: Issues raised	49
Table 4.3: Workshop considerations – initial review	58
Table 4.4: Option 1 – downstream high level bridge	59
Table 4.5: Option 2 – downstream low level bridge	60
Table 4.6: Option 6 – bridge located at Palmer Street	60
Table 4.7: Option 7 – bridge located at Court Street/North Street onto Palmer Street	61
Table 4.8: Option 9A – rehabilitation of existing bridge	61
Table 4.9: Option 9B – rehabilitation of existing bridge	62
Table 5.1: Engineering assumptions for all options	65

Table 5.2: Economic analysis of options.....	66
Table 5.3: Relative performance of the options.....	77

1 Introduction

1.1 Background

Windsor is located 57 km northwest of Sydney within the Hawkesbury City Council local government area. Windsor and the surrounding areas lie within the floodplain of the Hawkesbury River. The town is located on a small ridge above the Hawkesbury River on its southern bank and is surrounded by a semi-rural landscape.

The Windsor Bridge crosses the Hawkesbury River from Bridge Street, Windsor. Windsor Bridge opened in 1874 and parts of it are over 130 years old. It is the oldest existing bridge crossing the Hawkesbury River.

The existing road is an arterial road with heavy traffic flows. Windsor Bridge carries two lanes of traffic on a 6.1 metre wide carriageway. Over 18,000 vehicles per day use the bridge. The daily traffic consists of around 90 percent light vehicles and 10 percent heavy vehicles. Most of the heavy vehicles are classes three to nine vehicles (heavy vehicles with less than seven axles). More than 900 vehicles per hour cross the bridge in both the southbound AM peak and the northbound PM peak traffic periods.

The level of the existing bridge is below the one-in-two year flood event level whereas the surrounding approach roads are at a one-in-five year flood level. Over the past 100 years the existing bridge is thought to have been flooded on 59 occasions with the approach roads still being accessible in many of these events.

In June 2008, in recognition of the need to replace Windsor Bridge, the NSW Government announced funding of \$25 million to replace the bridge.

The bridge is listed on the RTA's *s.170 Heritage and Conservation Register* as an item of state heritage significance. It is not listed on the State Heritage Register. There are a large number of state and local heritage items in the immediate vicinity of the existing bridge and in the area which would potentially be affected by the replacement of the bridge on the existing, or a changed alignment.

1.2 Existing bridge

The bridge was originally built with a timber deck on cast iron piers. Over the years the bridge has undergone alterations including, raising the bridge by 2.4 metres and adding a pier in 1897. The timber deck, abutment and the same pier were replaced by reinforced concrete in 1921-22 and a footpath was added on the downstream side in 1968.

The bridge is 143 metres long and 6.1 metres wide (without the footpath). It is currently comprised of:

- Abutments - abutment A is located at the Windsor end (southern) and abutment B at the Wilberforce end (northern). Abutment A is formed by three caissons (cast iron cylinders) fronting an end wall and wing walls cast in concrete. Abutment B is formed of nine piles upon which a mass concrete platform was constructed at the same time as the concrete decking. Abutment B has undergone scour remediation with added steel wing walls and stone rubble erosion baskets. Abutment A has also had substantial works carried out to deter scouring through the installation of stone filled gabions.
- Piers - nine piers are formed by two paired caissons with iron cross bracing, which was repeated when an additional 2.4 metres (eight feet) in height was added in 1897. The iron piers are filled with mixed rubble such as bricks for strength. To support the concrete deck constructed in 1921-22, a concrete cross girder was cast between the caissons, with an upper level cross girder directly under the deck beams.

One pier at the Wilberforce end is formed from mass concrete and is a replacement for an earlier timber pier with the re-decking in 1921-22. It was required due to heavy scouring on the bank and because the timber could not bear the weight of the concrete deck.

- Girder spans – there are eleven girder spans which were constructed of reinforced concrete in 1921-22 as part of the deck replacement and are of slightly differing lengths. The concrete beams and decking were constructed in two longitudinal sections each with four beams. The girder spans provide the structural support for the road deck.
- Concrete decking – the reinforced concrete deck was constructed with the new girders in 1921-22. The deck sits on top of the concrete beam girders and has been overlain with a thin asphalt covering that provides the road surface for traffic.
- Footway – constructed in 1968 is made of removable concrete slabs and steel bracing using a series of rolled steel joist girders cantilevered to the underside of the bridge deck and supported by the piers. Ducting for utilities (telephone cables, a water main and an electrical conduit) are fixed to the footpath.
- Railings - originally constructed with a rare pipe and chain collapsible railing specifically designed for this bridge. These could be manually lowered during flood to avoid debris build up. Providing no structural support or a barrier to traffic, this was replaced on both sides of the road by tubular crash railing on top of concrete kerbs. The downstream side was completed in 1968 as part of the new footway and the upstream side was replaced in 1982.

Each of these components has varying heritage significance and associated management issues.

1.3 Need for bridge works

In December 2003, a bridge inspection and condition assessment assessed the bridge as being in poor condition due to concrete spalling in the longitudinal beams and headstocks. The sections of the caissons below the water line have corroded over time and this corrosion has now reached a critical level. The conclusion of the report was that the structure requires extensive repairs.

Refurbishment of the existing bridge for a 25 years life span was estimated to cost in excess of \$18 million, not including the community costs and impacts from extensive detours that would be required during repairs and refurbishment of the bridge. Closure of the bridge requires a road detour of 30 kilometres via Richmond Bridge.

Although flood water has not overtopped the bridge for almost two decades, refurbishment of the existing structure would not improve the frequency of inundation and the bridge would continue to be subject to impacts from flood waters that could seriously damage the bridge through the build up of debris and sediment that may wash from upstream.

The width of the existing bridge and design of the approach roads do not meet current road safety/design standards. The bridge deck, at 6.1 metres wide restricts the movement of heavy vehicles with some drivers electing to wait on one side of the bridge while an oncoming heavy vehicle passes which can delay traffic behind the waiting vehicles.

Investigations in May 2011 revealed cracks in the caissons. A speed restriction to 40km/hr for all heavy vehicles was imposed on 14 June 2011.

In summary, the need to repair or replace Windsor Bridge is based on:

- The structural degradation of the existing bridge which would require ongoing extensive and costly repairs.
- Ultimately a load limit would need to be placed on the bridge diverting heavy vehicles, which would impact travel times and the local economy.
- The current bridge is at a one-in-two year flood event level and a flood that is higher than this level could seriously damage or destroy the bridge.
- The bridge design and approach roads do not meet current road design standards.

1.4 Project objectives

The project aims to provide a safe and reliable crossing of the Hawkesbury River at Windsor. Options were considered against the objectives identified in Table 1.1.

Table 1.1: Project objectives

OBJECTIVE	
To improve safety for motorists, pedestrians and cyclists	<ul style="list-style-type: none">• Meets the current design codes (eg traffic lane widths, shoulder widths and shared path widths).• Meets a road speed of 60 km/hr.• Ensures pedestrian safety.
To improve traffic and transport efficiency	<ul style="list-style-type: none">• Minimises queue length/delays.• Improves performance of road network (level of service).• Enables two heavy vehicles to pass on the bridge without waiting.• Improves load capacity of the crossing to meet current load standards.
To improve the level of flood immunity	<ul style="list-style-type: none">• Provides a crossing that is above the 1 in 5 year flood event.
To meet long term community needs	<ul style="list-style-type: none">• Provides an efficient connection for local and regional traffic.• Provides a pedestrian and cyclist connection to surrounding locations.• Minimises impact on recreational spaces.• Minimises impact of noise.• Minimises impact to businesses and the shopping environment.• Minimises impact on property access and need for acquisition.• Provides a 100 year life span for the bridge structure.
To minimise the impact on heritage and the character of the local area	<ul style="list-style-type: none">• Minimises impact on Aboriginal and non-Aboriginal heritage and conservation areas.• Minimises impact on the built heritage of the town and its setting.

OBJECTIVE	
	<ul style="list-style-type: none"> Minimises visual impact and impacts on the character of the local area.
To be a cost effective and an affordable outcome	<ul style="list-style-type: none"> Provides a cost effective solution in terms of: <ul style="list-style-type: none"> Capital cost. Maintenance cost. Return on investment. Minimises the impacts of construction (including disruption to existing traffic).

1.5 Purpose of this report

The purpose of this report is to provide:

- A description of the options that were considered.
- An evaluation of the options.
- A summary of the investigation process that led to the selection of RTA's preferred option.
- A description of the preferred option.
- Details of the next steps in the process.

2 Options

This section describes the options that have been considered for the proposed Windsor Bridge replacement or refurbishment.

2.1 Identification of options

Nine options to refurbish or replace Windsor Bridge were considered.

- Eight replacement options (option 1 to 8).
- One refurbishment option (option 9).

Preliminary plans were developed for each option. The options were placed on public display for comment. This included:

- A community update distributed to 13,500 local residents, businesses and government agencies.
- Displays erected at the Hawkesbury City Council administration building and library and the Richmond Motor Registry between 13 July 2009 and 14 August 2009.
- Advertising of the options display in the Hawkesbury Gazette on 15 July 2009 and the Hawkesbury Courier on the 16 July 2009.
- Project information on the RTA website.
- A shopping centre promotion was held at the Windsor Riverview Shopping Centre on Saturday 25 July 2009.
- A community information session with the RTA project team was held at the Windsor Central Library on 1 August 2009.
- Community stakeholder meetings between the RTA project team and various groups and organisations in July and August 2009.

Submissions were invited from the community on the nine options. The issues raised during the discussions are outlined in the *Community Consultation Report* (November 2009) which is available on the RTA website (www.rta.nsw.gov.au/roadprojects). A summary of the issues raised is in section 4. The information gathered throughout this process was used to help refine the options.

2.2 Description of preliminary options

Below are descriptions of the options that were initially proposed as part of the public consultation to replace or refurbish Windsor Bridge. The locations of these options are shown in Figure 2.1 and 2.2. Options 1 to 8 all include removal of the existing Windsor Bridge.

2.2.1 Option 1 – downstream high level bridge

Option 1 would:

- Provide a new two or three lane crossing located 35 metres downstream of the existing bridge along the alignment of Old Bridge Street.
- Provide access in a 1 in 5 year flood event.
- Maintain the roundabout at George Street and establish a roundabout at the intersection of Freemans Reach Road and Wilberforce Road.
- Provide a minimum of 4.5 metre clearance for passage along The Terrace. This would allow access for light vehicles and service vehicles, including garbage trucks and coaches.
- Provide pedestrian access across the bridge and along the southern bank.
- Remove the current road through Thompson Square.

2.2.2 Option 2 – downstream low level bridge

Option 2 would:

- Provide a new two or three lane crossing located 35 metres downstream of the existing bridge along the alignment of Old Bridge Street.
- Provide access in a less than 1-in-5 year flood event.
- Maintain the roundabout at George Street and establish a roundabout at the intersection of Freemans Reach Road and Wilberforce Road.
- Provide a 3.5 metre clearance for passage along The Terrace. This would allow access for light vehicles only.
- Provide pedestrian access across the bridge and along the southern bank.
- Remove the current road through Thompson Square.

2.2.3 Option 3 – bridge immediately upstream of the existing bridge

Option 3 would:

- Provide a new two or three lane crossing about 10 metres upstream of the existing bridge, primarily following the existing alignment through Thompson Square.
- Provide access in a 1 in 5 year flood event.
- Keep the roundabout at George Street and the current alignment on Bridge Street.
- Create a curved bridge which would meet the existing alignment of Wilberforce Road.

- Provide pedestrian access across the bridge and along the southern bank.
- Provide sufficient clearance along The Terrace to allow access for light vehicles and service vehicles, including garbage trucks and coaches.
- Would create construction issues including potentially closing the bridge for a short period of time.

2.2.4 Option 4 – Baker Street

Option 4 would:

- Provide a new two or three lane crossing located about 70 metres upstream of the existing bridge, following the alignment of Baker Street in Windsor.
- Construct a traffic signalled intersection at Macquarie Street and Baker Street to allow traffic to travel along Baker Street crossing the new bridge before turning right through Macquarie Park and aligning with the existing Wilberforce Road. In order to provide the necessary lane width, parking along Baker Street would be removed.
- Provide access in a 1 in 5 year flood event.
- Remove pedestrian and vehicle access along The Terrace at Baker Street or requires the installation of a controlled intersection.
- Require traffic control facilities at the southern entrance to the bridge to control traffic and pedestrian access along the southern bank of the river.
- Provide pedestrian access across the bridge.

2.2.5 Option 5 – Kable Street

Option 5 would:

- Provide a new two or three lane crossing located about 170 metres upstream of the existing bridge following the alignment of Kable Street in Windsor.
- Reconstruct the traffic signalled intersection at Macquarie Street and Kable Street to provide access for traffic to travel along Kable Street then cross the new bridge before turning right through Macquarie Park and aligning with the existing Wilberforce Road. In order to provide the necessary lane width, parking along Kable Street would be removed.
- Provide access in a 1 in 5 year flood event.
- Remove pedestrian and vehicle access along The Terrace at Kable Street or install a controlled intersection.
- Require traffic control facilities at the southern entrance to the bridge to provide traffic control and pedestrian access along the southern bank of the river.
- Provide pedestrian access across the bridge.

2.2.6 Option 6 – Palmer Street

Option 6 would:

- Provide a new two or three lane crossing located about 400 metres downstream of the existing bridge.
- Create a minor bypass of the Windsor town centre running on the edge of the township's urban/rural interface.
- Create a new signalised T-intersection on Windsor Road north of Pitt Town Road, then create a new road which includes a new bridge crossing South Creek and road travelling parallel to Palmer Street.
- Establish a T-intersection on Wilberforce Road on the northern side of the river.
- Require building a new 1.2 km length of approach road to the crossing, part of which would cut through the western edge of Governor Phillip Park.
- Provide access in a 1 in 5 year flood event.
- Remove access to George Street and Court/North Street, however access to Palmer Street would be maintained.
- Provide pedestrian access across the bridge and along the southern bank into Windsor.

2.2.7 Option 7 – Court/North Street onto Palmer Street

Option 7 would:

- Provide a new two or three lane crossing located about 400 metres downstream of the existing bridge.
- Create a minor bypass of the Windsor town centre with a new signalised intersection at the corner of Windsor Road and North/Court Street which would then run along North/Court Street before turning left down Palmer Street.
- Create a new crossing at the western edge of Governor Phillip Park leading onto the bridge with a new T-intersection on Wilberforce Road. North/Court Street would be sufficiently wide enough to support the realignment; however, parking may need to be restricted.
- Provide access in a 1 in 5 year flood event.
- Remove access to George Street from Palmer Street.
- Provide pedestrian access across the bridge and along the southern bank into Windsor.

2.2.8 Option 8 – Pitt Town Road

Option 8 would:

- Provide a new two or three lane crossing at Pitt Town, about six kilometres downstream of the existing bridge.
- Bypass the township of Windsor and require diverting traffic to turn down Pitt Town Road at the intersection with Windsor Road. Traffic would travel along the existing Pitt Town Road onto Bathurst Street and Punt Road.
- Provide a new viaduct or low embankment extending Punt Road across Bardenarang Creek and the adjacent floodplain to the Hawkesbury River.
- Cross the river to intersect with King Road at a T-intersection on the northern bank of the river. Traffic would then turn left (westbound) into King Road and intersect with Wilberforce/Singleton Road at the existing T-intersection at Wilberforce.
- Result in a 9 km detour of the Windsor Township.
- Not provide pedestrian access given the isolation of the crossing from populated areas.
- Provide access in a 1 in 5 year flood event.

2.2.9 Option 9 – refurbish the existing bridge

Substantial works would be required to refurbish the existing bridge. The current Windsor Bridge has the following structural issues:

- Spalling of girders.
- Graphitisation of cast iron piers.

To refurbish the existing bridge two methods were considered.

Option 9A

Option 9A would:

- Not require the removal or the replacement of the existing bridge deck.
- Retains the existing lane widths on the current bridge.
- Replace the bridge joints, concrete the bridge deck, install deck drainage and beams and add additional steel girders between the existing concrete beams. The cast iron piers would require strengthening by concrete encasement.
- Close the existing bridge for three months during the refurbishment.
- Would not improve flood immunity of the existing bridge.

Option 9B

This option would:

- Remove and replace the existing bridge deck.
- Remove and dispose of the existing super structure including the bridge deck. The rubble in the existing cast iron casings would be drilled out and replaced with a reinforced concrete infill to create permanently cased bored piles.
- Refurbish the bridge super-structure to include a head stock, beams and decking that would accommodate a wider road platform.
- Require closing the bridge for twelve months during the refurbishment.
- Not improve the flood immunity of the bridge.



Figure 2.1: Options 1 to 9 (excluding 8)



Figure 2.2: Option 8

3 Site context and preliminary studies

This section describes the context of the site and outlines the results of preliminary studies undertaken to identify environmental issues associated with the various options. Some of these preliminary studies focus on details relating to specific options, rather than all of the options. Further detailed environmental assessment would be carried out as part of the future environmental impact assessment of the preferred option.

3.1 Non-Aboriginal history

Europeans first visited the Windsor area in 1789 as part of an expedition led by Governor Phillip. The river flats were recognised as being the most promising farm land yet discovered in the colony and the first official land grants were made in 1794 with 22 farms being marked out by Lieutenant-Governor Major Grose. In 1798 the farming population was over 600 and the area was the primary supplier of produce to the new colony of Sydney.

Governor Macquarie visited the area in December 1810 to officially declare towns as 'claimed' land. He named the five Macquarie towns in the area: Windsor, Castlereagh, Wilberforce, Pitt Town and Richmond. Governor Macquarie designed the town centres of each town including the street layout, a public square, church, school and burial grounds. The town plans were intended to assert order over an unruly environment and to imprint authority at what were then the limits of British settlement.

The plan Macquarie proposed for Windsor built upon the developing settlement of the Green Hills taking up the high country on the land between the Hawkesbury River and South Creek. The state of the roads made most travel and freight only effective by water, requiring an accessible approach to the river for commerce. Thompson Square connects the long 'high street' running down the spine of the elevated land to St Matthews Church and the river. It is a unique urban open space in Windsor, being the last surviving square from any of the Macquarie towns remaining in a legible form. Governor Macquarie named Thompson Square after Andrew Thompson, a prominent local business man who died in 1810.

Over the next decade Macquarie oversaw the development of many civic buildings in Windsor, including those around Thompson Square. A doctor's house, hotels and stores were built around Thompson Square during this time. Macquarie also ordered the construction of a new Windsor wharf in 1814 which serviced Windsor until its replacement in the 1980s.

Windsor Bridge was constructed in 1874 at a low level and has been modified several times since. A town celebration was held in Thompson Square for its opening. After frequent flooding the deck was raised by eight feet (around 2.4 metres) in 1896. The approach on the Wilberforce side also proved difficult for horse-drawn drays and was modified with the raising of the bridge. The bridge was approached partly along (Old) Bridge Street although photographs show that much of Thompson Square remained empty, allowing wagons and carts to off-load goods, turn around and park haphazardly. The current formalised alignment cutting diagonally through the square was established in 1934 to meet the requirements of the motor

car. A number of heritage listings indicate that the road '*destroys the visual integrity of space*' being a departure from the rectilinear town plan and bisecting the public space into two triangular segments.

In addition to Thompsons Square, there are many other heritage items of both local and state significance in and around Windsor which would potentially be impacted by the proposed options.

Due to the high value and number of heritage items identified in Windsor and the surrounding areas a preliminary non-Aboriginal heritage investigation was undertaken (Austral Archaeology 2009). This investigation identified known and potential items of heritage value for all nine options.

The preliminary heritage investigation identified many heritage items within the local area. Table 3.1 outlines listed heritage items within the area, details of the heritage listing and identifies which options are located near to the item. It should be noted that Table 3.1 relates to items near the options as they are described in chapter 2 and not to the options as later refined. It is based on the status of heritage listings as of 2009. Locations of these heritage items are shown in Figures 3.1 and 3.2.

The preliminary heritage investigation also identified a number of potential archaeological heritage items within Thompson Square. These include:

- Punt dock - the Hawkesbury River was originally crossed at the location of the current bridge by a punt service established in 1814. Historical maps and observations suggest that the punt dock was located where the current bridge is established. There may have also been a small 'punt house' located immediately behind it on the banks. Due to substantial works being undertaken around the foundations of the bridge and the effects of time and erosion on the river banks, it is unlikely that evidence of this dock still remains on either side of the river. This would require further investigation as part of the environmental impact assessment for the preferred option.
- Windsor Wharf – The first Windsor Wharf was recorded in 1795, however Governor Macquarie found it lacking and provided construction contracts for a new wharf and approach in 1814 and again in 1815 (this contract included works for a sewer, see point below). Remains associated with the wharf were identified by a *Maritime Archaeological Inspection* carried out by Cosmos Coroneos in June 2008. A copy of this report is available on the RTA website (www.rta.nsw.gov.au/roadprojects). Land-ties were identified jutting out into the water, however further examinations from the water would be required as part of the environmental impact assessment of the preferred option.
- Brick-barrel drain/s – A contract for the construction of a brick-barrel drain beneath the surface of Thompson Square was awarded at the same time as the original contract for the wharf, which dates to 1815. An entrance to a drain on the river bank behind the remains of the wharf has been identified, however the exact route of the drain or how many there are is unclear, as the contract provided for two alternate plans. Further investigation as to the potential location of this drain would be required as part of the environmental impact assessment of the preferred option.

Windsor Bridge is listed on the RTA's Section 170 Heritage and Conservation Register as an item of state heritage significance. It is not listed on the NSW State Heritage Register. Windsor Bridge is a good example of the bridge building engineering of the mid 1800s and demonstrates the advances that have been made since in its later alterations and upgrades.

The preliminary heritage investigations revealed that all options have the potential to impact on non-Aboriginal heritage. Further detailed assessment on non-Aboriginal heritage issues would be carried out as part of the environmental impact assessment of the preferred option. This would include ongoing consultation with the Office of Environment and Heritage and Heritage Council of NSW.

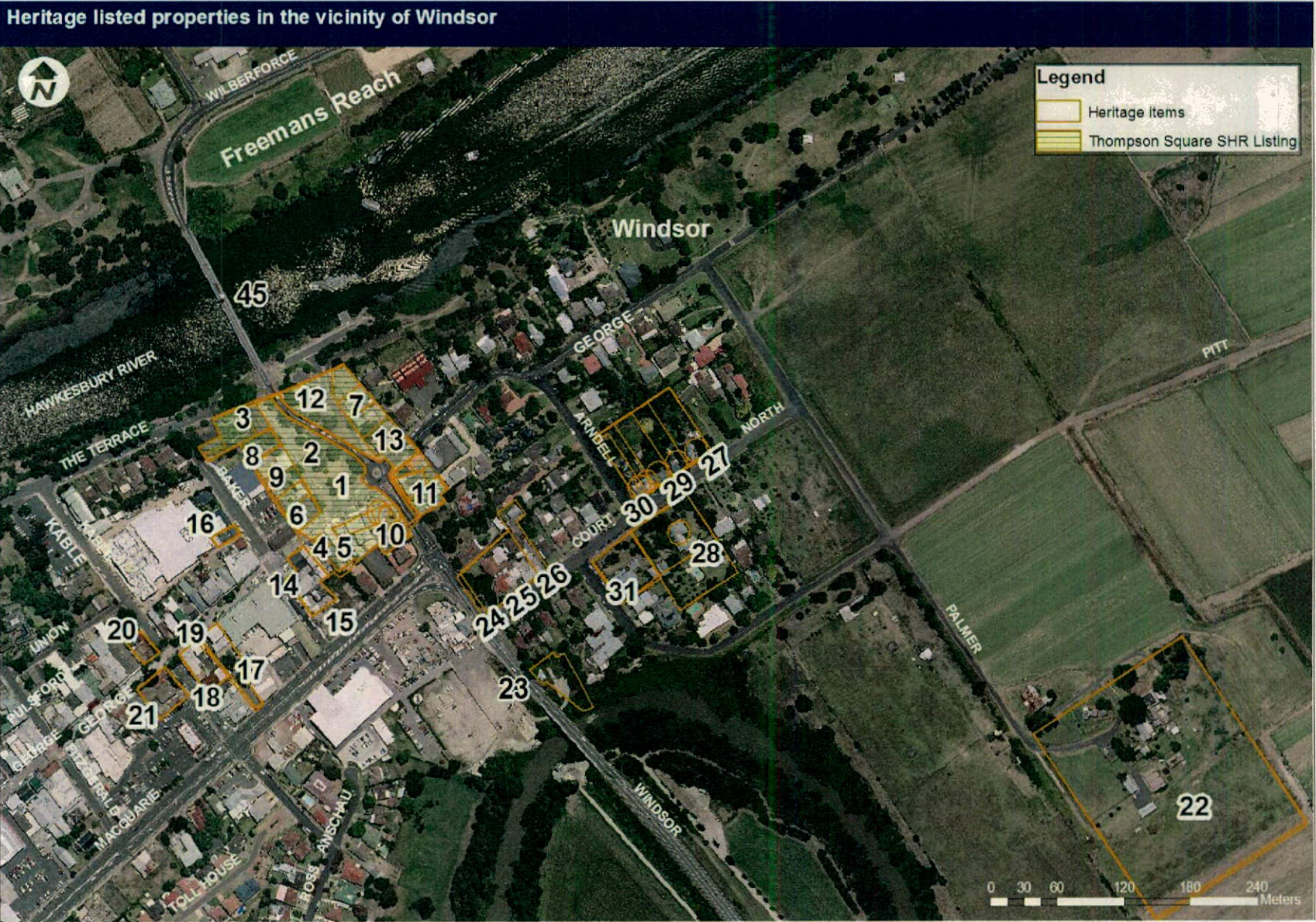


Figure 3.1: Listed heritage items near to options 1 to 9 (excluding 8)

The numbers listed on Figure 3.1 refer to the heritage items listed in Table 3.1



Figure 3.2: Listed heritage items near to option 8

The numbers listed on Figure 3.2 refer to the heritage items listed in Table 3.1

Table 3.1: Listed heritage items surrounding Windsor Bridge options

No.	Heritage item	Location	Heritage listing	Preliminary option near to heritage item
1	Thompson Square Conservation Area	Thompson Square	State Heritage Register Register National Estate National Trust Australia Register Hawkesbury Local Environmental Plan 1989	1, 2, 3
2	Reserve and Streets	Thompson Square, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989 Register National Estate Forms part of Thompson Square Conservation Area (item 1)	1, 2, 3
3	Doctors House	1 – 3 Thompson Square, Windsor	Register National Estate Hawkesbury Local Environmental Plan 1989 Forms part of Thompson Square Conservation Area (item 1)	1, 2, 3
4	Shop	80 George Street, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989 Forms part of Thompson Square Conservation Area (item 1)	1, 2,
5	Shop	82 George Street, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989 Forms part of Thompson Square Conservation Area (item 1)	1, 2, 3
6	Macquarie Arms Hotel	99 George Street, Thompson Square, Windsor (Cnr Thompson Square & George Street)	State Heritage Register Hawkesbury Local Environmental Plan 1989 Register National Estate Forms part of Thompson Square Conservation Area (item 1)	1, 2, 3
7	House	6 Bridge Street, Thompson Square, Windsor	State Heritage Register Register National Estate Hawkesbury Local Environmental Plan 1989 Forms part of Thompson Square Conservation Area (item 1)	1, 2, 3
8	House and Outbuildings	5 Thompson Square, Windsor	State Heritage Register Register National Estate Hawkesbury Local Environmental Plan 1989 National Trust Australia Register Forms part of Thompson Square Conservation Area (item 1)	1, 2, 3
9	Hawkesbury Museum and Tourist Information Centre	7 Thompson Square, Windsor	State Heritage Register Register National Estate Hawkesbury Local Environmental Plan 1989 Forms part of Thompson Square Conservation Area (item 1)	1, 2, 3

No.	Heritage item	Location	Heritage listing	Preliminary option near to heritage item
10	Precinct of buildings and land	62-68 George Street, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989 Register National Estate Forms part of Thompson Square Conservation Area (item 1)	1, 2, 3
11	A.C Steam Building	74 George Street, Windsor	State Heritage Register Register National Estate Hawkesbury Local Environmental Plan 1989 National Trust Australia Register Forms part of the Thompson Square Conservation Area (item 1)	1, 2, 3
12	Bungalow	4 Bridge Street, Windsor	State Heritage Register Register National Estate Hawkesbury Local Environmental Plan 1989 Forms part of Thompson Square Conservation Area (item 1)	1, 2, 3
13	Building	10 Bridge Street, Windsor	State Heritage Register Register National Estate Hawkesbury Local Environmental Plan 1989 National Trust Australia Register Forms part of the Thompson Square Conservation Area (item 1)	1, 2, 3
14	Buildings	92-98 George Street (cnr Baker Street), Windsor	Hawkesbury Local Environmental Plan 1989 National Trust Australia Register	4
15	Building	Baker Street, Windsor (prt Lot 2 DP 730435)	Hawkesbury Local Environmental Plan 1989	4
16	Building	9 Baker Street, Windsor	Hawkesbury Local Environmental Plan 1989	4
17	Loder House	Lot 1 DP 580752 Windsor	State Heritage Register	5
18	Building	22 Kable Street, Windsor	Hawkesbury Local Environmental Plan 1989	5
19	Building	134-136 George Street, Windsor	Hawkesbury Local Environmental Plan 1989	5
20	Building	141 George Street, Windsor	Hawkesbury Local Environmental Plan 1989 National Trust Australia Register	5
21	Building	146 George Street, Windsor	Hawkesbury Local Environmental Plan 1989 National Trust Australia Register	5
22	Tebbutt's Peninsula House	Lot 1, DP 731655 Windsor	State Heritage Register Register National Estate Hawkesbury Local Environmental Plan 1989	6
23	Toll House	40 Bridge Street, Windsor	Hawkesbury Local Environmental Plan 1989 Register National Estate National Trust Australia Register	7

No.	Heritage item	Location	Heritage listing	Preliminary option near to heritage item
24	Former military 'lock up', Windsor Police Station	32 Bridge Street, Windsor	State Heritage Register Register National Estate Hawkesbury Local Environmental Plan 1989	7
25	Windsor Police Station masonry walls	Court Street, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989 Register National Estate	7
26	Stables at rear of Windsor Police Station	32 Bridge Street, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989 Register National Estate National Trust Australia Register	7
27	Houses	25 North Street, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989 Register National Estate	7
28	House	28 North Street, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989 Register National Estate	7
29	Houses	31-33 North Street, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989 Register National Estate	7
30	Houses	37-39 North Street, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989	7
31	Windsor Court House	34 Court Street, Windsor	State Heritage Register Hawkesbury Local Environmental Plan 1989	7
32	Former 'Bird in Hand Inn'	81 Bathurst Street (85 Eldon Street), Pitt Town	State Heritage Register Hawkesbury Local Environmental Plan 1989 Register National Estate National Trust Australia Register	8
33	Former 'Macquarie Arms Inn'	104-106 Bathurst Street, Pitt Town	State Heritage Register Hawkesbury Local Environmental Plan 1989 National Trust Australia Register	8
34	House	22 Bathurst Street, Pitt Town	Hawkesbury Local Environmental Plan 1989	8
35	Slab barn	85 Bathurst Street, Pitt Town	Hawkesbury Local Environmental Plan 1989	8
36	Barn (now blown over)	89 Bathurst Street (93 Bathurst Street), Pitt Town	Hawkesbury Local Environmental Plan 1989	8
37	House and garden	96 Bathurst Street, Pitt Town	Hawkesbury Local Environmental Plan 1989	8
38	Scots Uniting Church	89 Bathurst Street, Pitt Town	Hawkesbury Local Environmental Plan 1989 Register National Estate	8
39	St James Anglican Church	112 Bathurst Street, Pitt Town	Hawkesbury Local Environmental Plan 1989 Register National Estate	8

No.	Heritage item	Location	Heritage listing	Preliminary option near to heritage item
40	House	126 Bathurst Street, Pitt Town	Hawkesbury Local Environmental Plan 1989 National Trust Australia Register	8
41	Slab cottage and barn	132 Bathurst Street, Pitt Town	Hawkesbury Local Environmental Plan 1989	8
42	Slab barn and house	142 Bathurst Street, Pitt Town	Hawkesbury Local Environmental Plan 1989	8
43	'The Manse'	1 Punt Road, Pitt Town	Hawkesbury Local Environmental Plan 1989 Register National Estate National Trust Australia Register	8
44	'Bligh House'	14 Hall Street, Pitt Town	Hawkesbury Local Environmental Plan 1989	9
45	Hawkesbury River Bridge (Windsor Bridge)	Over Hawkesbury River	RTA s.170 Heritage and Conservation Register Hawkesbury Local Environmental Plan 1989	9

3.2 Aboriginal heritage

Aboriginal people have possibly resided in the Windsor area for more than 40,000 years. The traditional Aboriginal people of the area spoke the Darug language dialect at the time of European contact. This language group originally existed from the eastern suburbs of Sydney, to La Perouse in the south, Bathurst in the west and the Hawkesbury River in the north. The traditional name for the location and the Aboriginal people who resided in the Windsor area is not known. Darug groups were thought to have lived in bands or communities of around 50 members each, and were highly mobile. Foods were gathered from the land and the rivers and provided a rich variety of resources to the local community. Food was cooked on open fires or in ovens beneath the ground.

Given this long history, there is a high likelihood of finding Aboriginal artefacts within the area. A number of developments in the Windsor area over the past 20 years show Aboriginal assessments and site recordings have clustered around the Windsor and Windsor Bridge area. Some of the assessments include (but are not limited to):

- A test and salvage excavation of the former Hawkesbury hospital site, about 800m south of Windsor Bridge, recovered 62 flaked stone items (37 of tuff and 25 of silcrete) from 12 trenches. One naturally fractured quartzite pebble and one small un-worked quartz pebble were also recovered.
- An excavation at the Windsor Museum site (Baker Street) saw 26 conjoining pits excavated totalling 26 metres square of open area excavated. This excavation found an intact sandy deposit in this location beneath the existing municipal car park and historical archaeological features previously identified on this site. It is hypothesised that the site represents an intact Pleistocene sand dune. About 11,000 Aboriginal artefacts were salvaged from this excavation. It is expected the sand dune would extend well beyond the excavated area. At the time of writing this report, a statistical breakdown on the materials and styles and dating

of the finds was not complete. It is expected a report outlining this information would be released in the near future.

- Test excavations during the development of the Windsor flood evacuation route (located to the south west of Windsor Bridge). Archaeological material was found in every test excavation pit.

An *Aboriginal Archaeological and Cultural Baseline Investigation* was carried out by Austral Archaeology in July 2009. A copy of this report is available on the RTA website (www.rta.nsw.gov.au/roadprojects). It provides a desktop analysis of each option from the perspective of Aboriginal archaeological and cultural heritage.

Following initial Aboriginal consultation in accordance with the former Department of Environment and Climate Change procedures in 2008, a desktop analysis and site inspection of the nine options was carried out in June-July 2009. The Deerubbin Local Aboriginal Land Council and the Darug Tribal Aboriginal Corporation were contacted, invited to inspect the bridge options and offer advice on any impacts each option may have on Aboriginal cultural heritage values. Twelve known Aboriginal archaeological and cultural sites were identified and likely areas of Aboriginal archaeological sensitivity highlighted. Of the nine bridge options only two (options 6 and 7) are without known Aboriginal archaeological constraints.

Each of the options also has the likelihood of impacting upon previously unrecorded Aboriginal archaeological sites and areas of potential archaeological deposit.

The Aboriginal stakeholders expressed a lesser preference for options 6 and 7 and were expressly unfavourable towards option 8. The stakeholders felt these options would have a considerable impact upon the Aboriginal cultural values of that stretch of the river and its banks.

Options 1, 2, 3, 4, 5 and 8 are considered to impact upon known Aboriginal archaeological values. In addition options 3 through to 8 also impact upon areas of previously unassessed archaeological sensitivity and potential. Those areas closest to the Hawkesbury River and to a lesser extent South Creek hold intrinsic Aboriginal cultural value. Where intact sand dunes are located there is also potential for burials to be present. This would be of considerable cultural significance to the Aboriginal community.

The carrying out of any of the options would require detailed Aboriginal archaeological and cultural assessment involving consultation with Aboriginal stakeholders.

Taking the background Aboriginal archaeological contextual data and site inspection into account, options 1 and 2 and to a lesser extent option 3 represent the preferred options for the Windsor Bridge in respects to Aboriginal archaeological and cultural heritage. These three options would involve the least amount of disturbance to known and potential Aboriginal archaeological and cultural values as well as involving the least amount of further assessment, investigation and impact mitigation.

Further detailed assessment and consultation with local Aboriginal groups and the community would be carried out as part of the environmental impact assessment of the preferred option.

3.3 Biodiversity

Since European settlement almost all the natural habitat for native flora and fauna species within the Windsor area has been cleared for urban development and agricultural purposes. The vegetation types that exist along the banks of the Hawkesbury River are predominantly riparian vegetation restricted to three main types: exotic grasslands; disturbed woodland; and Casuarina woodland. While some of the species within these communities are native to the area, the vegetation overall is generally degraded by weed invasion and monocultures of species planted to protect the river bank from erosion.

Along the South Creek a buffer of riparian vegetation has been planted to stabilise the banks and improve the quality of the creek. A revegetation program supported by the Hawkesbury Council, the Hawkesbury Nepean Catchment Management Authority and local volunteers has planted along these banks for about a decade. While none of the species planted are threatened or endangered species, some of the species may be components of the River-flat Eucalypt Forest on Coastal Floodplains Endangered Ecological Community.

Preliminary searches of the *Threatened Species Conservation Act 1995* (NSW) and the *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth) databases in 2009 identified the potential for the following to exist within a 10 kilometre radius of Windsor Bridge:

- Up to 12 endangered ecological communities.
- Up to 15 threatened flora species.
- One threatened flora population.
- Up to 31 threatened fauna species.

Given the highly degraded state of the natural environment, it is considered unlikely that any of these species exist or rely solely on habitat within the study area.

Since European development in the area, aquatic habitats have been degraded through water pollution, the introduction of aquatic weed species and introduced fauna species, bank erosion and flooding. Native flora and fauna species however continue to inhabit the Hawkesbury River. A search of the BioNet database for species listed under the *Fisheries Management Act 1994* identified one endangered species, the Trout Cod (*Maccullochella maquariensis*) as potentially existing within the waters around Windsor Bridge. A search of the Department of Primary Industries Noxious Weeds register identified 93 declared noxious weeds relevant to the Hawkesbury River. Many of the identified species are aquatic species and therefore occur within the river or on adjacent banks within the study area.

Further consideration and assessment of flora and fauna issues would be carried out as part of the environmental impact assessment of the preferred option.

3.4 Flooding

The Hawkesbury-Nepean catchment covers approximately 22,000km². The catchment extends from Goulburn in the south to the mouth of the Hawkesbury River at Broken Bay. The section of the river at Windsor is freshwater tidal influenced by a saline intrusion from downstream estuaries and ocean waters.

The pattern of development in the Hawkesbury-Nepean catchment has contributed to the unique flood behaviour of this valley which can adversely affect communities and property within the floodplain. The landforms of the Hawkesbury-Nepean Valley have significant effects on the flow and dispersion of floodwaters. The recent development of the Penrith Lakes Scheme, located upstream between Richmond and Penrith, is designed to assist in flood mitigation on downstream populations including Windsor.

The current height of Windsor Bridge is seven metres Australian Height Datum (AHD) making it accessible during a one in two year flood event. The following levels have been identified as the markers for various flooding events in Windsor:

- 1-in-100 year flood – 17.3 metres AHD.
- 1-in-50 year flood – 15.7 metres AHD.
- 1-in-20 year flood – 13.7 metres AHD.
- 1-in-10 year flood – 12.3 metres AHD.
- 1-in-5 year flood – 11.1 metres AHD.

Much of the township of Windsor is built on a ridge above the river however it has experienced a number of major floods over the past two hundred years (see Table 3.2). The surrounding area is generally inaccessible during a 1-in-5 or 1-in-10 year flood event. Both existing approach roads, Windsor Road and Wilberforce Road, have sections of the road that are inaccessible in a 1-in-5 year flood event.

Table 3.2: Flood levels from previous flooding events in Windsor

Year	Month	Flood level at Windsor (metres AHD)
1867	June	19.7
1956	February	13.8
1961	November	15.0
1964	June	14.8
1978	March	14.5
1986	August	11.2
1988	April	12.7
1990	August	13.5

Further assessment of flooding issues would be carried out as part of the environmental impact assessment of the preferred option.

3.5 Socio-economic profile

A socio-economic investigation was undertaken by SGS Economics and Planning. A copy of the *Socio-economic Investigation Report* (2010) is available on the RTA website (www.rta.nsw.gov.au/roadprojects). The socio-economic profile of Windsor and details of the findings of this report are outlined below.

Considering data from the 2006 Australian Bureau of Statistics census, Windsor makes up about one third (22,159 persons) of the Hawkesbury local government area population (60,562). Around 40 per cent of the population is aged less than 25 years old. This compares to 38 per cent in the Hawkesbury area and 33 per cent in the Sydney statistical division. The population of Windsor has a higher share of 'technicians and trade workers', 'machinery operators and drivers' and 'labourers', compared to both the Hawkesbury area and Sydney statistical division. Major employers within Windsor include health care and social assistance, retail trade, public administration and safety.

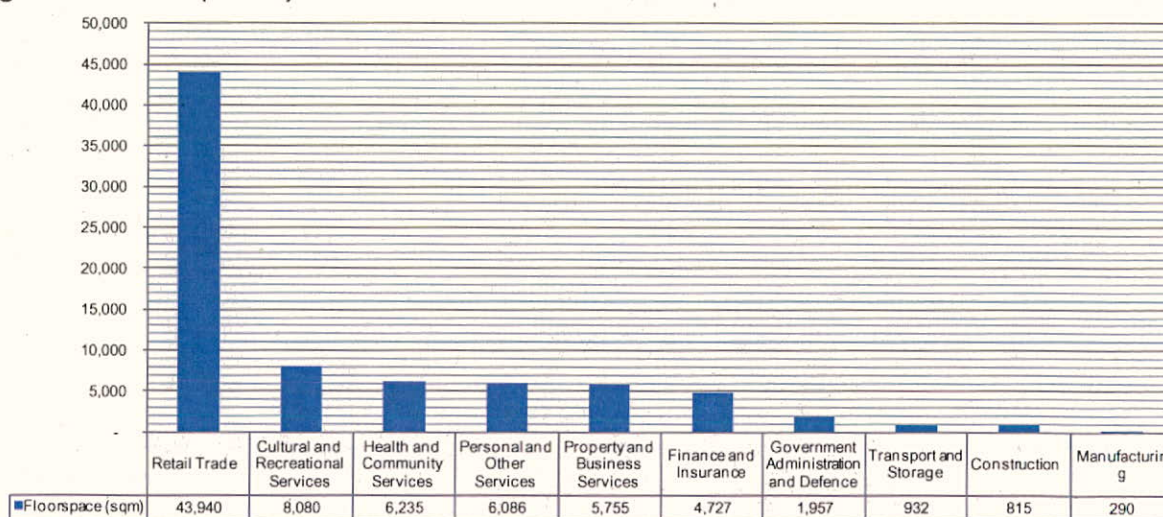
Car dependency is high within the Hawkesbury local government area with 86.4% of households owning at least one car, with many having two or more vehicles.

An audit of commercial land use in the Windsor town centre was undertaken to identify commercial and retail activities. The dominant industries, in terms of floor space, in the Windsor town centre are:

- Retail trade, including Windsor Riverview Shopping Centre (Coles), a Woolworths and other specialty retail.
- Cultural and recreational services.
- Health and community services.
- Personal services.
- Property and business services.

The floor space break down by business in the Windsor town centre is shown in Figure 3.3.

Figure 3.3: Floor space by businesses, Windsor town centre



Most retail activity is concentrated in the east of the town centre and along George Street. There is a cluster of hospitality and service industries in the vicinity of Thompson Square. These businesses are within easy access of the existing bridge crossing.

On-street parking is provided in almost all side streets within the town centre. Much of this is limited to one-hour parking, however, some two hour parking is provided close to the supermarkets.

It was estimated that the annual retail turnover for the Windsor town centre is around \$186.9 million per year (2009 dollars). Annual retail turnover by retail category is shown in Table 3.3.

Table 3.3: Estimated annual retail turnover, Windsor Town Centre

Retail Category	Estimated Annual Turnover (2009 dollars) (\$'000,000)
Supermarkets	\$ 79.6
Other Food	\$ 14.6
Clothing and Footwear	\$ 13.8
Hospitality and Services	\$ 24.7
Household Goods	\$ 9.6
Other Retail	\$ 44.8
Total	\$ 186.9

3.5.1 Pedestrian survey

A survey was undertaken of pedestrian and cyclist activity in November 2009 across four days, at four sites, which are shown on Figure 3.4. These are:

- Site 1: Bridge and Macquarie streets.
- Site 2: Bridge and George streets.
- Site 3: Bridge Street and Wilberforce Road.
- Site 4: Palmer and George streets.

Results are outlined in Table 3.4. There are heavy pedestrian flows at both site 1 and site 2. There is very little pedestrian activity at site 3. This indicates that few pedestrians use the existing river crossing. There is also little pedestrian activity at site 4. However, there is likely to be high pedestrian movement at site 4 during special events on the river and at Governor Phillip Park.

Figure 3.4: Data collection sites for pedestrian survey (2009)

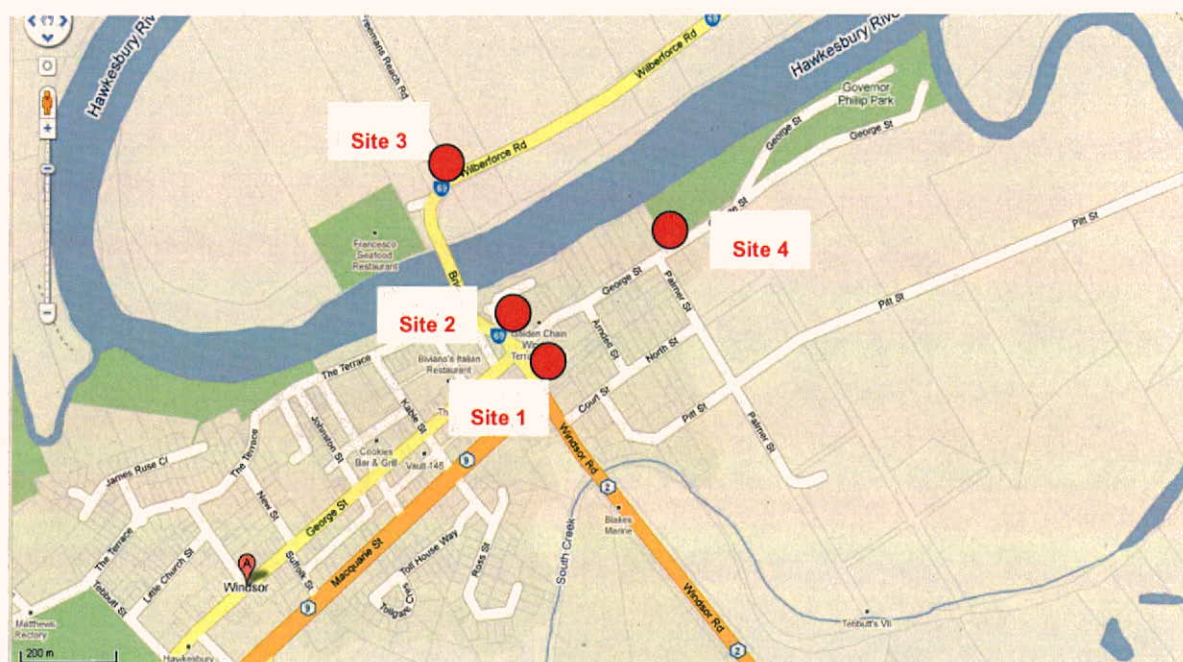


Table 3.4: Summary of pedestrian survey results

		Wed 25 Nov	Thur 26 Nov	Sat 28 Nov	Sun 29 Nov
Site 1	AM	111	48	50	61
	PM	111	71	37	66
Site 2	AM	110	72	210	163
	PM	310	169	326	169
Site 3	AM	2	6	3	2
	PM	2	5	4	5
Site 4	AM	18	31	6	32
	PM	1	19	9	37

3.5.2 Survey of businesses and local patrons

Two surveys were undertaken by SGS Economics and Planning in December 2009 (Thursday 11 and Saturday 13 December), one of the businesses within Windsor (55 businesses) and the other of patrons visiting (254) the Windsor town centre. The purpose of these surveys was to gain an understanding of the function of the Windsor town centre to the local and the regional community. Specifically, information was sought on:

- The portion of trade believed to be associated with passing traffic.
- Customer origins and travel patterns.
- The purpose of the patron's visit to the town centre.
- Why Windsor town centre was their chosen destination.

The survey was to compare the potential impacts that options close to, or around the town centre, may have on the economic activity of the town centre.

Proportion of customers that could be considered passing traffic

The business owners that responded estimated that around 80 per cent of their customers visit the Windsor town centre as their final, or chosen, destination. In addition, some 73 per cent of businesses considered they would be better off with more passing traffic. These results imply that while passing trade per se is not important to business turnover, many business operators are of the opinion that an increase in the overall level of traffic may increase the turnover of their business.

The patron survey was consistent with the findings of the business survey, in that Windsor town centre is considered as a planned destination for many patrons and that only a small proportion of trade is due to passing traffic or unplanned visits. Around 84 per cent of patrons surveyed planned their visit to Windsor town centre (in advance) while the remaining 16 per cent stated their visit was spontaneous or unplanned. Those who stated their visit was spontaneous largely visited the centre for the purpose of food, clothing and footwear retail.

The catchment for the Windsor town centre shops

The patrons' survey indicates that around 86 per cent of people visiting Windsor travelled from their homes. Figure 3.5 shows the place of residence of the survey respondents. A large share of the patrons surveyed live in Windsor and the adjacent suburbs of South Windsor, Bligh Park, Wilberforce and Richmond. Not all patrons surveyed or visiting the area would need to use Windsor Bridge to access the town - of those suburbs above only those from Wilberforce would need to cross the river to access Windsor.

Reasons for visiting

1. **Close to home.** Around 40 per cent of patrons indicated they choose to visit the township of Windsor, as opposed to another location, because it is 'close to home'. This was also the most common response from business when they were asked to nominate the reasons they believe customers choose to visit the Windsor town centre, as opposed to another location. This supports the conclusion that Windsor town centre serves a local catchment.

2. **Specific product.** The second most common reason patrons provided for visiting Windsor was 'for a particular product or service' (18 per cent of those who responded to the patrons'

survey and 33 per cent of those who responded to the businesses survey). Around half of the respondents who answered 'for a particular product/service' also worked in the centre.

3. Character of the town centre. Around half of the businesses surveyed regard the character of the centre as a reason customers choose to visit Windsor, as opposed to another location. Of the patrons surveyed, 9.2 per cent of respondents chose the character of the centre as a reason why customers visit Windsor.

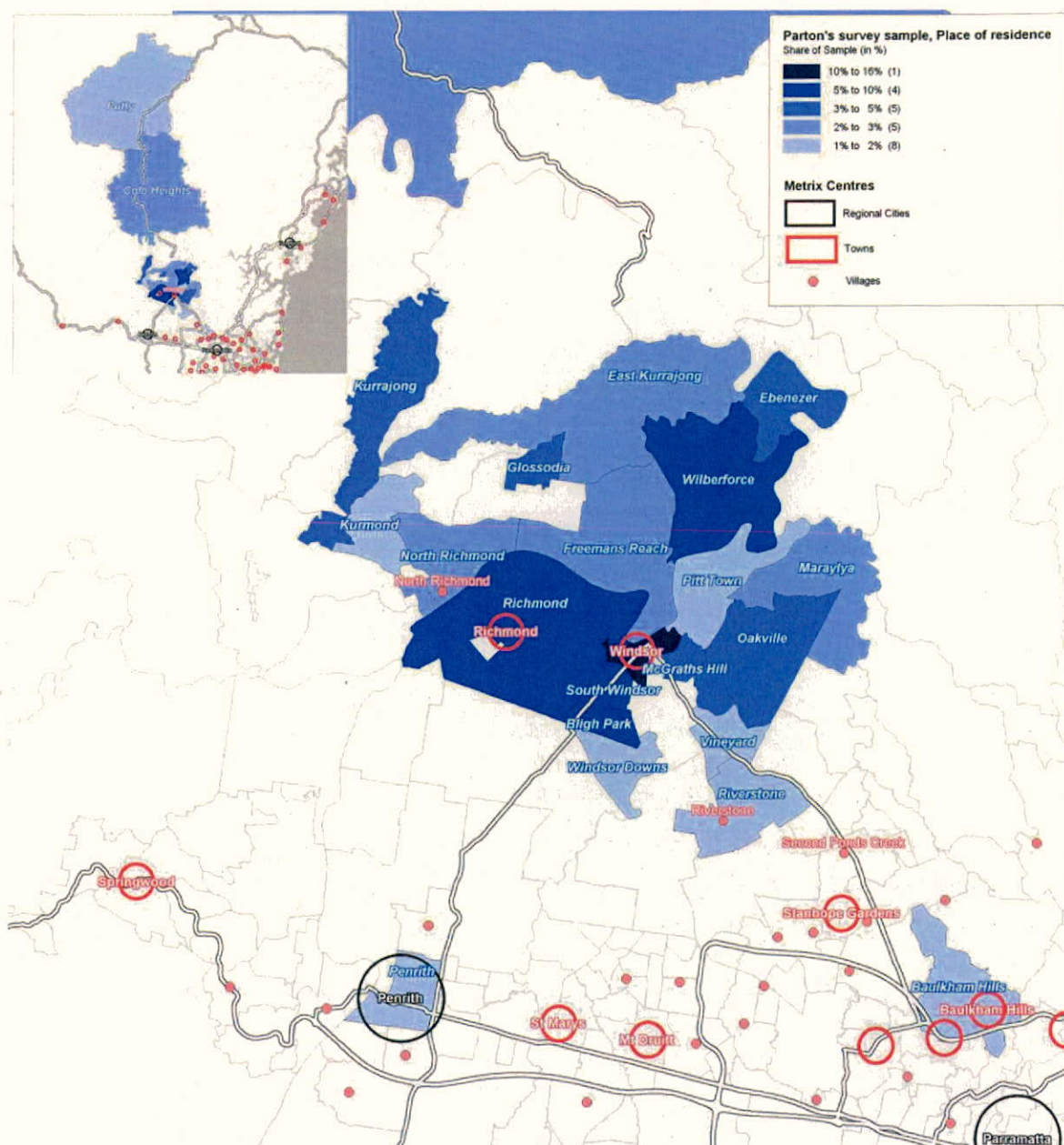


Figure 3.5: Patrons' survey sample, place of residence (share of sample)

Impact of traffic in the centre

The survey provided comments that the impact of traffic on the ability of patrons to enjoy the town centre is currently low, with 59 per cent of people stating there is 'no impact' from traffic. This was followed by 20 per cent of people preferring less traffic in the town centre because it would be faster to get things done, 12 per cent because it would be easier to walk around, and 10 per cent because there would be less noise. Only 2 per cent of people would prefer 'more traffic' in the town centre.

In the area immediately surrounding Thompson Square, 20 per cent of business indicated there would be no impact on their turnover if there was less traffic on George Street. 75 per cent indicated turnover would be better with more traffic in the town centre. This indicated that fewer vehicles on the George Street approach to the pedestrian mall may reduce turnover for some of the businesses located in this area.

Frequency of visits and time taken to travel

Around 70 per cent of respondents who were customers who visit the centre several times a week expressed a view that they would visit the centre just as often even if it took an additional 10 minutes by car to reach the centre. Patrons who would reduce the frequency of return were visiting the centre on the survey day for the purpose of food, retail clothing and footwear. Only option 8 would add more than 10 minutes travel time to access the Windsor town centre from the northern side of the river. Therefore, it is unlikely that any other options would substantially change the number of visits a patron made to the Windsor township.

Mode of transport

Both the businesses and patrons surveys indicated that most customers / patrons rely on private vehicles to access the centre. Car parking in the local area and the need for suitable vehicle access to the town centre are therefore important.

Summary

The survey of local businesses and patrons indicates that Windsor town centre is primarily a destination point for shoppers and to a much lesser extent an impulse stop. Therefore changing access by replacing the bridge upstream or downstream, and increasing the trip length from some directions to the township, would likely have little impact on the number of patrons visiting the town centre.

The surveys also indicate that while some patrons would like less traffic in the town centre to make their visits more manageable, many businesses would prefer an increase in traffic levels, in hope it may increase patronage.

The survey identified that a majority of people visiting Windsor did not need to cross the Hawkesbury River to get there. They approach from the south, west or east. This conclusion is supported by the traffic survey that indicates 70 per cent of traffic using the Windsor Bridge is through traffic, which does not stop in Windsor.

These investigations suggest that the location of the replacement bridge would have minimal impact on the number of patrons visiting the Windsor town centre. A location in the same place or further upstream or downstream would have minimal impact on the current economic viability of the town centre and/shopping precinct. However, businesses are keen to take

advantage of any initiative that may strengthen the retail and economic activity in the town centre.

Further detailed assessment of socio-economic issues would be carried out as part of the environmental impact assessment of the preferred option.



Figure 3.6: Bird's-eye view of the Windsor town centre

3.5.3 Tourism and recreation – Hawkesbury River

The Hawkesbury River is extensively used by recreational boaters engaging in high-speed towing and boating races. NSW Maritime note that the *'Hawkesbury River is regarded as one of the most popular waterways for the use of power vessels in New South Wales'*. The area immediately downstream the existing bridge is used by local boating clubs to conduct vessel races which attract many spectators. These events generate substantial financial income for the local community. They include the Hawkesbury Canoe Classic, the Bridge to Bridge Power Boat Race and Bridge to Bridge Water Ski Classic (Brooklyn to Windsor). The river also serves as a base for a number of tourist and leisure activities including the Hawkesbury Paddle Wheeler, which operates cruises from Windsor (see Figure 3.7).

In June 2010 Hawkesbury Council closed tenders for the re-construction of Windsor wharf. The existing wharf will be demolished and construction of a new pontoon, with a main jetty and intermediate landing will be completed.

Further consideration of recreational and tourist issues would be carried out as part of the environmental impact assessment of the preferred option, including consultation with the various user groups and the Hawkesbury River Committee.

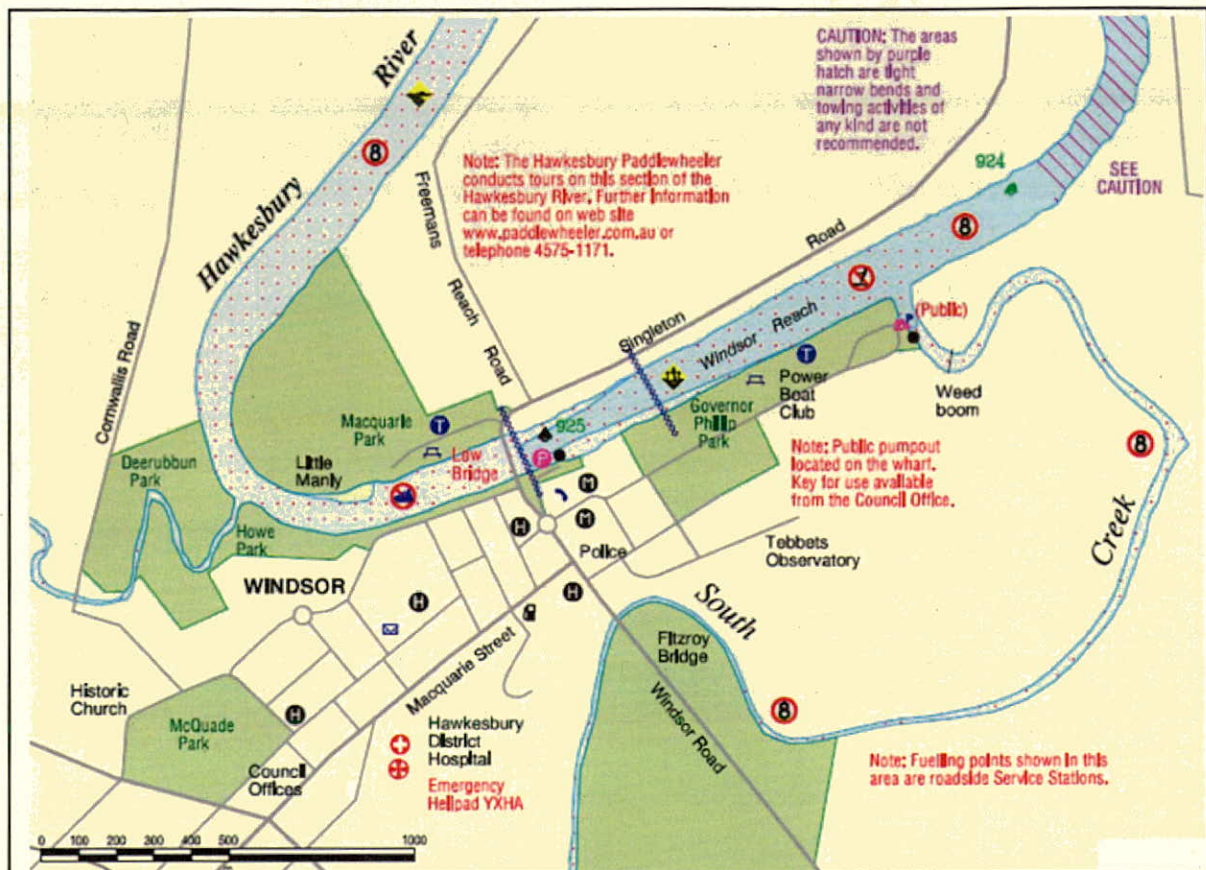
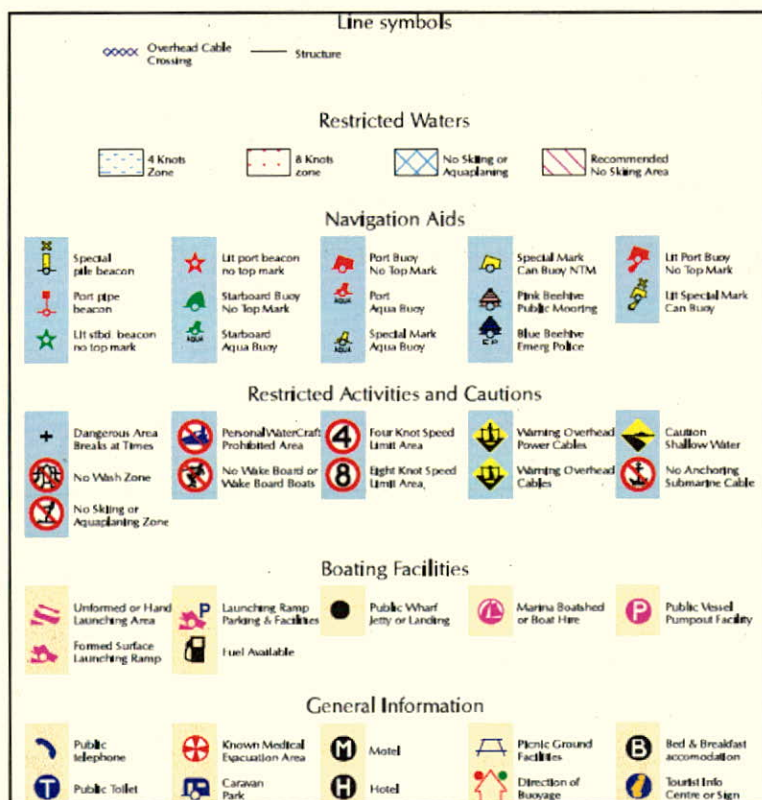


Figure 3.7: Map of Hawkesbury River, Windsor (NSW Maritime 2011) – key below



3.6 Noise and vibration

The existing noise environment in and around Windsor is influenced by high levels of road traffic noise. Volumes of traffic on main roads (eg arterial and sub-arterial roads) and the distance between receiver locations and main roads are the two factors that have the highest level of influence on the current noise environment in this area. Roads carrying through traffic generally have a higher level of influence on noise than local roads. Receiver locations near local roads are likely to have lower noise levels than receivers that are fronting or close to main roads. There is also noise and vibration associated with vehicles, especially heavy vehicles, using Windsor Bridge.

Further consideration of noise and vibration issues, including detailed noise and vibration assessment, would be carried out as part of the environmental impact assessment of the preferred option. This would also include specific consideration of noise and vibration issues for heritage items in the vicinity of the preferred option.

3.7 Urban design

3.7.1 Landscape character

As discussed in section 3.1, Windsor is an important historic town in New South Wales and has many items of high local and State heritage value. The whole township demonstrates a colonial period layout and has a well expressed historical character. The elements that contribute to this include its rectilinear planned street layout, the generally undeveloped rural setting within which the town is located, the prominence of major civic and commercial Georgian and Victorian buildings, generally small-scale modern infill buildings, mature trees, survival of older kerbing and streetscape elements.

Windsor was laid out in a typical early colonial grid pattern, but because of the topography of the area, has unique qualities. There is a characteristic 'ridge street' which forms the main street and is crossed by a series of steep secondary streets that end near the Hawkesbury River and provide scenic views.

The town planning for Windsor was distinct and characteristic of its period, although with some departures. Windsor has a foreshore street (The Terrace), properties that face the river and open space along the foreshore. Although this would be common town planning practice today, it was rare during the time of Windsor's planning.

There are several parks, historic reserves and open spaces that front the Hawkesbury River near Windsor, including: Thompson Square, Howe Park, Windsor Wharf Reserve, Governor Phillip Park and Deerubbin Park. On the north side of the Hawkesbury River to the west of the Windsor Bridge is Macquarie Park.

Views of the surrounding countryside are available from various vantage points in the town. The Hawkesbury River played an important part in the development and survival of the Windsor area as a communication route and continues its importance today. The river is a major source of water and has helped industries like agriculture to succeed in Windsor and in nearby communities such as Wilberforce and Pitt Town.

Windsor Bridge is the oldest existing structure that crosses the Hawkesbury River and is one of only two local river crossings. Although it has a simple appearance, Windsor Bridge was a major engineering project for the State at the time of its construction. The bridge is an important historical and physical landmark.

The existing bridge is low key and is understated in its form and expression. Many views of the bridge are obscured by the steep topography of the riverbank and dense planting along the shoreline of the Hawkesbury River. The bridge is most visible from the northern side of the river, where the landscape is open.

The road network of the region was laid out soon after European settlement, to serve the agricultural districts and to link early colonial towns with Sydney Harbour. The existing road network has since evolved, but is still based on the initial layout.

Windsor Road and Wilberforce Road are the primary connections to the existing bridge and both direct traffic close to the centre of the town.

A *Landscape and Visual Impact Investigation* was undertaken by the Government Architects Office in December 2009. A copy of this report is available on the RTA website (www.rta.nsw.gov.au/roadprojects). The investigation examined options 1, 3 and 6. A number of main landscape characteristics were identified as existing within and surrounding Windsor that would need to be considered in designing the preferred option. These characteristics are outlined below:

Historical context

The town of Windsor is one of the State's pre-eminent historic towns. Governor Macquarie identified Windsor as one of five 'Macquarie towns'. As noted previously, it has high heritage significance. The modest prosperity of the town has helped to retain its early colonial character through the rectilinear streetscape, local scale of buildings, predominantly Georgian and Victorian architecture and its rural setting. This has given the town an important historical context as the whole township clearly demonstrates a time period, as opposed to just individual buildings.

The River

The Hawkesbury River has played an important part in the development of Windsor and the surrounding farming communities of Wilberforce and Pitt Town. Until late in the nineteenth century it was the preferred means of getting people and produce to Sydney. The river is prone to frequent flooding that periodically closes the bridge. The Windsor Bridge is not only the oldest crossing of the Hawkesbury River still operating and linking communities but has also been an important route for the development of greater Sydney region. The river has also played an important role in the development of this area. The Hawkesbury River as a major water source has allowed many industries to thrive in this area, in particular agriculture.

Settlement pattern, urban structure and public open space

The town of Windsor represents a typical early colonial grid pattern but overlaid onto a distinct topography that provides picturesque qualities. The characteristic ridge street forms the High Street and is crossed by a regular pattern of steep secondary streets that terminate to river views.

Windsor town planning is unique and contrasts many towns of this era. This is because rather than turning its back to the river, Windsor has a foreshore street, The Terrace, with properties addressing the riverfront (and open space along the foreshore). Although this is common practice today, Windsor was unique in this aspect at the time.

Also unique to Windsor is Thompson Square, a distinctly urban open space located at the gateway to the town, connecting the river and the main street. There is no other civic space like this remaining from the Macquarie era. The current appearance of Thompson Square is dominated by the 1934 road cutting, leaving little sense of the unified public space that was part of the original Macquarie plan.

Views

Close and more distant views of the existing bridge are fairly limited due to the steep topography of the riverbank, the dense planting along the shoreline and the relatively low level of the bridge. The bridge is more visible from the north side due to the open landscape.

The existing bridge is low key and is understated in its form and expression.

Transport corridors, vehicular access and movement

Windsor Road and Wilberforce Road are the primary connections to the existing Windsor Bridge. In addition to serving the town centre these regional roads result in through-traffic passing through the centre of this historic town. Access onto this route from secondary streets is difficult and potentially hazardous in some places due to the speed of through-traffic, particularly at Freemans Reach Road and George Street.

Pedestrian movement and safety across Bridge Street, George Street and Wilberforce Road in the vicinity of the bridge is potentially hazardous due to the speed and volume of traffic. Pedestrian amenity is also negatively impacted by the traffic noise and pollution.

3.7.2 Preliminary urban design objectives and principles

The findings of a *Preliminary Urban Design and Heritage Review for Options 1 and 3*, by design consultants Spackman Mossop Michaels with Godden Mackay Logan (2011), indicate that both option 1 and option 3 would have significant adverse urban design and heritage impact on Thompson Square, and has identified opportunities to reduce the potential impacts that will be investigated during the next concept development phase.

This study has also identified draft urban design objectives and principles for the project. A copy of this report is available on the RTA website (www.rta.nsw.gov.au/roadprojects). These draft urban design and heritage objectives and principles would be used to guide the future concept design and detailed design, and inform further the environmental assessment. The draft urban design objectives and principles are outlined below:

Objective: Develop an integrated concept design that fits sensitively with the existing qualities and characteristics of Windsor and its Hawkesbury River setting.

Design principles:

- Maintain the landmark qualities of a bridge crossing at Windsor.
- Minimise the physical footprint and scale of the bridge, approach roads and associate intersections.
- Ensure the design and character of the bridge and associated roadworks are well integrated with the adjoining built areas, open space, historic and natural settings, rather than being a dominant feature.
- Minimise negative physical impacts on parklands, open space, the river and other foreshore areas adjacent to the bridge.
- Design all road and bridge elements carefully to integrate and coordinate with adjoining elements and structures. Materials and details to be robust, low maintenance and suitable for purpose and place.
- Minimise the intrusion of road-related elements (fencing and water quality control measures) on the local landscape.

Objective: Maintain the integrity of cultural and historic buildings, structures, elements and spaces of Windsor.

Design principles:

- Maintain the physical and visual integrity of State-significant items including historical buildings, public spaces and their curtilage, particularly in Thompson Square.
- Preserve the integrity of heritage items and areas of cultural importance to the local community.
- Minimise the impact on historical archaeological sites, particularly those associated with Thompson Square.
- Enhance the setting of Thompson Square and its buildings.
- Minimise the impact on Aboriginal heritage sites and their associated heritage values.

- Minimise or avoid alterations to heritage items, except where the removal of intrusive elements would have a positive impact on their heritage significance.

Objective: Enhance the existing amenity, visual character and cultural landscapes of Thompson Square and Windsor.

Design principles:

- Redevelop any residual road space as parkland to be integrated within Thompson Square.
- Maximise opportunities to enhance the connection between Thompson Square and the commercial area around the intersection of George Street and Bridge Street.
- Enhance views of Thompson Square and its buildings to and from the bridge and approach roads on both sides of the river.
- Retain, and where possible improve, views to important landmarks in particular the Hawkesbury River, Thompson Square and the historic buildings around the Square.

Objective: Improve connectivity for vehicles, pedestrians and cyclists.

Design principles:

- Provide safe, direct and obvious connections between the bridge and approach roads with the local road network in Windsor.
- Provide generous and direct cycle and pedestrian connections across the bridge and enhance the existing pedestrian and cycle networks along the approach roads.
- Consider opportunities for public transport throughout the project.
- Maintain and enhance connections to the existing river edge and adjoining open space network.

Further consideration of landscape character and urban design, including detailed visual assessment, would be carried out as part of the environmental impact assessment of the preferred option.

3.8 Land use

Windsor lies to the north west of Sydney, a region with an extensive amount of pastoral and agricultural land. These agricultural and pastoral lands provide a substantial resource for the entire Sydney basin. In the area there are also a number of important government and community facilities such as Windsor Hospital and the Richmond RAAF base.

Near Windsor Bridge on the south side of the Hawkesbury River there are a mix of land uses including residential, commercial, retail and professional uses. Thompsons Square serves as an important area of open space linking Windsor to the river. To the northern side of the bridge is located open farmland and dispersed dwellings.

The former Department of Planning's draft *North West Subregional Strategy* (2007) identifies that about 5,000 new dwellings would be developed in the Hawkesbury local government area by 2031. Most of these dwellings would be located in existing urban areas of the local government area, such as Windsor.

The potential for urban growth in the Hawkesbury local government area is limited by the nature of the surrounding environment. Constraints to development include national parks, bushfire prone areas, flooding issues along the Hawkesbury River, limited development capacity within existing centres, the high value of agricultural land in the area and high levels of aircraft noise (from the Richmond RAAF base).

The population of the Hawkesbury local government area has remained stable between 1996 and 2006, not showing any signs of substantial growth or decline (Australian Bureau of Statistics 2006). The age structure of the local government area shows signs of an ageing population.

3.9 Traffic

A traffic investigation was undertaken by the RTA. A copy of the *Traffic Modelling and Evaluation of Options - Preliminary Report* (RTA 2011) is available on the RTA website (www.rta.nsw.gov.au/roadprojects).

Preliminary traffic investigations were undertaken to determine the current movement of vehicles and to predict future traffic levels. This information was then used to refine the options to meet both the current and future traffic demands of the local area.

The models were developed to show the results for a two hour period at both the AM and PM peak periods for traffic levels in 2009 and 2026. These were developed for the existing bridge and road network (used as the base model) and for options 1 and 6. The traffic study used a micro-simulation method, which models the behaviour of individual vehicles. It used the VISSIM software platform. The network covers the area shown in Figure 3.8.

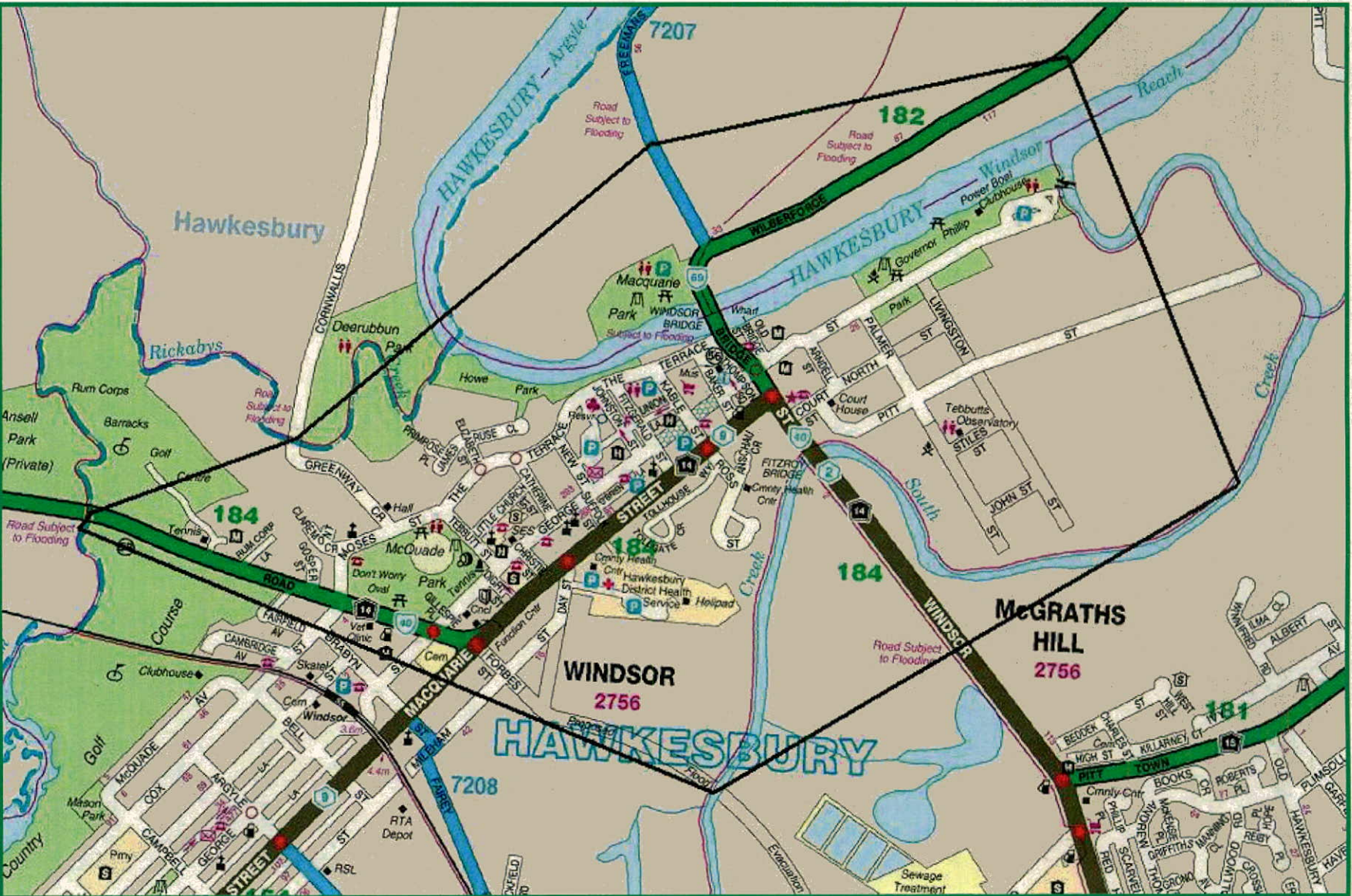


Figure 3.8: Area included in the traffic model

3.9.1 Survey of existing traffic

Traffic surveys were undertaken on 18 June 2009 for the morning and afternoon peak traffic periods. Supplementary data was extracted from the RTA's SCATS traffic signal control system.

The existing traffic levels (considered as the base model) showed that the Bridge Street/George Street roundabout in combination with the nearby Bridge Street/Windsor Road/Macquarie Street signalised intersection experienced random congestion in both the AM and PM peaks.

- In the AM peak southbound traffic using the existing Windsor Bridge is subject to heavy queuing. In some cases traffic queues stretch from the Macquarie Street intersection for several hundred metres across the bridge, occasionally beyond the Freemans Reach intersection.
- In the PM peak northbound traffic using the existing Windsor Bridge is subject to heavy queuing, although not as severe as the AM peak. Occasional queuing for several hundred metres occurs from the current George Street/Bridge Street roundabout.

Congestion is currently caused by insufficient capacity at the Bridge Street/George Street roundabout and the configuration between this intersection and the Macquarie Street intersection.

The traffic data shows that 70 per cent of vehicles using the Windsor Bridge crossing are considered to be through traffic. Vehicles are using this crossing as a through route, to get to a destination other than the Windsor township. Much of this traffic is likely to be freight transport or people travelling to work in other areas of Sydney, and then returning home.

Using the 2009 traffic counts, the traffic growth up to 2026 was estimated using the Sydney Strategic Traffic Model based on an estimated population growth rate of 1.3 per cent for the local area. This modelling showed that the main key intersections (being the two Bridge Street intersections and the Windsor Road/Hawkesbury Valley Way intersection) could not accommodate the predicted future traffic volumes and the models indicated traffic congestion. Substantial improvements would be required on both routes to cater for the forecast growth in traffic.

In order to be able to model the traffic effectiveness of crossing options, the signal control delays at the intersection of Hawkesbury Valley Way and Windsor Road were set to zero.

3.9.2 Modelling of option 1

Using the traffic model outlined above, option 1 was modelled for its impact on future traffic. A number of issues were identified in relation to the capacity of this option and a number of improvements were made to the option design. These included:

- The original option 1 included a roundabout at the northern end of the bridge, at the Freemans Reach/Wilberforce Road intersection. The traffic model results suggested that the roundabout would be barely operational at the 2009 traffic levels and would not accommodate any future traffic growth. The roundabout would need to be replaced with a signalised intersection that would operate satisfactorily up to 2026.
- The southern intersection would be at capacity under future growth levels. A signalised intersection would need to be included at the George Street/Bridge Street intersection replacing the roundabout.

- In order for the George Street/Bridge Street signalised intersection to operate sufficiently, three of the existing right hand turns would need to be prohibited. This included prohibiting the southbound right hand turn from Bridge Street into George Street, the northbound right hand turn from Bridge Street into George Street and the east bound turn from George Street onto Bridge Street.
- The existing Macquarie Street/Windsor Road intersection would be at capacity under future traffic. Future upgrades to this intersection would be required.
- The existing traffic arrangements across Fitzroy Bridge would not accommodate the above changes to traffic arrangements. In the future the bridge would need to be widened to three lanes (two northbound and one southbound). This could be able to be achieved within the existing bridge by removing the pedestrian path from the existing structure and re-linemarking.

3.9.3 Modelling of option 6

The original arrangement of option 6 did not satisfactorily address future traffic volumes. A number of issues were identified with the effectiveness of the road and bridge design. Refinements included:

- The proposed T-intersection on Wilberforce Road on the northern side of the bridge was not sufficient. A signalised intersection would be required at this location.
- Improvements to the signalised intersection at Windsor Road onto the new approach road included additional turning lanes.
- The additional turning lanes would require a wider bridge structure across South Creek.
- Similar to option 1, some congestion then resulted on the two lane Fitzroy Bridge. In the future the bridge would need to be widened to three lanes (two northbound and one southbound). This could be achieved within the existing bridge by removing the pedestrian path from the existing structure and re-linemarking.
- Improved turning lanes would be required into and out of Tebbutt's Observatory.

3.9.4 Summary of traffic findings

The traffic models showed that the 2026 travel demand would be close to the traffic capacity of option 1. Traffic flow on Bridge Street shows signs of instability, especially in the morning peak. In the traffic model long queues occasionally develop from the Macquarie Street intersection, extending through George Street and across the bridge. In 2026 the model of option 6 indicates traffic would flow, with less queuing. A test with a 10% increase in traffic over the 2026 AM peak (a rough estimate of 2031 traffic) shows that option 6 performs significantly better than option 1.

These results suggest:

- The intersection arrangements currently in place at Bridge Street/George Street and Macquarie Street/Windsor Road would reach capacity in the near future.
- Upgrades to both the George Street/Bridge Street roundabout and the Macquarie Street/Windsor Road would be needed.
- Upgrades to the Macquarie Street/Windsor Bridge intersection would likely also require adjustments to the Fitzroy Bridge to allow two northbound lanes.
- If traffic was to continue growing at this rate, further upgrades to other intersections within and around Windsor may be required in the future.

The changes that were required to the design of the bridge and approach intersections as a result of the traffic information were included in the comparison of the costs to build both bridges and approaches (refer to section 5.2). It was found that option 1 performed better than the other options and so it was further analysed for a variety of intersection scenarios.

3.9.5 Intersection scenarios for option 1

A study was undertaken to compare different intersection scenarios for option 1. These scenarios involved alternative treatments of the bridge and the intersection of George Street and Bridge Street. The relative performance of the three critical intersections in 2011 and 2026, under each scenario for option 1 were analysed. The three critical intersections are:

1. Windsor Road and Macquarie Street.
2. George Street and Bridge Street.
3. Wilberforce Road and Freemans Reach Road.

It was found that scenario 1 provided the best performance for the 2026 traffic in both the AM and PM peaks. As a result, scenario 1 was adopted as a preliminary lane configuration for option 1. Scenario 1 contains the following configuration, as shown in Figure 3.9.

- The bridge to be line-marked as three lanes (one lane northbound, two lanes southbound).
- A signal controlled intersection at George Street and Bridge Street.
- Right turns allowed only from George Street east and Bridge Street south.

Further detailed assessment of traffic issues would be carried out as part of the environmental impact assessment of the preferred option.



Figure 3.9: George Street and Bridge Street – Scenario I

4 Consultation

4.1 Community consultation

The RTA has conducted a number of consultation activities as outlined below:

Displays

Details of the nine options were placed on display between 13 July 2009 and 14 August 2009 at:

- Hawkesbury City Council administration building and library.
- Richmond Motor Registry.

Community updates

Community updates were distributed to 13,500 local residents, businesses and government agencies to provide information on and seek feedback regarding the options.

The community update was delivered to registered project stakeholders.

Advertising

An advertisement was placed in the Hawkesbury Gazette on 15 July 2009 and the Hawkesbury Courier on the 16 July 2009 to invite the community to attend the workshop. Written comments were also invited on all the options.

RTA website

The RTA's project website contains project information and the community was invited to provide feedback.

Community information session

A shopping centre display was held on Saturday 25 July 2009 at the Riverview Shopping Centre Windsor a week prior to the community workshop. About 140 people were briefed on the project.

A community workshop was held at Windsor Central Library on Saturday 1 August 2009. About 90 people attended this session.

Stakeholder and community meetings

Meetings were held between the project team and various groups and organisations between July and September 2010, including:

- Community groups.
- Local business group in Windsor.
- Hawkesbury City Council.
- Heritage Branch of the Department of Planning (now part of the Office of Environment and Heritage).
- Heritage Council of NSW.
- Maritime NSW.

4.2 Submissions

Comments and issues were requested on the options and 136 submissions were received. Submissions were made by the local council, local business groups, individual members of the community and community groups. Representatives from Hawkesbury City Council, the former Heritage Branch of the Department of Planning (now part of the Office of Environment and Heritage) and Maritime NSW met with the project team and made submissions on the proposal. A breakdown of the submissions is shown in Table 4.1.

Table 4.1: Submissions

Submission from	Percentage
Local resident	47%
Regular driver on bridge	16%
Local business	10%
Pedestrian/cyclist	9%
Community member	5%
Other road user	5%
Community group	2%
Interest group	2%
Local council	2%
State Government agency	1%
Other groups	1%

A petition with over 600 signatures from community members was received in August 2009 from the Windsor Residents First group. This petition indicated support for options 1, 2 and 8 (in order of preference), whilst strongly opposing options 6 and 7 as the group felt that they failed to meet the project objectives.

4.3 Issues

4.3.1 Issues

Community

Issues raised by the community included:

- The heritage and character of the local area, and the need to preserve this through good design.
- Local community needs, such as pedestrian and cyclist connections, recreational space, access to business and shopping.
- Traffic and transport issues – improvements in traffic conditions was a desired outcome from nearly all submissions.
- Floods and maintaining access with a new bridge.
- Safety for motorists across the bridge and approaches, and pedestrian crossings.
- The cost effectiveness of the project outcome.

Government

Issues raised by government agencies included:

- The preferred option should have least amount of impact to the Windsor township.
- Several items listed on the State Heritage Register are situated in the vicinity of the various bridge route options, including the extremely significant Thompson Square (refer to details in Figures 3.1 and 3.2).
- The river is extensively used by recreational boaters engaged in high-speed towing and other activities.

Hawkesbury Council has indicated a strong preference for option 1 on the basis of maintaining direct traffic access into Windsor township. The Heritage Council of NSW has advised that it has a strong preference for option 6 and would not support option 1 or 3 due to impacts on Thompsons Square. The Heritage Council's preferred heritage outcome is to remove any future road alignment from Thompson Square.

Table 4.2 describes issues raised by stakeholder groups and community.

Table 4.2: Issues raised

Issues	Percentage
Need to minimise impacts on heritage	30%
Need to meet community needs	25%
Need to improve traffic and transport efficiency	21%
Improve flood immunity	10%
Improve safety for motorists, pedestrians and cyclists	8%
Cost effective	6%

4.3.2 Description of community issues

The following summarises the comments on each of the options from the local community and businesses received during the public displays and workshops. The RTA did not ask the community to nominate a preferred option, however, stated preferences were often provided.

Option 1 and 2 – high level or low level bridge 35 metres downstream of existing bridge

Option 1 and 2 received the most comments and this option was given the highest stated preference. The main issues raised were:

- Support for the potential for the Bridge Street road cutting to be backfilled and landscaped to reinstate the shape of Thompson Square as outlined in the July 2009 community update.
- This route is beneficial in that it is the most direct route from Windsor Road to Freemans Reach Road.
- Support for opening The Terrace under the bridge that would allow vehicle access to Windsor Wharf and the car park.
- The need to maintain the existing connection from the Windsor township to the northern side of the Hawkesbury River, which has been in place since 1875.
- This option is considered to be the least disruptive to all existing areas because it follows the existing road corridor.
- Concern that the current traffic through Thompson Square and across Windsor Bridge has a high level of noise, pollution and congestion and this would be entrenched with options 1, 2 and 3.
- Support for an improved connection at Freemans Reach Road and Wilberforce Road.
- Support that this option would not affect the navigation of vessels on the river.
- Concern that option 2 would restrict coach access to Windsor Wharf.
- Concern about the impact of vibration on adjacent heritage properties.

Option 3 – high level bridge 10 metres upstream of existing bridge

Option 3 received relatively few comments. The main issues raised were:

- The heritage impact of this option given its encroachment on the Doctor's House and it reduces the overall size of Thompson Square.
- Thompson Square would not be improved by this option, whereas other options provide that opportunity.

Option 4 – along Macquarie Street via Baker Street, upstream from existing bridge

Option 4 received relatively few comments. The main issues raised were:

- This option would split the township in half and would result in high severance impact.
- This option has a high level of aesthetic impact.
- This option would interfere with the Windsor retail precinct, as the increased volume of traffic along the shopping precinct in Baker Street would result in a reduction of pedestrian and vehicle safety.
- The impact on some heritage items is a concern.
- Noted that there would be no impact on the ability of vessels to navigate the river provided the span width between bridge piers and height remains to current standards.

Option 5 – along Macquarie Street via Kable Street, upstream from existing bridge

Option 5 received relatively few comments. The main issues raised were:

- This option would split the township in half and would result in high severance impact.
- This option has a high level of aesthetic impact.
- This option would interfere with the Windsor retail precinct, as the increased volume of traffic along the shopping precinct in Kable Street would result in a reduction of pedestrian and vehicle safety.
- The closure of The Terrace would redirect traffic that would bisect the Windsor pedestrian mall.

Option 6 – town bypass from a new T-intersection on Windsor Road, north of Pitt Town Road

Option 6 received the second highest number of comments and was given the second highest stated preference. The main issues raised were:

- The negative impact on a number of residents who live along this route. The issue of fairness was expressed in many submissions – some residents chose not to live along a busy road and felt that moving the road to a new location was an unfair impact.
- New levels of traffic and the noise impacts to residents.
- Motorists using this bypass may not choose to turn off to the Windsor town centre for their shopping especially for spontaneous shopping which would result in a loss of business for the Windsor town centre.

- There could be positive impacts with a bypass of the small township.
- This option is in a low lying area and could be affected by flooding.
- The additional piers in the water with a downstream bridge would affect the ability of vessels to navigate the river.
- The possible shadowing from the new bridge could affect the boating race course currently used and other boating events on the river. This would impact on the local economic stimulus these events provide.
- The likely impact on heritage items.
- This option would have the least impact on houses in the area.

Option 7 – from Windsor Road along Court and North streets and then along Palmer Street upstream from existing bridge

Option 7 received relatively few comments. The main issues raised were:

- The likely impact to the North Street Conservation Area and Court House would be significant.
- The impact on a number of residents who live along the route with new levels of traffic and noise.
- The visual impact of the new road in these areas.
- Motorists using this bypass may not choose to turn off to the Windsor town centre for their shopping especially spontaneous shopping which would result in a loss of business for the Windsor town centre.
- There could be positive impacts with a bypass of small townships.
- This option is in a low lying area and could be affected by flooding
- The additional piers in the water with a downstream bridge would affect the ability of vessels to navigate the river.
- Possible shadowing from the new bridge could affect the boating race course currently used and other boating events.

Option 8 – Pitt Town Road, upstream from existing bridge

Option 8 received relatively few comments. The main issues raised were:

- More traffic will use King Road and North Richmond.
- This would be a relatively expensive option, as more infrastructure would need to be built due to the distance this option would cover.
- A bypass of the Windsor township is a good thing as it keeps through traffic well clear of historic Windsor.
- Could be considered as a long term solution, and would be dependent on population growth and growing community transport needs.

- Possible shadowing from the new bridge could affect the boating race course currently used and other boating events.
- This area is extensively used by recreational boaters engaged in high-speed towing and other activities. No supporting structures or pylons should be established in navigable water.
- The impact on vegetation.
- This option could become a possible flood evacuation route for Wilberforce and Putty Road, a positive outcome.

Option 9 – refurbish the existing bridge

Option 9 received relatively few comments. The main issues raised were:

- The existing bridge should be retained for either local traffic or as a pedestrian/cycle path.
- In addition to refurbishing the existing bridge the RTA should consider building an additional bridge to bypass the town. The existing bridge can then be kept and made available just for local traffic and pedestrians.
- Windsor is a historical town and minimal change to this beautiful town should be considered.
- This option may have the least amount of heritage impact on Thompson Square.
- An increase in the heavy traffic through Windsor would result in danger to pedestrians and create unpleasant exhaust fumes.
- This option is the least disruptive to all existing areas and hence it is a more economical option.

4.3.3 Description of government issues

Hawkesbury City Council

Hawkesbury City Council has indicated a preference for option 1. This preference was based on:

- Continuation of the Windsor Road corridor as a major transport link.
- Improved connection at Freemans Reach Road and Wilberforce Road, which would facilitate orderly traffic movement from both Freemans Reach Road and Wilberforce Road.
- Connection from the township of Windsor to the northern side of the Hawkesbury River.
- Provision of safe access for pedestrians and cyclist as part of the Great River Walk.
- Provision of flood immunity for the 1 in 5 year flood event increasing the benefits of the newly constructed Flood Evacuation Route.
- Provision of access for service vehicles including garbage trucks, cars and coaches under the new bridge to service the Windsor Wharf. Council is planning to upgrade the wharf at its current location.

Hawkesbury City Council raised concerns relating to options 2 to 9 in that:

- Option 3 would limit possible improvement to Thompson Square.
- Option 4 and 5 would disaggregate the historic precinct of Windsor and the mall and impact in terms of both aesthetic and historic.
- Option 6 and 7 would restrict usage of Governor Phillip Park during boating events.
- Option 8 would bring traffic implications through the Pitt Town area, North Richmond and Richmond during peak periods.
- Option 9 would bring no improvement to the seagull intersection at Wilberforce Road and Freemans Reach Road intersection.

Heritage Council of NSW

As part of the assessment of all nine options the Heritage Council of NSW indicated their preference to retain and refurbish the existing bridge. This preference is based on Windsor Bridge being the oldest existing structure crossing the Hawkesbury River and of crucial importance to the heritage of the state. The bridge is listed on the RTA's s170 Heritage and Conservation Register. This option would allow the re-use of a heritage item for its original designed purpose.

The Heritage Council of NSW also indicated that further investigations on option 6 and option 8 is needed as these options would limit or avoid heritage impacts to Thompson Square which is listed on the State Heritage Register as well as surrounding buildings. The Heritage Council of NSW considered that the exclusion of through traffic from Thompson Square would contribute significantly to re-establishing its heritage significance as one of the last remaining Georgian spaces in Australia.

Particular emphasis was placed on the importance of Thompson Square as part of Windsor's overall heritage significance as 'one of few early historic townships in the Sydney region established during the eighteenth century'. The Council has advised that if a road is to go through Thompson Square, the objective should be to keep as close as possible to the current road alignment so that no additional impacts are sustained.

As detailed previously in the report, the preliminary heritage investigations showed that all of the options could potentially impact on a number of heritage items listed on the State Heritage Register. This particularly related to options running through Thompson Square, North Street, Court Street and Pitt Town Road.

The options were considered by the Heritage Council of NSW. The RTA was provided with the resolution of the Heritage Council (correspondence dated 18 August 2010) which indicated that:

'...the proposed option 1 for a new bridge at Windsor cannot be supported on heritage grounds; and that of the options identified by the RTA, the Heritage Council notes that option 6 appears to be the best alternative that the Heritage Council has seen.'

It was also noted that

'... option 1 cannot be supported on heritage grounds as it would have a significant impact on the Macquarie-era township of Windsor, and in particular on the State Heritage Register (SHR) listed Thompson Square, a Colonial historic urban space planned by Governor Macquarie and identified on the Windsor town plan of 1812. A number of additional SHR listed, historic buildings line both sides of Thompson Square. Under option 1 the new road would be through the Square and directly adjacent to SHR listed buildings along the east side of the Square on Old Bridge Street.'

As a result of this advice and due to funding not being available for option 6, the RTA reconsidered all options in terms of feasibility of construction and affordability. The revised engineering assumptions for the refined options are described in section 5.1.

As a result of the refinements, a further presentation was made to the Heritage Council of NSW on 16 September 2010. This presentation focussed on the refined options 1, 3 and the cost of option 6.

Following this presentation, the RTA was informed by the Heritage Branch in a letter dated 7 December 2010 that:

'... that a site visit was made by the Heritage Council sub-committee on 10 November 2010. That visit confirmed that options for a new bridge through Thompson Square would have significant impacts on the setting of the Square. These include RTA Option 1 previously rejected by the Heritage Council, and also Option 3, which was revised and presented to the Heritage Council in September 2010. Both options go through the Square, Option 1 along the east side and Option 3 on the alignment of the existing road. For both options the RTA preference is understood to be for a high level bridge to reduce the incidence of river flooding closing the new bridge to traffic.'

The strong view of the Heritage Council is that neither Option 1 nor Option 3 can be supported on heritage grounds. High level bridges for either option would detrimentally affect the historic setting of the Square and would affect the historic view of Thompson Square and the town of Windsor from the north side of the Hawkesbury River.

Replacement of the current Windsor Bridge with another low level bridge would provide little benefit through increased flood mitigation.

The Heritage Council therefore confirms its prior advice that of the bridge options identified by the RTA, Option 6 is preferred on heritage grounds. As you are aware, this option would bypass the town and cross the river 400m downstream of the existing bridge.

I also reiterate the Heritage Council's position that Thompson Square is of crucial importance to the heritage of NSW as the area has unique history and state heritage significance."

The heritage values of Thompson Square, include its open space character contribution to Windsor's town planning heritage, surrounding buildings and Aboriginal and non-Aboriginal archaeological resource, as well as the state significant Windsor Bridge, and other identified and potential heritage elements. These will be further investigated and assessed in accordance with heritage best practice as part of the environmental impact assessment of the preferred option. This will include ongoing consultation with the Office of Environment and Heritage and consideration of the issues raised by the Heritage Council of NSW.

Maritime NSW

Maritime NSW has not indicated a preference for an option but did raise concerns relating to option 6, 7 and 8 in that:

- The river is extensively used by recreational boaters engaged in high-speed towing and other activities.
- Licensed aquatic boating activities which are regularly held in the waters directly adjacent to Governor Philip Park would be impacted.
- Possible shadowing effect from the bridge for the boating race course, especially in options 6 and 7.
- Possible restriction to the passage of larger commercial vessels to their permanent moorings established adjacent to the public wharf at Windsor.

There will be further consideration of impacts on recreational and licensed aquatic activities, including further consultation with Maritime NSW, as part of the environmental impact assessment of the preferred option.

National Trust of Australia (New South Wales)

The National Trust noted their preference for option 9 since this option would have no additional impact on Thompson Square. The Thompson Square Precinct was listed by the National Trust on its register in June 1975.

The National Trust considered that further evaluation should also be given to options 6 and 8 based on:

- The 1975 National Trust classification report which noted that *"the centre of Thompson Square is also spoilt by a main road which slices diagonally through it and into a cutting, destroying the visual integrity of the space that was originally intended"*.
- The possible reinstatement of Thompson Square and the original Macquarie vision should be part of the improvements of the Hawkesbury River crossing at Windsor.

4.4 Other options suggested by community members

Community members were invited to submit alternative proposals for consideration. The Livingston Road and Pitt Town Bottom Road alternatives are shown in Figure 4.1

Livingston Road alternative

This alternative begins with a new signalised T-intersection on Windsor Road, north of Pitt Town Road, to then travel east by a new bridge across South Creek. It then runs parallel and to the east of Palmer Street along intended Livingston Road, proceeding to a new bridge over the Hawkesbury River, intersecting with Wilberforce Road at a T-intersection.

This alternative was to have the benefit of reducing impact on properties closer to Palmer Street.

A preliminary analysis of this option shows it will have greater impact on the licensed aquatic boating activities which are regularly held in the waters directly adjacent to Governor Philip Park. This suggestion would also split Governor Philip Park in half and impact on this recreational area.

Considering this suggestion, the RTA made a concerted effort to address some of the concerns by slightly modifying option 6. Accordingly, the option 6 route was marginally shifted to the eastern side of Palmer Street and direct access to Palmer Street was removed (refer to the description in section 5.1). A small landscape mound was proposed between the new alignment and Palmer Street to minimise traffic noise. This would to some extent meet the intention of the Livingston Road proposal as raised in the community response.

Pitt Town Bottom Road alternative

This alternative begins at the intersection of Pitt Town Road and Windsor Road, then travels east along the existing alignment of Pitt Town Road/Pitt Town Bottom Road and then across the Hawkesbury River to intersect with Wilberforce Road.

This suggestion would provide immunity for a 1-in-100 year flood event. However, the suggestion is beyond the objectives established for this project.

Retention of the existing Windsor Bridge for light traffic alternative

This alternative proposes to build a second crossing of the Hawkesbury and maintain the existing bridge for pedestrian, cyclist and light vehicle traffic only.

As described in section 1.2, the bridge currently has a number of problems such as corrosion of reinforcement materials, structural damage to the super structure and graphitisation of the cast iron piers.

To maintain the existing bridge as a pedestrian, cyclist and light vehicle bridge, the bridge would still require a substantial upgrade. The estimated capital cost of this upgrade is over \$18 million for a renewed life time of 25 years. Therefore, it is not feasible to maintain the Windsor Bridge in addition to constructing a new bridge. The existing bridge may also pose a risk to the new bridge during a heavy flooding.

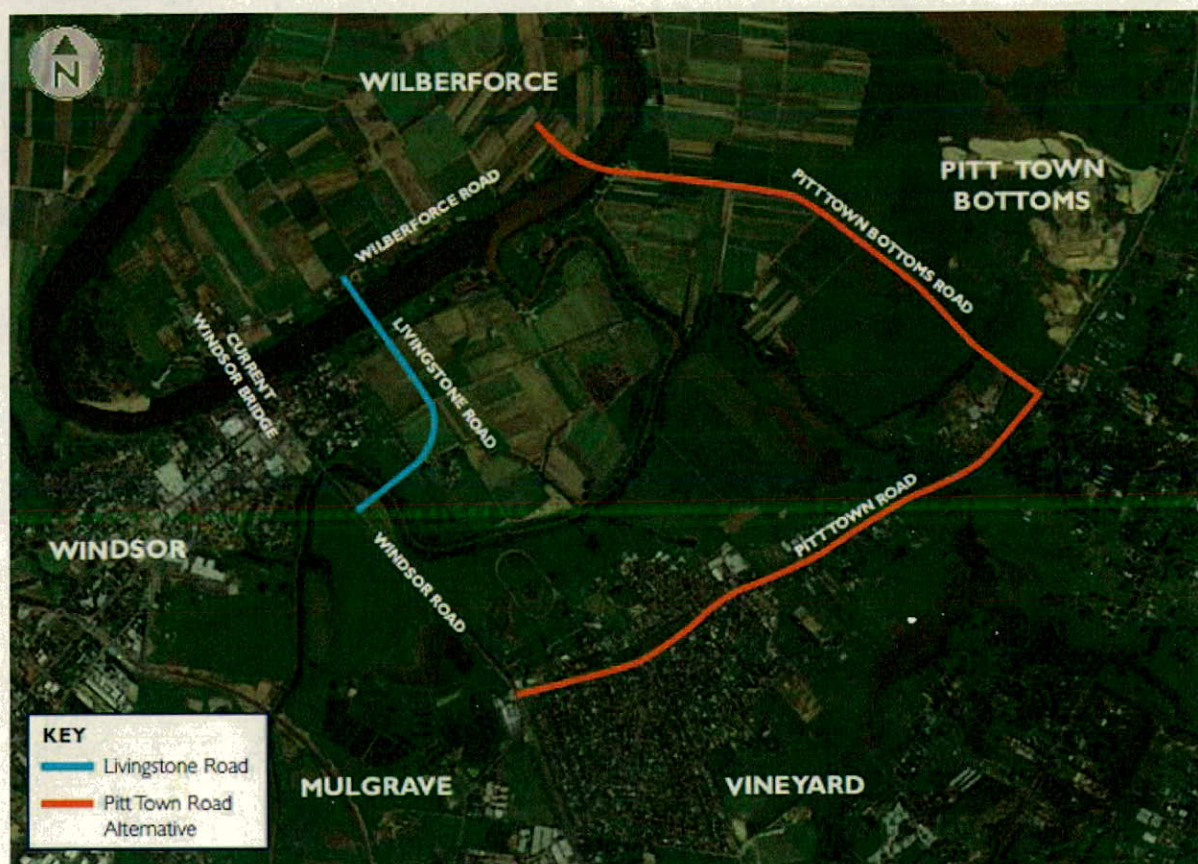


Figure 4.1: Livingston Road and Pitt Town Bottom Road alternatives

4.5 Stakeholder options review workshop

A stakeholder workshop was held on 18 September 2009 and was attended by the following government agencies:

- RTA.
- Hawkesbury City Council.
- NSW Maritime.
- Heritage Branch of the Department of Planning (now part of the Office of Environment and Heritage).
- Government Architects Office.

During the workshop, the participants were asked to consider the various project options and to identify the positive and negative aspects of each option. The evaluation was carried out in two steps – an initial review to identify and exclude options that did not meet the selection criteria, and a second more detailed consideration to rank the remaining options.

4.5.1 Initial review

Table 4.3 provides a summary of the initial review by the stakeholder group.

Table 4.3: Workshop considerations – initial review

Option 1	High level – 35 metre downstream of existing bridge <i>Assessed further by the group</i>
Option 2	Low level - 35 metre downstream of existing bridge <i>Assessed further by the group</i>
Option 3	High level - 10 metre upstream of existing bridge <i>Not favoured by group due to severance of town and a loss of its unique character</i>
Option 4	From Windsor Road, along Macquarie Street and then along Baker Street <i>Not favoured by group due to severance of town and a loss of its unique character</i>
Option 5	From Windsor Road, along Macquarie Street and then along Kable Street <i>Not favoured by group due to severance of town and a loss of its unique character</i>
Option 6	From Windsor Road via new T-intersection north of Pitt Town Road and via new alignment east of Palmer Street <i>Assessed further by the group</i>
Option 7	From Windsor Road along Court and North Streets and then along Palmer Street <i>Assessed further by the group</i>
Option 8	From Windsor Road along Pitt Town Road, Bathurst Street, Punt Road and then on a new greenfield route to cross the Hawkesbury River to meet King Road and then to Wilberforce Road <i>Removed from further consideration due to capital cost</i>

Option 9A Refurbish existing bridge – deck only

Assessed further by the group

Option 9B Refurbish existing bridge – more comprehensively

Assessed further by the group

As a result of the initial review by the stakeholder group, options 3, 4, 5 and 8 were not considered further during the workshop.

4.5.2 Detailed review

Options 1, 2, 6, 7, 9A and 9B were considered further by the stakeholder group. The following tables provide a summary of the more detailed review by the stakeholder group.

Table 4.4: Option 1 – downstream high level bridge

<i>Positives</i>	<i>Negatives</i>
<ul style="list-style-type: none">• Follows the historic road corridor.	<ul style="list-style-type: none">• Heritage impacts at Thompson Square precinct – State significance.
<ul style="list-style-type: none">• Improves flood immunity – 1-in-5 years.	<ul style="list-style-type: none">• Noise and visual impacts on Old Bridge Street.
<ul style="list-style-type: none">• Allows safer access for tourist buses along the river and to pass under the bridge.	<ul style="list-style-type: none">• Noise impact and amenity on Thompson Square precinct.
<ul style="list-style-type: none">• Thompson Square Park can be re-shaped.	<ul style="list-style-type: none">• Likely to disturb archaeological deposits.
<ul style="list-style-type: none">• Improved pedestrian access along the river front.	<ul style="list-style-type: none">• Impact on existing trees on Thompson Square precinct.
<ul style="list-style-type: none">• Positive transport/economic benefit.	<ul style="list-style-type: none">• Visual and physical impact on Thompson Square Precinct.
<ul style="list-style-type: none">• Improved access to Macquarie Park.	<ul style="list-style-type: none">• Requires demolition of existing bridge.
<ul style="list-style-type: none">• Better organisation of usable public space.	
<ul style="list-style-type: none">• Reduces asset maintenance requirements of existing bridge.	
<ul style="list-style-type: none">• Improved safety due to roundabout on the north side.	

The group recommended that option 1 be considered further.

Table 4.5: Option 2 – downstream low level bridge

<i>Positives</i>	<i>Negatives</i>
<ul style="list-style-type: none"> Follows the historic road corridor. 	<ul style="list-style-type: none"> Heritage impacts at Thompson Square precinct – State significance.
<ul style="list-style-type: none"> Improves flood immunity. 	<ul style="list-style-type: none"> Noise and visual impacts on Old Bridge Street.
<ul style="list-style-type: none"> Thompson square park can be re-shaped 	<ul style="list-style-type: none"> Noise impact and amenity on Thompson Square precinct.
<ul style="list-style-type: none"> Improved pedestrian access along the river front. 	<ul style="list-style-type: none"> Likely to disturb archaeological deposits.
<ul style="list-style-type: none"> Positive transport/economic benefit. 	<ul style="list-style-type: none"> Impact on existing trees on Thompson Square precinct.
<ul style="list-style-type: none"> Improved access to Macquarie Park. 	<ul style="list-style-type: none"> Visual and physical impact on Thompson Square Precinct.
<ul style="list-style-type: none"> Better organisation of usable public space. 	<ul style="list-style-type: none"> Requires demolition of existing bridge.
<ul style="list-style-type: none"> Improved safety due to roundabout on the north side. 	<ul style="list-style-type: none"> Buses and service vehicles (greater than 3.5m high) cannot pass under the bridge.
<ul style="list-style-type: none"> Reduces maintenance costs due to demolition of the existing bridge. 	

The group recommended that option 2 be considered further.

Table 4.6: Option 6 – bridge located at Palmer Street

<i>Positives</i>	<i>Negatives</i>
<ul style="list-style-type: none"> Least heritage impact. 	<ul style="list-style-type: none"> Asset maintenance / upgrade liability for the old bridge if it is retained.
<ul style="list-style-type: none"> Removes the through traffic from Thompson Square; allows for safe future upgrades. 	<ul style="list-style-type: none"> Creek crossing required for South Creek crossing.
<ul style="list-style-type: none"> No obstruction of the waterway. 	<ul style="list-style-type: none"> Increased impact for residents on Palmer St - noise and amenity.
<ul style="list-style-type: none"> Provides emergency flood egress. 	<ul style="list-style-type: none"> Would impact on known boating club activities.
<ul style="list-style-type: none"> Allows for the possible retention of the old Windsor bridge 	<ul style="list-style-type: none"> Impact on parts of the Governor Philip Park.
<ul style="list-style-type: none"> Removes heavy vehicles from Windsor town centre. 	<ul style="list-style-type: none"> Significant compulsory acquisition required.
<ul style="list-style-type: none"> Create easier access to boat ramp. 	<ul style="list-style-type: none"> Potential requirement to provide new pedestrian crossing near town centre.
<ul style="list-style-type: none"> Least constrained in terms of future growth. 	

The group recommended that option 6 be considered further.

Table 4.7: Option 7 – bridge located at Court Street/North Street onto Palmer Street

<i>Positives</i>	<i>Negatives</i>
<ul style="list-style-type: none"> Does not require a new bridge over South Creek (compared to Option 6). Removes the through traffic from Thompson Square; allows for safe future upgrades. 	<ul style="list-style-type: none"> Major heritage impacts on Court and North Sts. Loss of car parking on Court St. Introduces an additional set of traffic lights close to Macquarie Street lights. Greatest residential impact compared to the other options. Doesn't achieve 1 in 5 yr flood immunity on existing road approaches. Requires resumption of part of Governor Philip Park. Would impact on known boating club activities.

The group considered that option 7 would have major heritage impacts and create potential traffic safety issues and recommended that it not be considered further.

Table 4.8: Option 9A – rehabilitation of existing bridge

<i>Positives</i>	<i>Negatives</i>
<ul style="list-style-type: none"> Adaptively re-uses a heritage item for its original and intended purpose 	<ul style="list-style-type: none"> Closure for 3 months will affect social cohesion of the area. Major economic impact on community. Would not meet the safety objectives of the project. The same problem will be faced in 25 years time. Closure for three months will destroy social cohesion of the area. Would not achieve 1 in 5 year flood immunity.

The group considered that option 9A would not meet project objectives and recommended that it not be considered further.

Table 4.9: Option 9B – rehabilitation of existing bridge

<i>Positives</i>	<i>Negatives</i>
<ul style="list-style-type: none"> Adaptively re-uses a heritage item for its original and intended purpose 	<ul style="list-style-type: none"> Closure for 12 months would seriously affect social cohesion of the area Major economic impact on community The same problem will be faced in 25+ years time Road cutting leading to the bridge will need to be widened (Thompson Square Park) Loss of original fabric and design Would not achieve 1 in 5 year flood immunity.

The group considered that option 9B would not meet project objectives and recommended that it not be considered further.

4.5.3 Outcome of stakeholder workshop

The participants endorsed the following as workshop outcomes.

1. The group unanimously recommended that options 3, 4, 5, 7, 8 and 9 not be considered further.
2. It was agreed that options 1 and 2 would be further investigated to develop an option that provides a solution to best address the issues in relation to Thompson Square.
3. It was recommended that for options 1 and 2, the improvement of pedestrian access at the intersection of George and Bridge Streets be investigated to facilitate safe access across Bridge Street in both directions
4. It was recommended that option 6 would be further developed due to its superior heritage outcomes and the potential it offers for future road network upgrading without bringing increased traffic volumes through the town centre. It was also agreed that the option 6 design would be further developed to reduce costs and to optimise the intersection design.

Further investigations were undertaken in respect of some of the options in respect of heritage, traffic and access and socio-economic issues. Options 1, 3 and 6 were further developed as a result of the investigations to ensure minimal impacts to heritage and the community, and to provide best efficiency of the road system. The refinements to these options are outlined in section 5.1.

5 Refinement and evaluation of options

The options were refined in response to the issues raised after community and government consultation. The engineering assumptions for the refined options are shown in Table 5.1.

5.1 Refinement of options

The findings of the studies undertaken and the stakeholder consultations outlined in this report have led to further refinement options, outlined below.

5.1.1 Option 1

The refinements to option 1 include:

- Installing an intersection with traffic lights on the northern approach to the bridge at Freemans Reach Road and Wilberforce Road.
- New bridge to provide for a future three lane road (two southbound and one northbound).
- Installing an intersection with traffic lights on the southern approach to the bridge in place of the existing round about at George Street and Bridge Street.
- Extending the upgrades and re-line marking Bridge Street between Macquarie Street and George Street.
- Altering the arrangements at the Macquarie Street and Windsor Road intersection to provide improved access to the intersection at George Street and Bridge Street.
- Modifying Fitzroy Bridge (within the existing curtilage) to provide for three lanes of traffic (two northbound and one southbound).

5.1.2 Option 3

Option 3 was not originally considered favourably at the stakeholder options review workshop (see section 4.5) due to constructability issues within Thompson Square. However, as a result of the review of the options a number of alterations to the design of the new bridge were suggested to address the issues that previously were of concern.

The refinements to option 3 include:

- Adjusting the alignment and construction of the road to pull it away from the Doctor's House minimising the impact on the property.
- Installing an intersection with traffic lights on the northern approach to the bridge at Freemans Reach Road and Wilberforce Road.
- New bridge to provide for a future three lane road (two southbound and one northbound).
- Installing an intersection with traffic lights on the southern approach to the bridge in place of the existing round about at George Street and Bridge Street.

- Extending the upgrades and re-line marking Bridge Street between Macquarie Street and George Street.
- Altering the arrangements at the Macquarie Street and Windsor Road intersection to provide improved access to the intersection at George Street and Bridge Street.
- Modifying Fitzroy Bridge (within the existing curtilage) to provide for three lanes of traffic (two northbound and one southbound).

5.1.3 Option 6

The refinements to option 6 include:

- Installing an intersection with traffic lights on the northern approach to the bridge at Wilberforce Road.
- Altering the design of the bridge to make it a three span structure with only two piers at the banks of the river to reduce impacts on water activities.
- New bridge to provide for a future three lane road.
- Moving the approach road on the southern side further away from Palmer Street to allow for a landscaped mound to reduce visual impacts of the road.
- Increasing the capacity of the signalised intersection at Windsor Road to allow more turning lanes.
- Modifying Fitzroy Bridge (within the existing curtilage) to provide for three lanes of traffic (two northbound and one south bound).
- Adjusting option 6 to remove it further away from the heritage properties at Tebbutts Observatory.
- Providing turn lanes into and out of Tebbutt's Observatory.

Table 5.1: Engineering assumptions for all options

Options	New bridge over Hawkesbury River	Proposed clearance under bridge (The Terrace)	Length of bridge (approximately)	Number of lanes on Windsor Bridge	Modifications to the bridge over South Creek required	Length of new road construction (approximately)	New signalised intersections	Lots (properties) requiring full or partial acquisition*	Number of piers assumed to be in the water*	Flood access provisions - flood level catered for
Option 1	Yes	Heavy vehicles and light vehicles	180m	3	Yes	400m	2	3	10	1-in-5 Year
Option 2	Yes	Light vehicles only	180m	3	Yes	400m	2	3	10	Less than 1-in-5 Year
Option 3	Yes	Heavy vehicles and light vehicles	180m	3	Yes	450m	2	None	10	1-in-5 Year
Option 4	Yes	At grade	180m	3	Yes	600m	3	10 or more lots impacted (along Baker Street)	10	1-in-5 Year
Option 5	Yes	At grade	180m	3	Yes	800m	3	10 or more lots impacted (along Kable Street)	10	1-in-5 Year
Option 6	Yes	N/A	180m	3	Yes	1200m	4	7	2 Clear span required to support water activities	Bridge 1-in-5 Year However southern approach is only 1-in-2 yr. diversion required along George Street
Option 7	Yes	N/A	180m	3	Yes	800m	4	20 or more lots impacted (along Court and North Street)	2 Clear span required to support water activities	Bridge 1-in-5 Year However southern approach is only 1-in-2 yr. diversion required along George Street
Option 8	Yes	N/A	210m	3	Yes	1700m	3	5 or more	None	1-in-5 Year
Option 9 rehabilitation of existing bridge	No	None	143m	2	N/A	N/A	0	None	11	1-in-2 Year

* Information provided is based on strategic design only. Further development will be carried out during the environmental impact assessment and detailed design.

5.2 Preliminary cost of each option

A preliminary cost evaluation was undertaken by RTA. Details of the estimated cost are included in the *Traffic Modelling and Evaluation of Options - Preliminary Report* (RTA 2011) which is available on the RTA website (www.rta.nsw.gov.au/roadprojects).

The capital cost estimates for the nine options were prepared using the engineering assumptions in Table 5.1. The preliminary estimated capital cost of each option is outlined in Table 5.2.

Table 5.2: Economic analysis of options

Option	Estimated capital cost (\$million)	Estimated present value of RTA costs (\$million)	Estimated present value of increased travel costs (\$million)	Benefit cost ratio	Net present value (\$million)
Closing the bridge	0.5	0.5	166.8		
Option 1	45.4	41.2	-17.9	4.5	144.0
Option 2	45.4	41.2	-17.9	4.5	144.0
Option 3	53.4	48.4	0.9	3.5	118.0
Option 4	50.1	45.5	1.3	3.7	120.5
Option 5	52.9	48.0	-0.9	3.5	120.1
Option 6	82.9	75.1	8.8	2.1	83.3
Option 7	56.5	51.3	6.2	3.2	109.7
Option 8	130.6	113.0	252.4	-0.8	-198.1
Option 9A	18.0	17.6	10.0	9.2	139.6
Option 9B	24.7	23.8	40.0	5.4	103.4

A comparison of the net present value shows that option 1 and 2 performed better than the other options. Option 1 may be delivered in stages based on traffic demands and available funding. The first stage is estimated at \$31 million (2011 dollars).

5.3 Comparison of options

5.3.1 Positives and negatives

The following is a review of the positives and negatives of each option as refined following consultation in respect to the project objectives.

5.3.1.1 Option 1 – downstream high level bridge

Positives:

- Would meet current road design and bridge load capacity standards and maintain an existing road speed of 60 km/h.
- Would improve pedestrian access along The Terrace and would improve pedestrian access across George Street/Bridge Street intersection with the future inclusion of traffic lights.
- Would improve performance of the road network and minimise queue lengths and delays.
- Lane width would allow trucks to pass on the bridge.
- Bridge height would provide access in a 1-in-5 year flood event on both bridge and approaches.
- Provides an efficient connection for local traffic and continues to direct regional traffic through the Windsor town centre.
- Pedestrian and cyclist connection would be provided across the bridge into the Windsor Township connecting to local access points.
- Would change the open space within Thompson Square to be amalgamated and provide a unified urban space.
- Extends the rectilinear street grid into Thompson Square and reunites George Street to the riverside.
- Most preferred by Aboriginal stakeholders in relation to Aboriginal cultural heritage impacts due to known and limited impacts.
- Minimal property acquisition would be required.
- Can be constructed with minimal disruption to existing traffic.

Negatives:

- Would have a high impact on the non-Aboriginal heritage value of Thompson Square, the surrounding heritage buildings and the heritage town setting.
- Would require approximately eighteen months construction within Thompson Square.
- Pedestrian access at George Street/Bridge Street intersection would not be improved as part of stage 1.
- Height and design of the bridge and signalised intersection may impact the amenity of local businesses in Thompson Square, including those who provide outdoor dining/shopping.
- Access to two properties on the eastern side of Thompson Square would be restricted.

- Would impact on potential archaeological evidence for both Aboriginal and non-Aboriginal occupation within Thompson Square and on the northern river bank.
- The height of the bridge and inclusion of a signalised intersection would have a substantial impact on the visual amenity and character of the area.

5.3.1.2 Option 2 – downstream low level bridge

Positives:

- Would meet current road design and bridge load capacity standards and maintain an existing road speed of 60 km/h.
- Would improve pedestrian access along The Terrace and would improve access across George Street/Bridge Street intersection with the inclusion of traffic lights.
- Would improve performance of the road network and minimise queue lengths and delays.
- Lane width would allow trucks to pass on the bridge.
- Provides an efficient connection for local traffic and continues to direct regional traffic through the Windsor town centre.
- Pedestrian and cyclist connection would be provided across the bridge into the Windsor Township connecting to local access points.
- Would allow open space within Thompson Square to be amalgamated and provide a unified urban space.
- Extends the rectilinear street grid into Thompson Square and reunites George Street to the riverside.
- Most preferred by the Aboriginal community in relation to Aboriginal cultural heritage impacts due to known and limited impacts.
- Minimal property acquisition would be required.
- Can be constructed with minimal disruption to existing traffic.

Negatives:

- Would have a high impact on the non-Aboriginal heritage value of Thompson Square, the surrounding heritage buildings and the heritage town setting.
- Would require approximately eighteen months construction within Thompson Square.
- Bridge height is less than a 1-in-5 year flood event.
- Bridge height would not allow service vehicles or coaches to pass underneath the bridge to access Windsor wharf (scheduled for upgrading by the Hawkesbury Council).
- Pedestrian access at George Street/Bridge Street intersection would not be improved as part of stage 1.
- Height and design of the bridge and signalised intersection may impact the amenity of local businesses in Thompson Square, including those who provide outdoor dining/shopping.
- Access to two properties on the eastern side of Thompson Square would be restricted.

- Would impact on potential archaeological evidence for both Aboriginal and non-Aboriginal occupation within Thompson Square and on the northern river bank.
- The height of the bridge and inclusion of a signalised intersection would have a substantial impact on the visual amenity and character of the area.

5.3.1.3 Option 3 – bridge immediately upstream of the existing bridge

Positives:

- Would meet current road design and bridge load capacity standards and maintain an existing road speed of 60 km/h.
- Would improve pedestrian access along The Terrace and would improve access across George Street/Bridge Street intersection with the inclusion of signalised intersection.
- Would improve performance of the road network and minimise queue lengths and delays.
- Lane width would allow trucks to pass on the bridge.
- Bridge height would provide access in a 1-in-5 year flood event on both bridge and approaches.
- Provides an efficient connection for local traffic and continues to direct regional traffic through the Windsor town centre.
- Pedestrian and cyclist connection would be provided across the bridge into the Windsor township connecting to local access points.
- Maintains existing noise impacts on Thompson Square.
- Minimal property acquisition would be required.
- The visual connection between George Street and the river would be enhanced by the relocation of the bridge.

Negatives:

- Pedestrian access at George Street/Bridge Street intersection would not be improved as part of stage 1.
- May require a slight increase in the size of the road through the centre of Thompson Square reducing the useable open space and would impact on the open space in Macquarie Park.
- Height and design of the bridge and signalised intersection may impact the amenity of local businesses in Thompson Square, including those who provide outdoor dining/shopping.
- Would have a high impact on the non-Aboriginal heritage value of Thompson Square (in particular The Doctors House), the surrounding heritage buildings and the heritage town setting.
- Would impact on potential Aboriginal heritage artefacts within Thompson Square.
- The height of the bridge and inclusion of a signalised intersection would have a high impact on the visual amenity and character of the area.

- Would require approximately eighteen months construction within Thompson Square and diversion of heavy vehicles for a period of approximately three months.

5.3.1.4 Option 4 – Baker Street

Positives:

- Would meet current road design and bridge load capacity standards.
- Lane width would allow trucks to pass on the bridge.
- Bridge height would provide access in a 1-in-5 year flood event on both bridge and approaches.
- Provides an efficient connection for local traffic to the Windsor town centre.
- Pedestrian and cyclist connection would be provided across the bridge into the Windsor town centre connecting to local access points.
- Would allow for the existing road alignment through Thompson Square to be consolidated, increasing the open space and improving the heritage value and visual aspects of the area.
- Removal of through traffic would improve the amenity of Thompson Square and for adjacent businesses.
- Visual connection between George Street and the river enhanced by the relocation of the bridge.

Negatives:

- Would not provide for a 60 km/h road due to local road speed limits of 50 km/h.
- Minimal improvement to the performance of the road network is likely due to utilising local road access.
- Does not provide an efficient connection for north-south regional traffic as it directs it through the town centre.
- May impact on pedestrian safety along the George Street mall by increasing traffic volumes along Baker Street. Also traffic lights may be required at The Terrace for pedestrian access.
- Some property acquisition would be required along Baker Street including businesses.
- Would reduce the amount of useable open space in Macquarie Park.
- Impacts on noise levels at new residences along Baker Street.
- Would sever the business centre of Windsor by putting an arterial road through it.
- Would impact on the heritage buildings adjacent to Baker Street and the heritage setting of the area.
- Would remove street parking along Baker Street and reduce access to those properties.
- Would cut vehicle access along The Terrace from Baker Street.
- Would potentially impact on Aboriginal heritage artefacts in the area.

- The height of the bridge would impact on the visual amenity and character of the area both through the town and in Macquarie Park.
- Would require minimum six months construction within the town centre and some construction in Thompson Square to remove existing road.

5.3.1.5 Option 5 – Kable Street

Positives:

- Would meet current road design and bridge load capacity standards.
- Lane width would allow trucks to pass on the bridge.
- Bridge height would provide access in a 1-in-5 year flood event on both bridge and approaches.
- Provides an efficient connection for local traffic to the Windsor town centre.
- Pedestrian and cyclist connection would be provided across the bridge into the Windsor town centre connecting to local access points.
- Would allow for the existing road alignment through Thompson Square to be consolidated, increasing the open space and improving the heritage value and visual aspects of the area.
- Removal of through traffic would improve the amenity of Thompson Square and for adjacent businesses.
- Visual connection between George Street and the river enhanced by the relocation of the bridge.

Negatives:

- Would not provide for a 60 km/h road due to local road speed limits of 50 km/h.
- Minimal improvement to the performance of the road network is likely due to utilising local road access.
- Does not provide an efficient connection for regional traffic as it directs it through the town centre.
- May impact on pedestrian safety along the George Street mall by increasing traffic volumes along Kable Street. Also traffic lights may be required at The Terrace for pedestrian access.
- Some property acquisition would be required along Kable Street including businesses.
- Would reduce the amount of useable open space in Macquarie Park.
- Would sever the business centre of Windsor by putting an arterial road through it.
- Would impact on the heritage buildings adjacent to Kable Street and the heritage setting of the area.
- Would remove street parking along Kable Street and reduce access to those properties.
- Would cut vehicle access along The Terrace from Kable Street.
- Would potentially impact on Aboriginal heritage artefacts in the area.

- The height of the bridge would impact on the visual amenity and character of the area both through the town and in Macquarie Park.
- Would require minimum six months construction within the town centre and some construction in Thompson Square to remove existing road.

5.3.1.6 Option 6 – Palmer Street

Positives:

- Would meet current road design and bridge load capacity standards and maintain an existing road speed of 60 km/h.
- Would improve pedestrian access and safety along The Terrace and at the George Street/Bridge Street intersection by removing traffic volume.
- The bridge would have sufficient height to provide access in a 1-in-5 year flood event.
- Would improve performance of the road network and minimise queue lengths and delays.
- Lane width would allow trucks to pass on the bridge.
- Provides an efficient connection for regional traffic to adjacent arterial roads.
- Would have minimal impact on heritage items (excluding the vista from Tebbutt's Observatory).
- Would allow for the existing road alignment through Thompson Square to be consolidated, increasing the open space and improving the heritage value and visual aspects of the area.
- Removal of through traffic would improve the amenity of Thompson Square and for adjacent businesses.
- Visual connection between George Street and the river enhanced by the relocation of the bridge.
- Reducing the number of piers in the river may improve recreational aquatic use of the river upstream for larger boats.
- No construction would be required in the town centre except for the removal of the existing road alignment through Thompson Square.

Negatives:

- Least preferred by the Aboriginal community because of potential cultural heritage impacts.
- Approach road over South Creek would not provide for a 1-in-5 flood event. Flood access would be provided down George Street in emergencies only.
- Does not maintain an efficient connection to the town centre for local traffic. Also does not provide an efficient regional connection.
- Pedestrian and cyclist connection would be provided across the bridge, however would be disconnected from the Windsor town centre.
- Would reduce the useable size of open space in Governor Phillip Park.

- The location of the bridge may impact on boating events in this area through shadowing of the bridge (This bridge design provides for only two piers in the river and around an 80 metre span over the centre of the river minimising impacts on boat users).
- Would impact on potential Aboriginal heritage artefacts in the area.
- Some property acquisition would be required.

5.3.1.7 Option 7 – Court/North Street onto Palmer Street

Positives:

- Would meet current road design and bridge load capacity standards.
- Would improve pedestrian access and safety along The Terrace and at the George Street/Bridge Street intersection by removing traffic volume.
- Lane width would allow trucks to pass on the bridge.
- The bridge would have sufficient height to provide access in a 1-in-5 year flood event.
- Would allow for the existing road alignment through Thompson Square to be consolidated, increasing the open space and improving the heritage value and visual aspects of the area.
- Removal of through traffic would improve the amenity of Thompson Square and for adjacent businesses.
- Visual connection between George Street and the river enhanced by the relocation of the bridge.
- Reducing the number of piers in the river may improve recreational aquatic use of the river upstream for larger boats.
- There would be more direct access to Governor Phillip Park for vehicles with boats.
- No construction would be required in the town centre except for the removal of the existing road alignment through Thompson Square.

Negatives:

- Southern approach would not provide for a 1-in-5 flood event. Flood access would be provided down George Street in emergencies only.
- Would not provide for a 60 km/h road due to local road speed limits of 50 km/h.
- Would impact pedestrian safety along Court Street/North Street.
- Minimal improvement to the performance of the road network is likely due to utilising local road access.
- A pedestrian and cyclist connection would be provided across the bridge; however it would be disconnected from the Windsor town centre.
- Does not maintain an efficient connection to the town centre for local traffic. Also does not provide an efficient regional connection.
- Would reduce the useable size of open space in Governor Phillip Park.

- The location of the bridge may impact on boating events in this area through shadowing of the bridge (This bridge design provides for only two piers in the river and around an 80 metre span over the centre of the river minimising impacts on boat users).
- Some restrictions to street parking may be required and access to properties along Court Street/North Street may be impacted.
- Some property acquisition would be required.
- Would have an impact on the non-Aboriginal heritage items and value of Court Street/North Street. Would also impact the visual appeal of this area.
- Would impact on potential Aboriginal heritage artefacts in the area.
- Some road realignment and construction of traffic signals would be required along Court Street/North Street.

5.3.1.8 Option 8 – Pitt Town Road

Positives:

- Would meet current road design and bridge load capacity standards and maintain existing road speed of 60 km/h.
- Would improve pedestrian access and safety along The Terrace and at the George Street/Bridge Street intersection by removing traffic volume.
- Lane width would allow trucks to pass on the bridge.
- Would improve performance of the local road network and minimise queue lengths and delays.
- Bridge height would provide access in a 1-in-5 year flood event.
- Provides an efficient connection for regional traffic to adjacent arterial roads.
- Would allow for the existing road alignment through Thompson Square to be consolidated, increasing the open space and improving the heritage value and visual aspects of the area.
- Removal of through traffic would improve the amenity of Thompson Square and for adjacent businesses.
- Visual connection between George Street and the river enhanced by the relocation of the bridge.
- No construction would be required in the town centre except for the removal of the existing road alignment through Thompson Square.

Negatives:

- Approach road between Pitt Town and Windsor Road would not provide for a 1-in-5 flood event.
- Does not provide an efficient connection for local traffic into Windsor which would reduce access to businesses in the town centre.

- Pedestrian and cyclist connection would be provided across the bridge however would be completely disconnected from the Windsor town centre.
- The location of the bridge may impact on boating events along the river through shadowing of the bridge (This bridge design spans the entire river to minimising impacts on boat users).
- Large amounts of property acquisition would be required.
- May potentially have heritage impacts on Pitt Town and the surrounding heritage landscape.
- Would impact on potential Aboriginal heritage artefacts in the area.

5.3.1.9 Option 9 – refurbish the existing bridge

Positives:

- Maintains historic bridge crossing in the same location.
- Maintains existing local and regional connections to the town centre.
- Maintains existing pedestrian and cyclist connections to surrounding areas.
- Maintains existing arrangements for open/recreational space.
- Maintains existing arrangements and impacts to businesses for the short term.
- Maintains existing access arrangements.
- No property acquisition would be required.
- Impacts on heritage would be limited to the existing bridge. The heritage value and setting of the town would remain the same.
- No impacts to Aboriginal heritage would occur.

Negatives:

- Would not meet current road design or bridge load capacity standards. Speed limit on bridge would likely remain at 40km/h.
- Existing pedestrian arrangements would be maintained, which would not improve safety.
- Refurbishment would require replacement of all original fabric on the bridge. May include altered deck configuration.
- Queue lengths, delays and road performance would not be improved.
- Would not provide sufficient lane width for heavy vehicles to pass on the bridge.
- Ongoing traffic problems using the existing crossing may impact on the accessibility and amenity of local businesses in the long term.
- Construction would require closing the existing bridge to all traffic for a minimum of 12 months (no temporary replacement bridge would be built). Requires a thirty kilometre road detour to cross the Hawkesbury River via Richmond Bridge.

5.3.2 Comparison of options against the project objectives

A comparison of each option against the project objectives is shown in Table 5.3.

Options 4, 5 and 7 were found to have minimal improvement to traffic efficiency and may impact on pedestrian safety due to the high volume of traffic expected along the local streets. These options also impacted on the adjacent properties and were not seen as an acceptable outcome by the community and government representatives.

Option 8 does not meet the long term needs of the community and was found to have a significant capital cost.

Option 9 did not meet the requirements of road design and safety, and would not improve the traffic efficiency of the area. Closure of the bridge during construction would adversely affect the area, requiring a large detour. The flood immunity would also not be improved.

On a broad consideration of all objectives, options 1, 2, 3 and 6 are the best overall performing options.

Option 1 performs well in respect of safety, flood immunity and long term community needs. Option 1 also offers best value for money. Option 1 performs poorly in respect of impacts on heritage and the character of Thompsons Square and the surrounding heritage buildings. However, options 1 and 2 both introduce enhanced urban design opportunities to reinstate the rectilinear street layout and improve the relationship between open space and the river.

Option 2 performs well in respect of safety and long term community needs. It offers the best value for money when compared with the other options. Option 2 performs poorly in respect of impacts on heritage and the character of the area and does not perform as well as option 1 in respect of flood immunity.

Option 3 performs well in respect of safety, flood immunity and long term community needs. Option 3 does not perform as well as options 1 and 2 in terms of value for money. Option 3 performs poorly in respect of minimising impacts on recreational spaces. Option 3 also performs poorly in respect of impacts on heritage and the character of the area.

Option 6 performs well in respect of safety, traffic and transport efficiency and impacts on heritage and character of the local area. Option 6 does not impact on Thompson Square or surrounding heritage buildings. However, option 6 performs very poorly in respect of value for money and exceeds the funding allocated by the NSW Government for the project.

Table 5.3: Relative performance of the options

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
To improve the safety for motorists, pedestrians and cyclists										
Meets various design criteria		**	**	**	**	**	**	**	**	*
Meets a road speed of 60km/hr		**	**	**	*	*	**	*	**	*
Pedestrian safety		**	**	**	*	*	**	*	**	*
To improve traffic and transport efficiency										
Minimises queue length/delays		**	**	**	*	*	*****	**	**	*
Improves performance of the road network (level of service)		**	**	**	*	*	**	*	**	*
Enables two heavy vehicles to pass on the bridge without waiting.		**	**	**	**	**	**	**	**	*
Improves the load capacity of the crossing to meet current load standards.		**	**	**	**	**	**	**	**	*
To improve the level of flood immunity										
Provide access in a 1 in 5 year flood event.		***	**	***	***	***	**	**	***	*
To meet long term community needs										
Provide an efficient connection for local and regional traffic.	Local	***	***	***	***	***	**	**	*	**
	Regional	**	**	**	*	*	*****	**	**	**
Provide pedestrian and cyclist connections to surrounding locations		***	***	***	*****	*****	**	**	*	*
Minimise impact on recreational spaces		**	**	*	*	*	**	**	***	**
Minimise impact of noise		noise assessment has not yet been undertaken								
Minimise impacts to business and shopping environment		**	**	**	*	*	**	**	*	*
Minimise impact on property access and the need for property acquisition	Access	**	**	**	**	**	*****	**	*****	**
	Acquisition	***	***	*****	*	*	**	**	*	**
Ensure a 100 year life span for the bridge		**	**	**	**	**	**	**	**	*
To minimise the impact on the heritage and character of the local area										
Minimise impact on Aboriginal and non-Aboriginal heritage and conservation areas				*	*	*	**	*	**	**
Protect the built heritage of the town and its setting.		*	*	*	*	*	***	*	*	*
Minimise visual impact of the bridge and road approaches on the character of the area		*	*		*	*	**	*	**	**
To be a cost effective and affordable outcome										
The option provides a cost effective solution in terms of:	Capital cost	***	***	**	*	*	*	*		*****
	Maintenance cost	***	***	***	***	***	***	***	**	*
	Return on investment	*****	*****	***	***	***	*	***		***
Minimise construction impact		**	**	*	*	*	***	***	***	

*Assume in options 1 to 8 the existing Windsor Bridge is removed.



6 Conclusion

6.1 Decision making process

The RTA has investigated the condition of the existing bridge and the options to rehabilitate or replace it. A community update describing the nine options to rehabilitate or replace the existing bridge was distributed in July 2009. The community provided comments on the nine options and a workshop was held at Windsor Central Library on Saturday 1 August 2009. The options have a range of quite different impacts. Some have strong amenity impacts, some have high construction costs and all have heritage impacts.

The RTA received 136 submissions from the community, council, businesses and groups. Representatives from Hawkesbury City Council, the NSW Heritage Branch and Maritime NSW have met with the RTA and provided submissions on the project. The community indicated concerns about the following key areas:

- The potential impacts on the heritage and character of the local area.
- Local community needs such as pedestrian and cyclist connections, recreational space and increased noise and pollution.
- Loss of business in the town centre.
- Traffic and transport issues.
- Safety for motorists and pedestrians approaching and crossing the bridge.
- What level of flood protection would be designed.
- The cost effectiveness of the new bridge.

The RTA recognises the importance of achieving a balance between transport needs, social and heritage impacts, ecological, engineering and cost constraints. Most importantly, the upgrade would result in a safer road environment. The decision on the preferred option was made by considering:

1. Information on the potential impact of each of the options.
2. Community and government agency issues and comments on these options.
3. Consideration of the positives and negatives of each of the options and performance against project objectives.

6.2 Preferred option

The RTA has identified option 1 as the preferred option. This option performs best on value for money and performs well in relation to most of the project objectives, except heritage. Importantly, option 1 can be delivered in stages, which satisfies current funding. The proposed works for stage 1 can be built now, and stage 2 can be delivered if warranted based on traffic volumes and availability of funding.

6.3 Description of the preferred option

The RTA's preferred option is a high level bridge, linemarked with two lanes initially, with a capacity for three lanes to be linemarked in the future. The new bridge is located approximately 35 metres downstream from the existing structure. It:

- Provides a crossing that is central to Windsor, connecting the northern side of the Hawkesbury River directly to the township.
- Connects The Terrace underneath the bridge, providing access for vehicles, including garbage trucks and coaches to the new wharf.
- A new signalised intersection at Freemans Reach and Wilberforce roads.
- Would accommodate a 1-in-5 year flood event.
- Provides value for money.
- Retains traffic along an existing corridor.
- Would have minimal impact to traffic during construction.

The existing bridge and road through Thompson Square would be removed, allowing unification of open space and improved pedestrian connections to the river. It is acknowledged that there would be adverse heritage impacts associated with the preferred option, particularly on Thompson Square, its role in the historic town plan of Windsor, the surrounding heritage buildings and potential archaeological resource.

The RTA will continue to work with the Office of Environment and Heritage, and the local community to ensure that impacts to Windsor's heritage are minimised wherever possible. Further detailed heritage assessment, including consultation with the community and the Aboriginal community regarding Aboriginal cultural heritage, would be carried out as part of the environmental impact assessment of the preferred option.

6.4 Staging of works for the preferred option

The following information is based on preliminary strategic design. Further design development will be undertaken, informed by feedback from community and stakeholder consultation and further detailed investigations. Figure 6.3 shows the extent of the works for the preferred option indicating how it can be delivered in a staged fashion.

6.4.1 Stage 1

The proposed work will contain the following key features:

- A new signalised intersection with Freemans Reach and Wilberforce Road.
- A two lane bridge supported by piers in the river with 3.5 metre lanes and 2 metre shoulders. The bridge structure will span over The Terrace and the river.
- A 3 metre wide shared pedestrian/cycle path from Wilberforce Road running on the western side of the bridge.
- An approach road located on the eastern side of Thompsons Square. The level of the bridge deck would be close to that of George Street, meaning that the approach road would be supported on a formation that increases in height as it approaches the bridge.
- The existing road would be removed and the cutting through Thompsons Square would be filled in and reinstated as part of the park.
- The area to the river foreshore would also be regraded providing approximately 500 square metres of additional open space within Thompson Square.
- A 1.5 metre wide footpath along the eastern side of Thompson Square connecting to The Terrace.
- The Terrace to be extended under the bridge to connect to the wharf and car park on the eastern side of Thompson Square.
- The existing Windsor Bridge to be removed.
- Revegetation along the river's edge.

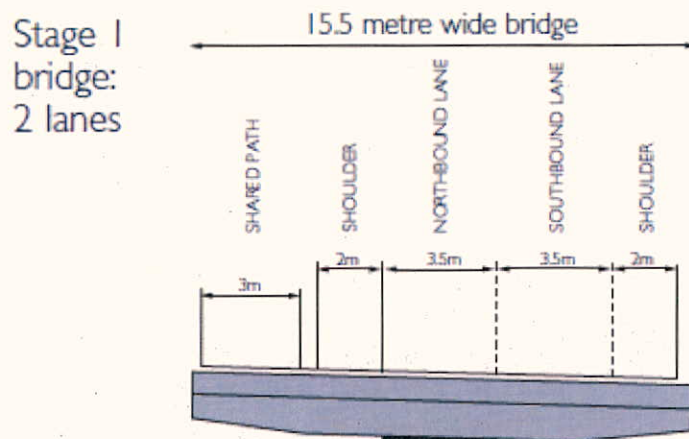


Figure 6.1: Bridge cross-section for stage 1

6.4.2 Stage 2

Future works can be delivered if warranted based on future traffic volumes and when funding is available. Future works include the following key features:

- Two lanes southbound and one lane northbound on Windsor Bridge. The shoulder widths would be reduced and a new lane added with new line marking as shown in Figure 6.2. No additional construction work required.
- Install traffic lights and three way pedestrian crossings in place of the George Street/Bridge Street roundabout. Right turn only allowed from George Street east and Bridge Street south (refer to section 3.9.5).
- Fitzroy Bridge across South Creek re-linemarked to provide two lanes northbound and one lane southbound. There would be no other modifications made to this bridge.

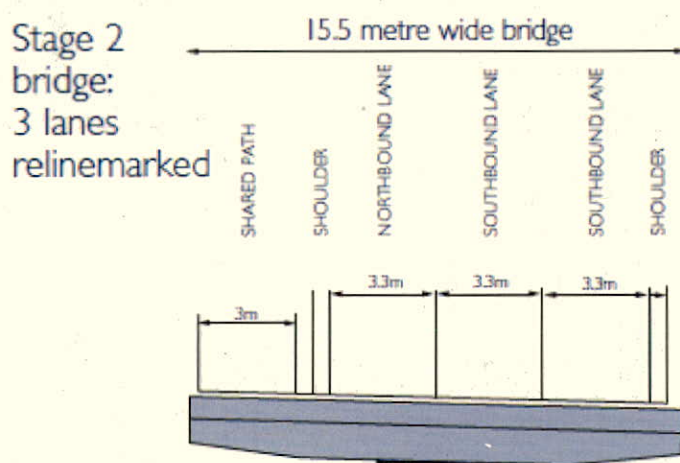


Figure 6.2: Bridge cross-section for stage 2



Figure 6.3: Option 1 – Stage 1 and stage 2 (future works) development (preliminary design)

6.5 Next steps

The RTA is currently seeking comments on the preferred option. Written comments are welcome to the project manager:

Yogarathnam Suthan

Roads and Traffic Authority

PO Box 973

Parramatta CBD NSW 2141

Or email comments to Windsor_Bridge@rta.nsw.gov.au

Comments are needed by **Friday 9 September 2011**.

Feedback received will inform development of a concept design for the preferred option and further environmental assessment. A State significant infrastructure application under the *Environmental Planning and Assessment Act 1979* will be submitted to the Department of Planning and Infrastructure.

Following lodgement of the State significant infrastructure application, the Director-General of the Department of Planning and Infrastructure will consult with other agencies and issue environmental assessment requirements for the project. These will inform the preparation of a detailed environmental impact statement to assess key issues such as non-Aboriginal heritage, Aboriginal heritage, urban design and visual impact, socio-economic impact and noise and vibration. Comments received from the community and other interested parties will also be taken into account in preparing the environmental impact statement.

The Department of Planning and Infrastructure will place the environmental impact statement on display and seek comments for a minimum of 30 days. Any issues raised will be addressed in a submissions report. An assessment report will then be prepared by the Director-General of the Department of Planning and Infrastructure to the Minister for Planning regarding the project. The Minister for Planning will then determine whether or not to approve the project.

The RTA will continue to consult with the community and stakeholders in the preparation of the concept design and throughout the environmental assessment process.

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