NSW GOVERNMENT | Planning & Infrastructure

MAJOR PROJECT ASSESSMENT:
Windsor Bridge Replacement Project
Windsor, NSW
(SSI - 4951)

Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

September 2013

ABBREVIATIONS

AHD	Australian Height Datum
CIV	Capital Investment Value
Department	Department of Planning and Infrastructure
DGRs	Director-General's Requirements
Director-General	Director-General of the Department of Planning & Infrastructure
DPI	Department of Primary Industries
EA	Environmental Assessment
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPA	Environment Protection Authority
EPI	Environmental Planning Instrument
ESD	Ecologically Sustainable Development
LEP	Local Environmental Plan
Minister	Minister for Planning and Infrastructure
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage
PAC	Planning Assessment Commission
Part 5	Part 5 of the *Environmental Planning and Assessment Act 1979*
PEA	Preliminary Environmental Assessment
PFM	Planning Focus Meeting
PPR	Preferred Project Report
Applicant	Roads and Maritime Services (RMS)
RTA	Roads and Traffic Authority (now RMS)
RtS	Response to Submissions
SEPP	State Environmental Planning Policy (State and Regional Development) 2011

Cover Photograph: Windsor Bridge Replacement (Source: EA 2012)

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NSW Government
Department of Planning & Infrastructure

EXECUTIVE SUMMARY

NSW Roads and Maritime Services (RMS) is seeking project approval for the construction and operation of a new reinforced concrete bridge and removal of the existing bridge located across the Hawkesbury River at Windsor, NSW. The project is located approximately 57 kilometres from Sydney, in the Hawkesbury Local Government Area.

The Windsor Bridge Replacement Project is required due to the poor condition of the existing bridge resulting from its age and heavy usage and insufficient lane capacity to meet long term traffic demands. In June 2008, the NSW Government committed funding to rehabilitate or replace Windsor Bridge. RMS investigated ten options for the project and following agency and community consultation, RMS determined that Option 1, being the construction of a new bridge located 35 metres downstream of the existing bridge to be the preferred option.

The proposal comprises the construction of a 159 metre long, five span bridge across the Hawkesbury River at Windsor. Construction works involve the construction of new northern and southern approach roads and the realignment and modification of access roads. The proposal includes the removal of the existing bridge. The proposal would require a construction workforce of 110 personnel and 20 months duration with a budget of $65 million.

The project is State significant infrastructure and in accordance with *State Environmental Planning Policy (State and Regional Development) 2011*, requires an Environmental Impact Statement (EIS) to be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Minister for Planning and Infrastructure is the approval authority.

The EIS was placed on public exhibition from 14 November 2012 until 17 December 2012 (34 days). During this period, the Department received 100 submissions on the proposal, comprising six from public authorities and 94 from the general public and special interest groups. The submission from Council supported the proposal. Of the 94 public submissions, 70 (74.5%) objected to the project, 19 (20.2%) supported the project and 5 (5.3%) did not object but raised matters to be considered in the assessment. The Heritage Council of NSW strongly objects to the proposal. The key issues raised in submissions were:

- Traffic;
- Visual amenity;
- Heritage, in particular impacts on Thompson Square Conservation Area; and
- Consideration of project alternatives and consultation.

Positive effects of the proposal raised in public submissions included the greater flood immunity of the proposed bridge, improved road safety, increased traffic flow through Windsor, enhanced urban design in the Thompson Square precinct, and improved pedestrian and cyclist connections across the Hawkesbury River and to its shore.

The Department has carefully considered the EIS, submissions, the Submissions Report which also incorporates the Preferred Infrastructure Report and the Applicant's environmental management measures in accordance with the objects of the EP&A Act and ecologically sustainable development. In addition, the Department commissioned independent expert reviews in relation to traffic, bridge engineering, and the heritage related impacts to help inform its assessment.

The assessment concludes that the new bridge will have a number of immediate and long term benefits including:

- Regional and local traffic benefits including reducing congestion, improving capacity and providing greater access across the river during flood events;

- Construction of a new bridge, approach roads and intersection upgrades that meet contemporary engineering and road safety standards;
- Increased pedestrian and cycle access along the southern foreshore of the river, and across the new bridge;
- A consolidated square and a more useable public domain resulting from the relocation of the southern approach road from its current location to the north-east boundary of the Thompson Square Parklands;
- Amenity improvements around the square resulting from the removal of the grade on the southern side of the river in particular air quality improvements; and
- An overall enhanced visual setting of the project area given the above and the contemporary design features of the new bridge.

Notwithstanding the above, the assessment acknowledges that despite there being no direct destruction of heritage items apart from the existing bridge; the new bridge would have long term negative impacts on Thompson Square in terms of its heritage fabric and character. This is defined by listing of the Square, individual properties and the existing bridge on the State Heritage Register. The assessment also acknowledges that there would be potential adverse impacts to a lesser degree associated with the construction of the bridge on Aboriginal heritage. Furthermore, shortcomings identified in the Heritage assessment do not detract from the Department's conclusion in relation to the long term Heritage impacts.

The Department recognises the strong views expressed in submissions in relation to heritage impacts. However, on balance, the Department is satisfied that despite these impacts, the Windsor Bridge Replacement Project is consistent with the objects of the Act and is in the broader public interest given its immediate and long term regional and local traffic benefits. Overall the Department accepts the level heritage impacts associated with the proposal, which to some degree can be managed by a range of stringent conditions. These include:

- The preparation of a Strategic Conservation Management Plan and Archival Recording on the southern side of the Hawkesbury River;
- An Archaeological Investigation Program comprising Aboriginal and non-Aboriginal Heritage with the results detailed in a Historic Archaeological Report and a Detailed Salvage Strategy;
- A Hawkesbury Region Sand Bodies Study should any Pleistocene and/or early Holocene be encountered during construction works; and
- An Urban Design and Landscape Plan.

In addition to the above, the Department has also recommended conditions addressing the residual hydrology and urban design issues and completion of a final landscape design prior to any construction on the southern side of the Hawkesbury River.

The Department therefore considers the project benefits outweigh the disbenefits and recommends that the Minister for Planning and Infrastructure approve the proposal subject to the recommended conditions of approval.

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1. BACKGROUND

Roads and Maritime Services (RMS) is proposing to replace the existing crossing of the Hawkesbury River at Windsor, known as the Windsor Bridge. This project, referred to as the Windsor Bridge Replacement Project, involves the construction and operation of a new bridge and removal of the existing crossing at Windsor.

Figure 1: Project Location in Context with Sydney CBD (Source: Google Maps 2013)

The site is located approximately 57 kilometres north-west of Sydney in the Hawkesbury Local Government Area. The project location is shown in **Figure 1**. The township of Windsor, which is located on the southern bank of the Hawkesbury River, is a major historical town with European settlement dating back to the late 1700s. Windsor is the third oldest place of European settlement and the town contains buildings and sites of historical heritage significance, particularly within the Thompson Square Conservation Area which is located on the southern bank of the Hawkesbury River at the proposed bridge location.

The area surrounding Windsor is characterised by predominantly rural land uses including turf farms and agricultural activities, with expanding urban development located to the south and west of the town. Surrounding land uses are shown in **Figure 2**.

The existing bridge was opened in 1874 and is the oldest bridge across the Hawkesbury River. It provides an important local vehicle and pedestrian link and contributes to the regional road network between Western Sydney, the Blue Mountains and the Hunter region. Current usage of the bridge is approximately 19,000 vehicles per day, of which 7% are heavy vehicles.

RMS deemed the Windsor Bridge Replacement Project as necessary due to substantial deterioration of the bridge structure resulting from age and heavy usage. The bridge and its approach roads and adjacent intersections no longer meet the demands of current peak hour traffic volumes and current road standards.

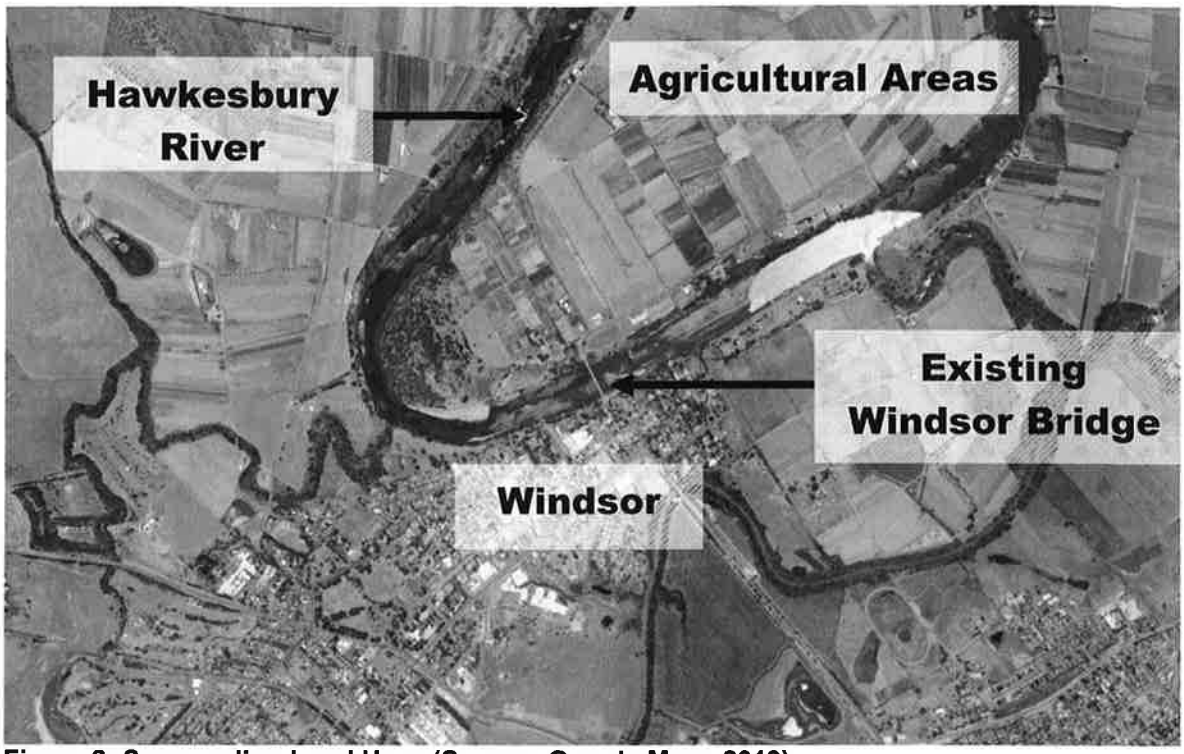

Figure 2: Surrounding Land Uses (Source: Google Maps 2013)

A further limitation of the existing bridge is flooding, as the existing bridge is prone to flooding given it lies within the 1 in 2 year flood event level. The surrounding roads are higher and benefit from some flood immunity. Anecdotal evidence provided in the EIS indicates that over the past 100 years, the existing bridge has been flooded on 59 occasions. The bridge is closed to traffic during large flood events, with inherent safety risks.

The condition of the existing Windsor Bridge was investigated by the Applicant in 2003, 2005, 2009 and 2011 with particular focus on carbonisation, graphitisation, deck joints and pier cracking. Based on these reports, the Applicant determined the existing bridge to be in poor condition. Key concerns that were identified include:

- corrosion of bridge sections, bracing and piers that stand under the water line resulting in variable pier wall thickness;
- horizontal and vertical cracking in pier columns;
- deteriorated load-bearing stiffness in one bridge span; and
- cracking and corrosion in the bridge deck including damaged deck joints.

Underwater inspections in 2012 did not identify any further significant deterioration of the structure.

According to information provided in the EIS, the current poor condition of the existing bridge presents key shortcomings regarding its safety and reliability into the future if it is to support current and predicted future traffic volumes.

2. PROPOSED PROJECT

2.1. Project Description

The Windsor Bridge Replacement Project involves the construction and operation of a new bridge and associated approach roads and intersections. It is proposed to construct the new bridge prior to removal of the existing Windsor Bridge to minimise traffic disruption and provide for continuous linkage across the Hawkesbury River at Windsor during construction.

The new bridge has been designed to accommodate heavy vehicles, private vehicles, maintenance and emergency vehicles, and pedestrians and cyclists. Initially designed as a two-lane bridge of 3.5 metres width lanes (one in each direction), the proposed width allows space to reconfigure to a three lane bridge in the future by reducing the road shoulder width to 0.5 metres and changing the lane markings. A 3 metre wide shared pedestrian and cyclist path is proposed to be constructed across the western side of the new bridge and connecting to new shared paths on the approach roads.

The associated construction works include the realignment and construction of new northern and southern approach roads and intersections, and ancillary works such as the construction of new property access points, installation of public utility services across the new bridge, installation of scour protection and installation of water quality management facilities including a permanent water quality basin, located on the northern bank of the new bridge, to intercept and treat stormwater runoff from the bridge and northern approach roads before it enters the Hawkesbury River.

The key components of the project are listed in **Table 1** and the detailed scope of works is listed in **Table 2**. The project layout is shown in **Figure 3**.

Table 1: Key Project Components

Aspect	*Description*
Location	• 35m downstream of existing Windsor Bridge
Bridge length	• 159m
Clearance height	• 7.5m across the Hawkesbury River at average high tide level • 3.6m to 4.6m at The Terrace (southern bank of the Hawkesbury River)
Bridge height	• Low point at deck level: 9.8m Australian Height Datum (AHD)
Bridge width	• 15.2m
Lane configuration (opening)	• 2 traffic lanes, one per direction: 3.5m each • shoulders: 2m • shared pedestrian/cycle path: 3m
Lane configuration (longer term)	• 3 traffic lanes, one per direction: 3.5m each • Shoulders: 0.5m • shared pedestrian/cycle path: 3m
Construction details	• Double T bridge • Bridge spans: 5 • Material: Reinforced concrete • Support: 4 piers located in the Hawkesbury River • Construction method: incrementally launched from southern bank
Construction timeframe	• 20 months

Table 2: Scope of Works

Aspect	Description
Site preparation	• Installation of temporary construction compounds and ancillary works (water quality, scour protection, noise control measures etc).
Road realignment and construction	• Construction of southern approach road and realignment of Bridge Street from its intersection with George Street to the north-west along existing alignment of Old Bridge Street on the eastern side of the Thompson Square Conservation Area; • Replacement of existing roundabout at George and Bridge Streets with a new signalised intersection; • Connection of existing two sections of The Terrace to form continuous access along southern river bank and access to Windsor Wharf by vehicles and pedestrians; • Construction of a new northern approach road and a new dual lane roundabout to connect the new bridge at the junction of Wilberforce Road, Freemans Reach Road and Macquarie Park access road; and • Upgrade of Freeman's Reach Road, Wilberforce Road and Macquarie Park access road approaches to the new dual lane roundabout.
Property access changes	• Change to vehicle access at two properties (4 and 6 Old Bridge Street) via southbound carriageway of southern approach road; and • Removal of existing driveway and construction of a new driveway to the east for access one property (33 Wilberforce Road).
Road and access modifications	• Bridge Street between Macquarie Street and George Street: o Construction of new road pavement; o changes to line markings; o shortening of central concrete median in Macquarie Street (at intersection with Bridge Street) to increase width of the pedestrian crossing; o additional conduits below existing footpath on eastern side of Bridge Street (between Macquarie and George Streets) via trenching to connect and coordinate two signalised intersections; and o bury the existing 33kV (overhead) electricity cable underground within the Bridge Street alignment between the Macquarie and George Streets intersection.
Pedestrian and cycle facilities	• Construction of a shared pedestrian and cycle path across the western side of the replacement bridge and connection to shared pedestrian and cycle paths in southern and northern access streets; and • Construction of signalised pedestrian crossings in northern and southern areas.
Public utility services	• Installation of new services on the new bridge to replace existing mains and conduits; • Adjustment of public utilities as required (high voltage 33kV overhead power lines and additional local stormwater infrastructure, water, sewer, telecommunications assets); and • Installation of street lighting.
Scour protection	• Installation of temporary scour protection during construction works and permanent scour protection where required for bank and river erosion control, potentially around bridge abutments and piers, at the northern bridge abutment (using reinforced grass) and around the demolished abutments of the existing bridge.
Water quality management	• Construction of a permanent water quality basin east of the proposed roundabout at the junction of Freemans Reach Road, Wilberforce Road and Macquarie Park access road.
Removal of existing approach roads	• Removal and backfill of existing bridge approach roads, including the existing Bridge Street section diagonally through Thompson Square, backfilling and reinstatement as open area; and • Infilling, regrading and landscaping of northern approach road to the existing bridge.
Demolition of	• Disconnection of existing public utility services on the existing bridge

Aspect	Description
existing bridge	(water, sewer, electricity and telecommunications lines); • Controlled removal and appropriate disposal of bridge elements containing lead based paints; • Removal of the existing bridge superstructure and substructure in sections, using temporary bracing to maintain stability. Transportation for off-site recycling and disposal of bridge components at a licensed facility (demolition methodology was not yet confirmed at the EIS stage); and • Rehabilitation of the existing bridge site.
Landscaping	• Revegetation of all disturbed areas and redevelopment of The Terrace along southern river bank and Thompson Square Conservation Area.

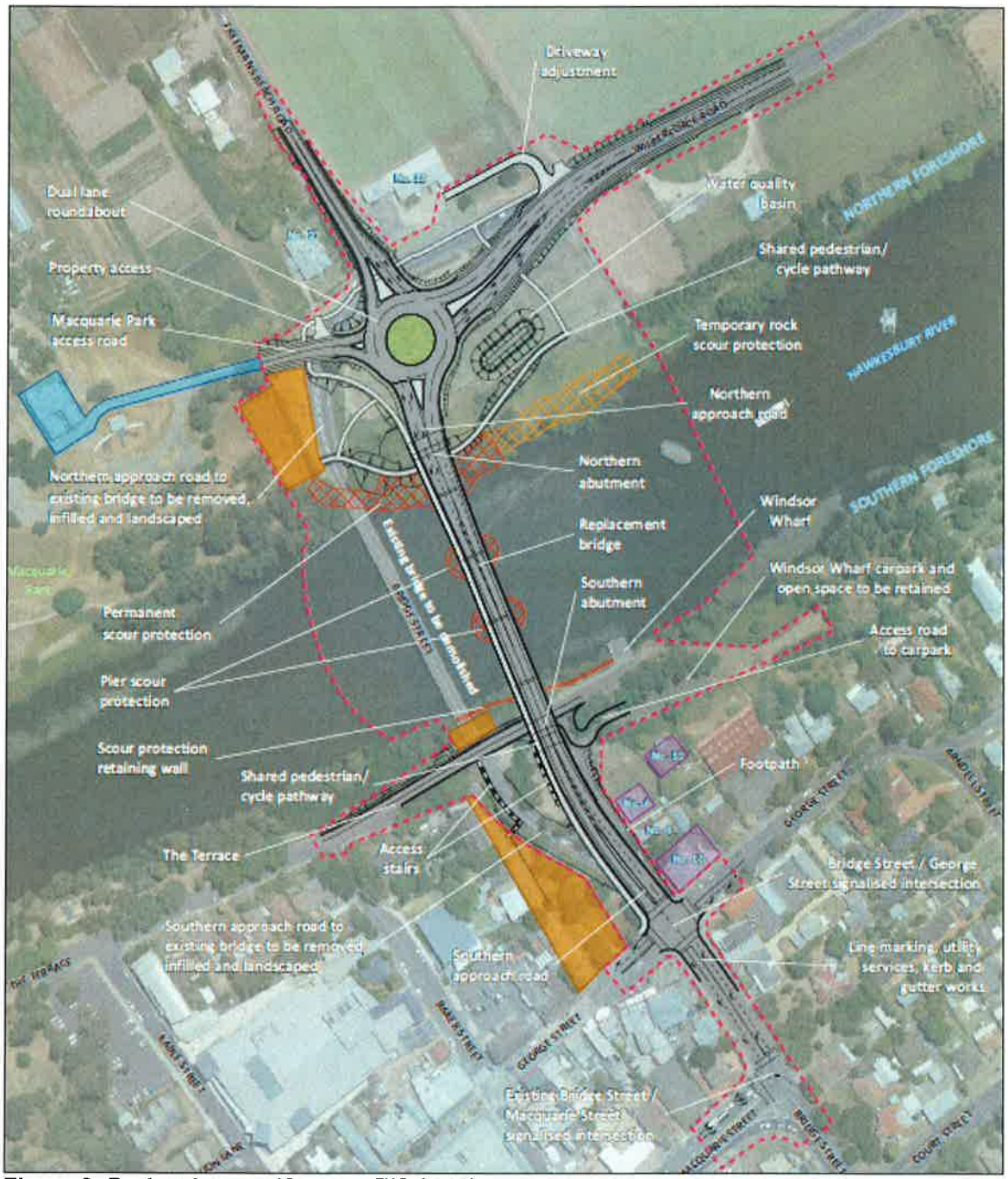

Figure 3: Project Layout (Source: EIS 2012)

2.2. Project Need and Justification

The existing Windsor Bridge provides an important road transportation link across the Hawkesbury River for local and regional vehicle traffic. At a local level, Windsor Bridge provides a direct access way for the communities on each side of the Hawkesbury River in the Windsor area. On a regional level, Windsor Bridge provides an important traffic link between western Sydney, the Blue Mountains and the Hunter region.

In June 2008, the NSW Government committed funding to rehabilitate or replace the Windsor Bridge. Four alternative actions were identified. RMS further investigated several options for each of the following alternative actions:

- do nothing and continue to maintain the existing bridge;
- refurbish the existing bridge and approach roads (involving temporary closure) to meet current design standards (two optional designs were considered by RMS);
- bypass Windsor, involving construction of a new bridge and associated roads (two design options were considered by RMS); and
- replace Windsor Bridge, involving construction of a new bridge either up or downstream of the existing bridge (six design options were considered by RMS).

The 'do nothing' option was not considered in detail by RMS due to short and long term maintenance costs, the inherent safety design issues and flooding issues associated with the existing bridge. RMS identified key issues regarding the structural integrity, condition and non-compliance with design standards of the existing bridge within the context of current and predicted future vehicle traffic volumes. This requires attention in the form of large-scale maintenance work, which is estimated to cost in excess of $15-20 million (plus maintenance) for a 50 year lifespan.

In particular, the existing bridge and approach roads do not meet current engineering and safety standards. Heavy vehicle use of the bridge is currently compromised due to the bridge deck width being less then the standard width for a two lane bridge and an imposed speed limit of 40 kilometres per hour. In addition, the existing traffic and pedestrian safety barriers do not meet current design standards and the pedestrian path on the existing bridge is of insufficient width (1 metre) for use by cyclists. The approach roads, being the George and Bridge Street intersection and Freeman's Reach Road and Wilberforce Road intersection, currently do not comply with safety design standards for sight distance for vehicles.

In addition to the non-compliances with safety design standards, the issues outlined above currently result in traffic delays on the existing bridge and approach roads. According to information provided in the EIS, the approach roads provide insufficient capacity for morning peak traffic levels at the intersection of Freemans Reach Road and Wilberforce Road and the intersection of Bridge and George Streets which is predicted, in the EIS, to be unacceptable by 2016. Additionally, the Applicant has identified predicted growth in vehicle use of the Windsor Bridge by 25% by 2026 which would not be supported by its current condition and size.

A further issue identified by the Applicant is the risk of flood impact. As described in **Section 1**, the existing bridge lies below the 1 in 2 year flood event level and has been subject to regular flooding. The existing bridge has been closed to traffic during large flood events, while the surrounding roads which are higher, have remained accessible during past flood events. Construction of the new bridge would effectively increase access across the river for traffic during flood events.

Based on the above and in order to achieve a longer-term solution which is financially viable and provides for community and regional requirements, RMS considered ten alternate options as detailed in **Table 3.**

Table 3: RMS Project Options

Option	Option Type	Name
Option 1	New Bridge	New downstream high-level bridge via Old Bridge Street.
Option 2	New Bridge	New downstream low-level bridge via Old Bridge Street.
Option 3	New Bridge	New bridge immediately upstream of existing bridge.
Option 4	New Bridge	New bridge at Baker Street.
Option 5	New Bridge	New bridge at Kable Street.
Option 6	Bypass	New bridge parallel to Palmer Street & new bridge over South Creek.
Option 7	New Bridge	New bridge at Palmer Street via Court Street & North Street
Option 8	Bypass	New bridge at Pitt Town Bottoms.
Option 9A	Refurbishment	Refurbishment of existing bridge to provide a 2 lane crossing.
Option 9B	Refurbishment	Refurbishment of existing bridge to provide a 3 lane crossing.

The preferred course of action by RMS is replacing the bridge with construction of a new bridge structure, 35 metres downstream and removal of the existing Windsor Bridge. This preferred option was selected by RMS following community and agency consultation and detailed consideration of the project objectives. Option 1 was determined by RMS to have the best outcomes in relation to most of the project objectives including improving safety for motorists, pedestrians and cyclists; improving traffic and transport efficiency; improving the level of flood immunity; meeting long term community needs; and to be a cost effective and affordable solution.

The Department also notes that there is limited scope for extending or altering the current bridge and approach configuration (Option 9A and 9B) to achieve the desired objectives of the proposal. The cost of reconfiguring the existing bridge and approaches would be unreasonably prohibitive and would not improve the flood immunity of the existing bridge. Reconfiguring the existing bridge would also require complete closure of the bridge for an extended period during construction requiring major road detours.

The project has also been considered in accordance with regional and local strategic plans relevant to the project location, as follows:

NSW 2021

The project is consistent with *NSW 2021* as it aims to improve the safety and efficiency of an important existing road crossing which is locally and regionally significant. *NSW 2021* sets priorities and guides resource allocation for improving transport and road safety, amongst its other objectives. Specifically, the project meets the *NSW 2021* objectives by:

- Improving the efficiency of road corridors during peak times;
- Improving road safety;
- Improving the quality of urban and rural State roads; and
- The project has been allocated funding as part of the most recent five year Infrastructure Plan for investment into regional infrastructure.

Draft Metropolitan Strategy for Sydney and Draft North West Subregional Strategy

The project meets the objectives of the *draft Metropolitan Strategy for Sydney* and the *Draft North West Subregional Strategy* which translates objectives of the Metropolitan Strategy and State Plan to the local level to guide land-use planning until 2031 in the Baulkham Hills, Blacktown, Blue Mountains, Hawkesbury and Penrith local government areas. The Department considers that the project will maintain an existing locally and regionally important efficient transport network link crossing the Hawkesbury River at Windsor, and thereby will alleviate congestion and improve capacity, safety and reliability of the road network.

A strategic direction stated in the Transport section of the *Draft North West Subregional Strategy* is to maximise use of the existing road infrastructure by "encouraging contra–peak flows and promote self-containment of employment within the subregion to help reduce pressure on the

overall transport network". Although the project will replace the existing Windsor Bridge and approach roads, the scope of works also involves improvements to several existing local roads and intersections to the north and south of the Windsor Bridge. It aims to reduce pressure on the existing bridge by the construction of a larger capacity bridge in the same location that also provides for improved pedestrian and cycle transport across the bridge and into the surrounding roads. Importantly, the project aims to improve access to centres which is one of the key objectives of the Strategy.

Furthermore, the Department considers that the project satisfies the Transport section of the *Draft North West Subregional Strategy* as follows:

- Improving the operational management of existing transport networks (Action D2.4) by specifically providing "additional road capacity at pinch points which experience high levels of congestion"; and
- Improving local and regional walking and cycling networks (Action D3.1).

Draft NSW Long Term Transport Master Plan

The Department is satisfied that the project outcomes are consistent with the objectives of the *Draft NSW Long Term Transport Master Plan* (Transport for NSW, 2012) which establishes NSW transport planning for the next 20 years. Specifically, RMS has based its selection of the new bridge construction option on pricing, investment and maintenance factors which is consistent with this Plan. Furthermore, provision of a new shared pedestrian and cycleway on the new bridge is consistent with measures in the Cycling and Walking sections of this plan.

Other Plans

Furthermore, the Department is satisfied that the project is consistent with the objectives of other relevant planning strategies including:

- *Hawkesbury Residential Land Strategy (Hawkesbury City Council, 2011)* by ensuring that appropriate infrastructure is planned and provided to cater for future development, taking into account physical constraints such as flooding;
- *Plan of Management for the Windsor Foreshore Parks Incorporating the Great River Walk (Hawkesbury City Council, 2009)* which applies to a series of foreshore open spaces including Thompson Square Conservation Area and Windsor Wharf Reserve; and
- *Hawkesbury Mobility Plan 2010* which consists of a Pedestrian Access Management Plan (PAMP) and a Bike Plan for the LGA.

3. STATUTORY CONTEXT

3.1. State Significant Infrastructure

The project is State significant infrastructure being an activity that, in the opinion of the Applicant (RMS) is likely to significantly affect the environment. Under clause 14 and Schedule 3 of *State Environmental Planning Policy (State and Regional Development) 2011*, the project therefore would require an environmental impact statement (EIS) to be obtained under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Applicant is therefore seeking approval for the project under Part 5.1 of the EP&A Act and the Minister for Planning and Infrastructure is the approval authority.

3.2. Permissibility

The project is located in the Hawkesbury Local Government Area and the *Hawkesbury Local Environmental Plan 2012* (Hawkesbury LEP 2012) identifies the zones that apply to the project, and the permissibility of the project in these zones. However, as the project is a State significant infrastructure the Hawkesbury LEP 2012 does not apply to this project. In addition, as a roads authority, the Applicant is authorised to construct bridges across navigable waters, under Part 6, Division 2, Section 78 of the *Roads Act 1993* (Roads Act). The Roads Act provides that such bridges are lawful obstructions of navigable waters.

3.3. Environmental Planning Instruments

Environmental planning instruments do not apply to or in respect of State significant infrastructure, except where they apply to the declaration of infrastructure as State significant infrastructure (EP&A Act s.115ZF(2)). The project is declared to be State significant infrastructure through Clause 14 and Schedule 3 (Part 1(1)) of the *State Environmental Planning Policy (State and Regional Development) 2011*. Therefore the state environmental planning policies (SEPPs) and local environmental plans (LEPs) which may have otherwise applied, do not apply to the project. Additionally, the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) permits through clause 94(1) development for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority on any land, without consent.

3.4. Delegations

On 27 February 2013, the Minister for Planning and Infrastructure delegated his functions under section 115ZA of the EP&A Act to nominated officers of Department of Planning and Infrastructure for the determination of State Significant Infrastructure Projects where the local council does not object, a political disclosure statement has not been made in relation to the application, and less than 25 objections are received. A total of 95 submissions were received from the public, 75% of which objected to the project. As such, the terms of this delegation do not apply and the Minister for Planning and Infrastructure is the determining authority for this project.

3.5. Objects of the EP&A Act

Decisions made under the EP&A Act must have regard to the objects of the Act, as set out in Section 5 of the Act. The relevant objects are:

(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

(ii) the promotion and co-ordination of the orderly and economic use and development of land,
(iii) the protection, provision and co-ordination of communication and utility services,
(iv) the provision of land for public purposes,
(v) the provision and co-ordination of community services and facilities, and
(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and
(vii) ecologically sustainable development, and
(viii) the provision and maintenance of affordable housing, and

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and
(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

The Department considers the project is consistent with the objects of the EP&A Act. The project promotes the ongoing orderly and economic use and development of land in and surrounding Windsor, by improving the safety, reliability and capacity of the main connecting road crossing between the growing communities on both sides of the Hawkesbury River. The project would reduce commuting times required for motorists and improve access by pedestrians and cyclists in a dedicated shared pedestrian/cycleway. Furthermore, the flood risk of the road crossing would be reduced by construction of the new bridge. The project would therefore further enhance new and existing commercial and residential development in this area on a local and regional scale.

The project is also considered to promote the principals of ecologically sustainable development (see **Section 3.6** below).

3.6. Ecologically Sustainable Development

The EP&A Act adopts the definition of Ecologically Sustainable Development (ESD) found in the *Protection of the Environment Administration Act 1991*. Section 6(2) of that Act states that ESD requires the effective integration of economic and environmental considerations in decision-making processes and that ESD can be achieved through the implementation of:

(a) the precautionary principle,
(b) inter-generational equity,
(c) conservation of biological diversity and ecological integrity,
(d) improved valuation, pricing and incentive mechanisms.

The Department considers that the proposal is consistent with ESD principles. The RMS has undertaken an environmental assessment of the full range of potential impacts in accordance with the EP&A Act. Impacts are considered, on balance, to be acceptable subject to range of mitigation measures. Ten options were assessed as part of the project development process and all options were assessed against project objectives and criteria that considered their risk of environmental impacts amongst other project objectives. RMS recognises that while the preferred option did not meet some project objectives as well as other options, on balance it was considered to be the optimal outcome. This is supported by the Department's assessment.

The proposal promotes intergenerational equity by providing an ongoing and uninterrupted efficient road crossing of local and regional significance, while minimising environmental impact of the proposed construction works. The proposal would also alleviate flooding issues that have continually impacted the existing Windsor Bridge. The bridge would be constructed for a 100 year effective life.

While noting the impacts of the proposal on the long term character of Thompson Square, there are a range of benefits that have been carefully balanced against this impact and the loss of the existing bridge, including long term improvements for the local and regional traffic, including greater access in times of flood, upgraded intersections and a new bridge that meet contemporary engineering and safety standards, a more useable public domain space in the square itself, increased access to the foreshore and bridge for both pedestrians and cyclists, and potential improvements in air quality and to a lesser degree the acoustic environment.

The proposal conserves biological diversity and ecological integrity by providing improved water quality management. As part of the proposed scope of works, a permanent water quality basin would be constructed in the northern approach area to intercept and treat stormwater runoff from the bridge and northern approach roads before it enters the Hawkesbury River. Furthermore, the project would not significantly impact biodiversity or flora and fauna species that inhabit or visit the local area. No threatened species, ecologically endangered communities or key terrestrial habitats were identified by RMS within or adjacent to the project area. Environmental management measures would protect biodiversity for the duration of construction works and the proposed landscaping would assist in restoring natural local areas to the north and south of the new bridge.

The proposal provides an improved reliable and safe vehicle road crossing of sufficient capacity that complies with current road standards and also provides a cycle and pedestrian link between the communities on each side of the Hawkesbury River. The new bridge is intended to reduce congestion traffic and provide for future traffic volumes (including heavy vehicles) travelling between the two communities and provide an ongoing regional connection to destinations in western Sydney and further afield.

3.7. Statement of Compliance

In accordance with Section 75I of the EP&A Act, the Department is satisfied that the Director-General's environmental assessment requirements have been generally complied with.

4. CONSULTATION AND SUBMISSIONS

4.1. Exhibition

Under Section 75H(3) of the EP&A Act, the Director-General is required to make the EIS of an application publicly available for at least 30 days. After accepting the EIS, the Department publicly exhibited it from 14 November 2012 until 17 December 2012 (34 days) on the Department's website; at the Department's Information Centre, Bridge Street, Sydney; Hawkesbury City Council chambers; RMS Head Office, North Sydney; the Deerubbin Centre (Windsor Central Library); and Nature Conservation Council of NSW, Newtown. The Department also notified relevant State and local government authorities in writing and advertised the public exhibition in the Sydney Morning Herald, The Daily Telegraph, the Hawkesbury Courier and Hawkesbury Gazette.

The Department received 100 submissions on the proposal, comprising 6 from public authorities and 94 from the general public. Of the 94 public submissions, 70 (74.5%) objected to the project, 19 (20.2%) supported the project and 5 (5.3%) did not object but raised concerns. A summary of the issues raised in submissions is provided below.

4.2. Public Authority Submissions

Six submissions were received from public authorities. A summary of key issues raised is provided below:

The **EPA** does not express a view of the project and states that the Minister's Conditions of Approval should include requirements for a detailed construction noise and vibration management plan and a soil and water management plan.

The **Heritage Council of NSW** unequivocally objects to the project on the grounds of long term irrevocable and serious negative impacts on the Thompson Square Conservation Area and the heritage of Windsor. This submission supports rehabilitation of the existing bridge and construction of a bypass. Detailed recommended Conditions of Approval were provided for the project, should it proceed.

Hawkesbury City Council supports the project but requested further information on the urban design of the new bridge and open space in the Thompson Square Conservation Area.

Department of Primary Industries (DPI)

- **Fisheries NSW** stated that the EIS adequately addresses potential impacts but requested further consultation on scour protection when detailed design is available.
- **NSW Crown Land** raised the issue of outstanding Aboriginal Land Claims on Crown Land acquired for the project.
- **Agriculture NSW** identified that excess land on the northern bank would still be suitable for agricultural/horticultural use and these uses should be considered rather than making the land public open space.
- **NSW Office of Water** requested that additional consideration be given to riparian vegetation rehabilitation on the northern bank.

Office of Environment and Heritage (OEH) (Aboriginal Cultural Heritage) recognised that the site may contain superior archaeological deposits and recommended salvage if disturbance cannot be avoided.

OEH (Flooding) stated that the flooding assessment undertaken for the EIS is comprehensive, but further work and consultation is required to determine and mitigate the potential flooding impacts of the new bridge.

4.3. Public Submissions

A total of 94 submissions were received from the public during the exhibition period. The public submissions included submissions from the following special interest groups:

- Engineering Heritage Committee of Sydney Division, Engineers Australia;
- Royal Australian Historical Society;
- Community Action for Windsor Bridge (CAWB);
- Cronulla Dunes and Wetlands Protection Alliance; and
- Hawkesbury Branch of the National Trust of Australia (NSW).

Of the 94 public submissions, 70 (74.5%) objected to the project, 19 (20.2%) supported the project and 5 (5.3%) did not object but raised concerns. The key issues raised in public submissions are listed in **Table 4**.

Table 4: Summary of Issues Raised in Public Submissions

Issue	Proportion of submissions (%)
Heritage impacts on Thompson Square Conservation Area	55.3
Windsor should be bypassed	52.1
Minimal or no improvement to traffic congestion in Windsor	35.1
Inadequacy of consultation	16.0
Minimal improvement to flood immunity above Windsor Bridge	14.9
Inadequacy of assessment of structural integrity of Windsor Bridge.	14.9
Heritage impact of removal of Windsor Bridge	13.8
Proposal is not cost effective	13.8
Negative impacts on the amenity of Thompson Square Conservation Area	12.8
Construction and operation impacts on heritage buildings in Thompson Square Conservation Area	10.6
Visual impacts of the new bridge and proposed road alignment	10.6

Positive effects of the proposal raised in public submissions that support the project included the greater flood immunity of the proposed bridge, improved road safety (primarily attributed to increased lane width on the proposed bridge and consequent separation between oncoming traffic), increased traffic flow through Windsor (partly owing to elimination of the current George St/Arndell St/Court St road arrangement), enhanced urban design in the Thompson Square precinct, and improved pedestrian and cyclist connections across the Hawkesbury River and to its shore.

The Department notes that three further submissions were received outside the exhibition period. These generally corresponded with the issues raised in Table 4. The Department has considered the issues raised in submissions in its assessment of the project.

4.4. Applicant's Response to Submissions

The Applicant provided a Response to Submissions and Preferred Infrastructure Report (RtS/PIR) which is included in **Appendix C**. The RtS/PIR included a response to the issues raised in submissions from the general public and public authorities and included the following amendments:

- Increasing the clearance of the new bridge over The Terrace from a minimum of 3.6 metres to a maximum of 4.6 metres to allow large coaches direct access to Windsor Wharf;
- Change in bridge type from a double box girder bridge to a double T bridge with similar features but a shallower superstructure;

- Changes to three pier locations in the Hawkesbury River to accommodate the different bridge type; and
- Provision of additional noise mitigation measures to eight additional heritage properties.

The RtS/PIR also provides minor revisions to the table of Environmental Management Measures.

The Department forwarded a copy of the RtS to Hawkesbury City Council, the Office of Environment and Heritage (OEH) (including the Heritage Branch), the Environment Protection Authority (EPA) the Department of Primary Industries (DPI) (including the NSW Office of Water (NOW)), Transport for NSW and RMS (Maritime) for comment. The documents were also placed on the department's website. A summary of Council and agency comments on the RtS is provided below.

The **Heritage Council of NSW** maintains its objections to the project.

Hawkesbury City Council has provided draft recommended conditions of approval.

Department of Primary Industries (DPI) Fisheries NSW states the PIR accurately acknowledges the need for ongoing consultation for scour protection.

DPI Crown Land reiterated the issue of outstanding Aboriginal Land Claims on Crown Land.

DPI Agriculture NSW has no further issues

DPI NSW Office of Water notes previous advice in relation to riparian vegetation rehabilitation on the riverbanks and that some comments have been recognised in the PIR. The bridge should be designed to encourage riparian vegetation and connectivity, particularly due to the bridge being raised on the southern bank. The PIR does not address the 40m requirement for a riparian corridor.

Office of Environment and Heritage (OEH) (Aboriginal Cultural Heritage) no further comment.

OEH (Flooding) stated that the flooding issues have been resolved.

5. ASSESSMENT

The Department considers the key environmental issues for the project to be:

- Traffic;
- Visual amenity, urban design and landscape;
- Heritage, including Windsor Bridge and Thompson Square Conservation Area; and
- Noise and vibration.

5.1. Traffic

The existing Windsor Bridge is a main vehicle, cyclist and pedestrian crossing point of the Hawkesbury River. It currently provides an important link for major traffic routes through Windsor, between Wilberforce, Richmond, South Windsor and Penrith.

The capacity of the existing Windsor Bridge and its approach roads and intersections to accommodate current and predicted future traffic volumes was one of the main design drivers for the project. Traffic levels, in addition to concern regarding the current condition of the existing bridge and required repair and maintenance work, was a key project justification and also an important consideration in the development of the ten project options and in the selection of Option 1, during the project development phase. The Department concurs with the view that traffic is a key issue for consideration based on its assessment of the project.

The traffic impact assessment conducted in the EIS was based on traffic profiles and count data dated 2005 to 2012. Current intersection performance was assessed using intersection modelling software and a crash analysis was also undertaken. Traffic forecasts from 2016 (commencement of new bridge operation) to 2026 were conducted based on the 2011 and 2012 traffic count data with applied growth rates derived from the Sydney Strategic Travel Model (SSTM), a world-recognised tool for projecting future growth and travel patterns in major NSW cities.

The traffic impact assessment, including construction and operational traffic impacts, covered the main traffic roads, from Bridge Street at Macquarie Street in the south to Wilberforce Road on the northern side of the Hawkesbury River. Each road was classified in a hierarchy according to its position in the overall road network and its traffic carrying capacity. The main traffic routes investigated in the EIS are shown in **Figure 4**.

The key findings in the EIS are as follows:

- Bridge Street traffic flow peaks at 8am in a southerly direction towards Sydney and at 5pm in a northerly direction;
- the intersection analysis indicated that the Bridge/George Street intersection is operating well, however both the Bridge Street/Macquarie Street intersection and the Wilberforce Road/Freeman's Reach Road intersection are beyond their maximum capacities resulting in unsatisfactory delays in peak periods;
- crash analysis indicated the majority of incidents occur at Wilberforce Road near Freeman's Reach Road as vehicles approach from adjacent roads. 16 crashes were recorded in a five-year period to 2009;
- public transport buses crossing the existing Windsor Bridge are limited to one route (Westbus Route 668) and daily school bus routes; and
- pedestrian and cycle paths were also studied in the traffic impact assessment and determined to be lacking, specifically a provision of a safe pedestrian crossing point at the Bridge Street/George Street intersection and at the northern bank for pedestrians at Macquarie Park. The existing Windsor Bridge contains one narrow shared pedestrian/cycle path on its eastern side.

Figure 4: Key traffic routes

Operational traffic impacts of the project in terms of future traffic volumes using the new approach roads and new bridge were assessed within the EIS. Growth rates to 2026 indicated that approximately 24,000 vehicles per day would use the new bridge, compared to the current 19,000 vehicles per day. The project itself is not predicted to generate additional traffic or change patterns as it is the replacement of an existing section of road. The new bridge design initially comprises one lane in each direction with the capacity to add an additional lane. **Table 5** provides the new bridge design components (also refer to **Table 1** in this report for additional bridge design details):

Table 5: New bridge design components

Bridge width	• 15.2m
Lane configuration (opening)	• 2 traffic lanes, one per direction: 3.5m each • shoulders: 2m • shared pedestrian/cycle path: 3m
Lane configuration (longer term)	• 3 traffic lanes, one per direction: 3.5m each • Shoulders: 0.5m • shared pedestrian/cycle path: 3m

Further operational impacts based on intersection modelling indicate an improvement in intersection performance as a result of the project. The approach roads and road realignment aspects of the project have been designed to achieve this goal and reduce queuing while improving the efficiency of traffic movements across the project area. Furthermore, the project would provide increased traffic capacity on a regional scale.

An independent traffic review was undertaken for the Department as part of the assessment. The review questioned whether 'traffic design to 2021 predicted traffic volumes' was appropriate noting that the project's capacity will always be constrained by the intersection capacity on adjacent roads. The RMS agreed with the view that there remains the need to undertake considerable work on adjacent intersections to alleviate traffic congestion in the Windsor area. Whilst it is acknowledged that the proposal will ease traffic congestion at Windor Bridge and its approaches, this proposal will not be the only solution required to address traffic congestion through Windsor. This will require a suite of measures to be implemented in addition to the replacement bridge project.

According to the Applicant's Submissions Report, submissions received regarding traffic issues included the following:

- 16 public submissions raised issues regarding through traffic and heavy vehicles;
- 8 public submissions and one agency submission (Heritage Council of NSW) raised concern about growth in traffic numbers;
- 5 submissions raised concern about specific right turn arrangements and traffic safety in local roads on the southern bank;
- 9 submissions raised issues of the performance of the Macquarie Street intersection and northern bank intersection of Wilberforce Road and Freemans Reach Road;
- 2 submissions raised issues of traffic speed limits
- 1 submission raised concern regarding the upgrade of the McGraths Hill section of Windsor Road;
- 3 submissions raised concern regarding construction traffic impacts
- 3 submissions raised concern regarding impacts to property access
- 3 submissions and one agency submission (Hawkesbury City Council) raised concern regarding coach access to Windsor Wharf.

The Applicant responded to these issues by emphasising the primary aim of the project is to maintain a safe and reliable crossing of the Hawkesbury River at Windsor. According to the

Submissions Report, the design of the project has carefully evaluated and considered traffic volumes increasing over a 10 year project planning period based on traffic modelling results, heavy vehicle contributions, traffic speed limits and improvements to intersections and round-about performance and safety. The Submissions Report included analysis of specific intersections and right turn arrangements to address the concerns that were raised in the submissions. These are shown in **Figure 4** including:

- Right turn from Bridge Street into George Street west;
- Right turn from Bridge Street into Court Street;
- Performance of the Macquarie street intersection; and
- Performance of the Freemans Reach Road/ Wilberforce Road intersection.

Construction traffic impacts are considered by the Applicant to be typical of any road construction project of this scale. Of note, as the new bridge and the majority of new roads involved in the project are off-line from the existing road network, their construction and upgrade would not result in substantial road closures. The existing Windsor Bridge would be removed after the new bridge is fully operational. Construction traffic impacts would mainly be related to the delivery of materials and earthworks which would be undertaken in accordance with environmental management measures. Furthermore, the increase in traffic movements from construction vehicles would be relatively small compared to the average daily traffic movements in the project area.

According to the EIS, during construction of the project, traffic impacts resulting from heavy construction vehicles accessing the site from existing roads would not be significant. At the peak of construction, the EIS reports an expected workforce of 110 construction personnel generating 220 additional traffic movements per day travelling to and from the site. Given the average traffic volume of 19,000 vehicles per day, this represents an increase of approximately 1%. Therefore the EIS concludes this impact to be negligible. The Department concurs with this finding.

Other potential traffic impacts during construction of the project include:

- truck movements for removal of the existing bridge: the EIS states that a peak of 12 truck movements per day would be required over a six month period which is less then 0.1 per cent of daily traffic movements and therefore negligible;
- access to properties would be maintained throughout construction of the project. Temporary interruptions to access may occur at two properties located in Old Bridge Street and would be managed through the Traffic Management Plan;
- no major impacts to access to the Windsor town centre during construction of the project are predicted. This would be managed by construction work at the Bridge Street/George Street intersection being conducted during low traffic periods and managed through the Traffic Management Plan;
- no impact to bus operations or emergency vehicles as no road closures will be required;
- parking of construction personnel vehicle would be provided within the work compounds and would need to be addressed in the Traffic Management Plan; and
- temporary exclusion zones for maritime activities would be required around the water-based construction sites. However passage up and downstream of the construction sites would be maintained.

Access to the Thompson Square parkland areas would be impacted during the construction works, including access to some recreational facilities. The lower parklands would be closed to public access for the duration of the construction works, as would a portion of the upper parklands for a period of two months of construction. Likewise, the EIS states that public vehicle access to Windsor Wharf, including Windsor Wharf car park and The Terrace would be impacted by construction of the project. However once the project is operational, full access to these areas would be restored within 12 months.

5.1.1 Department's Consideration

The Department has carefully considered the traffic performance of the proposed bridge and reconfigured intersections compared to the existing situation.

The department notes that the project has been designed to deliver improvements:

- in traffic capacity for the local and regional road network;
- in intersection performance; and
- to meet contemporary road engineering and safety design guidelines.

The Department considers that the new bridge and reconfigured intersections will improve traffic capacity for the local and regional traffic network. The Department notes that the higher capacity bridge also has the the potential to be upgraded to provide additional capacity in the future. The proposed bridge has sufficient width to be configured for 3 lanes whereas the existing bridge is limited to 2 lanes only. The third lane is expected to be required by 2026 based on traffic modelling conducted for the EIS and would provide an additional southbound lane.

The project also includes reconfiguring intersections north and south of the bridge which are also predicted to deliver improvements in traffic performance and safety. The replacement of the current T-intersection with a roundabout at Wilberforce Road, Freemans Reach Road and Macquarie Park access road at the northern approach will improve the Level of Service (LoS) of the intersection. The current intersection is reported in the EIS to have an unacceptable peak AM and peak PM LoS.

Modelling of predicted traffic growth rates for the Bridge Street/George Street intersection shows an unacceptable Level of Service (below C) would occur by the year 2016 during the PM peak period with long delays and unacceptable queues. The intersection performance would be considerably improved by the proposed upgrade works (replacement of the roundabout with traffic lights) which are expected to reduce queuing and crash incidents at this location. The Department therefore considers that the higher capacity bridge and reconfigured intersections would improve traffic performance now and into the future.

The new bridge will also improve safety for road users meeting contemporary road engineering and safety design guidelines. The existing bridge and approach roads do not meet current engineering and safety standards. Heavy vehicle use in particular is currently compromised due to the narrow width of the bridge deck and an imposed speed limit of 40 kilometres per hour. In addition the approach roads (being the George and Bridge Street intersection and Freeman's Reach Road and Wilberforce Road intersection) currently do not comply with safety design standards for sight distance for vehicles and the new alignment is designed to improve sight distances and reduce likelihood of crash incidents.

Furthermore, the Department considers improvements to pedestrian and cycle facilities, namely continuous access to the wharf and southern foreshore area under the new bridge, a 3 metre wide shared pedestrian/cycle path on the new bridge and improvements to pedestrian crossing on the approach roads will encourage sustainable transport of this nature in the project area. The Department therefore considers the project beneficial in this respect.

The Department accepts that local and sub-arterial roads surrounding the site are approaching or above desired maximum capacity. Prior to submitting the EIS, RMS identified 11 options for reconfiguring the local traffic network, including options to bypass the Windsor town centre. However, the Department understands that the option selected satisfied the majority of project objectives, an important one of which is satisfying future traffic demands in the local road network and on a regional scale.

The Department considers that traffic impacts during construction would be minor, and any residual impacts can be adequately managed through the adoption and adherence to contemporary management measures. Furthermore, the Department considers any disruption to traffic could be managed by scheduling construction traffic movement outside of peak traffic periods. Management measures, such as identification of construction traffic routes, temporary access arrangements to construction sites and compounds, designated parking areas for construction workers, traffic control schemes, and a construction traffic incident response plan would be provided in the Traffic Management Sub-Plan, as part of the Construction Environmental Management Plan, which forms part of the conditions of project approval.

The Department acknowledges that the new road alignment would impact on access to three properties on Old Bridge Street on the northern side of Thompson Square. Management measures proposed to address this are considered appropriate and would be implemented in consultation with the property owners.

A Traffic Management Sub-Plan would also be required to be prepared by the Applicant for approval by the Director General prior to the commencement of construction, as recommended in the conditions of the project approval.

Overall, the Department is satisfied that the replacement bridge and reconfigured intersections will result in immediate and long term traffic benefits including reducing congestion, improving capacity, safety and the reliability of the road network.

5.2. Visual Amenity, Urban Design and Landscape

The visual amenity, urban design and landscape assessment conducted for the EIS comprised visual and landscape sensitivity analyses of the study area, based on the magnitude of the physical change that would result from construction of the project and the sensitivity of viewpoints to absorb the change. Four visual catchment zones within a defined visual envelope map (VEM) across the project area were investigated for the EIS. A number of key representative viewpoints were identified within each visual catchment zone, based on consideration of land use. A total of 18 viewpoints were analysed. The visual impact assessment also considered overshadowing. For the landscape impact assessment, three Landscape Character Zones (LCZ) were defined based on the key landscape features that are present in the project area. Each LCZ was assessed for its existing and future built form and heritage, connectivity and access, public domain and key activity areas. An impact assessment of existing and future traffic movements, parklands, street trees and key buildings and structures within each LCZ was conducted. The LCZs were defined as follows:

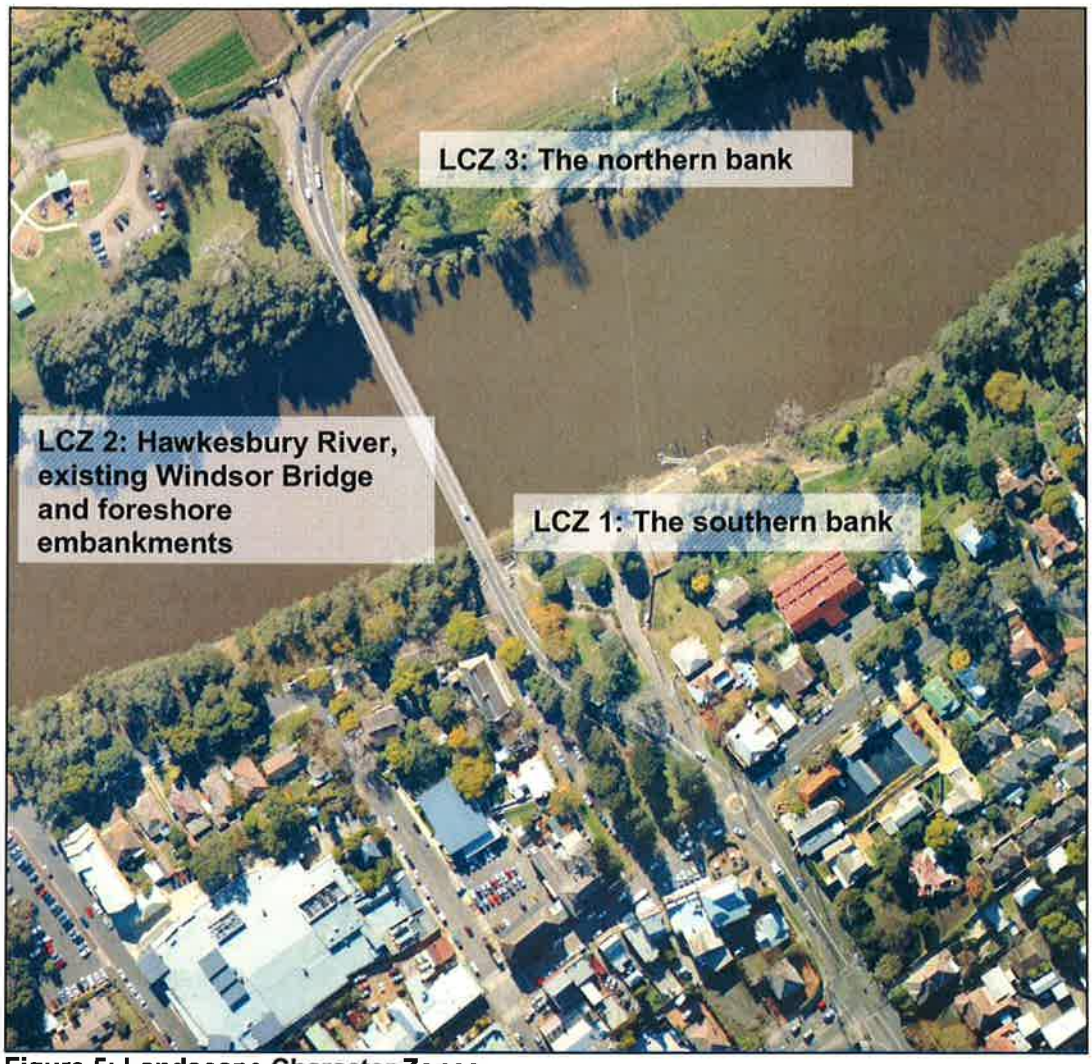

Figure 5: Landscape Character Zones

- LCZ 1: The southern area including Thompson Square Conservation Area and the surrounding roads (George Street, Bridge Street, Old Bridge Street and The Terrace).
- LCZ 2: Hawkesbury River, existing Windsor Bridge and northern and southern foreshore embankments; and
- LCZ 3: The northern bank, Wilberforce and Freeman's Reach Roads and the entry into Macquarie Park.

The visual amenity, urban design and landscape assessment approach was conducted in accordance with relevant RMS guidelines, including *Environmental Impact Assessment Guidance Note: Guidelines for Landscape Character and Visual Impact Assessment (RTA, 2008b)*. The assessment also involved consultation with Hawkesbury City Council and the local community.

The existing visual and landscape character of the project area as reported in the EIS, is strongly defined by its European heritage due to the historical precinct of Thompson Square Conservation Area on the southern bank and the well-preserved buildings it contains (refer to **Section 5.3**). The project area is also strongly defined by its Hawkesbury River foreshore setting. The southern bank is characterised by recreational activities and maritime activities associated with Windsor Wharf. At this location access to the river foreshore is provided via The Terrace. The northern bank is a rural landscape setting, characterised by turf farms and similar rural land uses. At the northern foreshore, direct access to the river is provided through Macquarie Park at a large sandy beach. The EIS reports that the river foreshore is

heavily vegetated on both sides of the Hawkesbury River but degraded by weed invasion and erosion.

Construction impacts would include temporary visual impacts due to construction sites and compounds, and the temporary closure of the Thompson Square parkland area. In addition, temporary piers and pontoons would be used and land remediation works may be required for construction of the new bridge piers, causing temporary visual impacts to the Hawkesbury River setting.

Operational visual and landscape impacts would result from the final form of the project and traffic using the new bridge and approach roads. The EIS concluded that permanent visual impacts of the whole project would arise due to the appearance of the new bridge, absence of the demolished bridge, and new views of approach roads and intersections. Replacement of the existing bridge and upgrade of existing road infrastructure would have a substantial impact on all LCZs in the study area due to the high sensitivity of the landscape and the relative scale of the works in comparison to existing bridge and road infrastructure. The replacement bridge would be of a larger scale than the existing bridge and would sit higher in the landscape.

The project would result in the reunification of the two components of Thompson Square. While this would change its existing visual character, it would improve the visual landscape of the parklands by creating an adjoined parkland area. In addition, visual and other amenity impacts would arise from changed local traffic routes using the project. Relocating the southern approach road would relocate local traffic along this route to the side of the parklands. This is discussed further below. Landscaping and urban design features would be provided as part of the project to minimise permanent visual impacts. The results of the landscape impact assessment are provided in **Table 6**.

Table 6: Landscape Impact Assessment

Landscape Character Zone (LCZ)	Sensitivity	Magnitude	Landscape character impact
LCZ1 – Thompson Square	High	High to Moderate	High
LCZ2 – Hawkesbury River and banks	High	High to Moderate	High
LCZ3 – Wilberforce and Freemans Reach roads intersection	High to Moderate	Moderate	High to Moderate

A key feature of the southern bank landscape, as defined by LCZ 1, is the existing Bridge Street that cuts diagonally through the Thompson Square parklands and The Terrace preventing continuous views and access to the foreshore. An important design feature of the project is the removal of this diagonally orientated street and replacement with a straight approach road to the new bridge. This is illustrated in **Figures 6 and 7**.

Figure 6: Existing road configuration in Thompson Square

Figure 7: Future new road configuration in Thompson Square

The landscape character of the Thompson Square parklands would be changed in the long term. Benefits of this change are reported in the EIS to include:

- connection of the upper and lower parklands which would consolidate open space within Thompson Square, improve visual amenity and promote recreational use of the parklands;
- connection of The Terrace along the river foreshore; and
- improvements to pedestrian and cycle access between Thompson Square Conservation Area and the river foreshore.

The strong presence of the Hawkesbury River foreshore setting within the project area is due in part to the low level of the existing Windsor Bridge which sits in the landscape, as opposed to rising above or cutting through it. This is an important factor: The existing bridge deck was originally built with a low deck level in 1874 and subsequently raised slightly to 7 metres in

1934. This visually integrates the bridge into the river setting. While the southern approach road to the existing bridge runs through the Windsor township and Thompson Square descending steeply from the ridge to the river, the northern approach is less visually distinct being almost level with the bridge. The new bridge deck height of 9.8 metres Australian Height Datum (AHD) is higher than the existing bridge deck height to provide greater access to the bridge during flood events. This results in the new bridge having a greater visual prominence in the river and foreshore setting. To offset this change, the new bridge has been designed in a manner that minimises its overall visual presence when viewed from Thompson Square and generally in the project setting. Such design features include shape and form features as well as the choice of construction materials. The specific bridge design features to minimise its visual impact include:

- a horizontal alignment that mirrors the horizontal plane of the water below;
- locating the required traffic barriers between the traffic lane and the shared pedestrian/cycle path to allow the balustrade on the edge of the bridge to be finer and less visible;
- design of the deck soffit to give the underside of the bridge a modelled, rather than a flat profile to improve the appearance of the bridge when viewed from below;
- design of the piers with a curved shape at all four corners to reduce the heavy appearance of the bridge piers and prevent the formation of strong linear shadows. This also allows the piers to be narrower in profile on the outside edges of the bridge, making them less imposing from distant viewpoints;
- wide spacing of the piers to give the new bridge an open quality when viewed from key locations around the project area;
- locating the piers away from the riverbank to reduce the risk of vandalism and graffiti;
- design of the abutment walls with a curved profile to match the bridge piers, and textured with relief features (such as ridges) to disrupt the plain surface and make them less susceptible to graffiti; and
- use of light coloured concrete for the overall new bridge construction.

Construction of the new bridge would also require scour protection to be installed along the southern foreshore and around the bridge piers and removal of vegetation on the southern bank.

The new bridge location is 35 metres downstream of the existing bridge. Overall the new bridge is designed to be approximately 3 metres higher and 9 metres wider than the existing bridge. Views of the existing and new bridges, as predicted in the EIS, are provided in **Figures 8 and 9.**

Information provided in the EIS indicates that the overall visual impacts at the northern bank of the new bridge (defined as LCZ 3) would be dominated by the presence of a new dual lane roundabout at the intersection of Wilberforce Road, Freeman's Reach Road, the northern bridge approach road and the access road to Macquarie Park. The scale of this roundabout would be substantial in the existing rural setting. In addition, the project includes construction of a permanent water quality basin. New tree planting would be conducted in the area surrounding the works to reduce the visual impact of the works. As indicated in the table above, the overall landscape impact on LCZ 3 would be moderate to high.

Figure 8: View of the existing Windsor Bridge from Doctor's House, Windsor (Source: RMS 2012)

Figure 9: Artistic impression of views of the new bridge from Doctor's House, Windsor (Source: RMS 2012)

The visual impact assessment comprising 18 identified viewpoints that were assessed as part of the EIS indicated five viewpoints are likely to experience a high visual impact. These areas are as follows:

- Viewpoint 7 – Thompson Square looking north;
- Viewpoint 8 – Old Bridge Street, at the entrance to number six, looking north west;
- Viewpoint 9 – Thompson Square, adjacent to the Doctor's House, looking north;
- Viewpoint 11 – Small carpark near the intersection of Old Bridge Street and The Terrace, looking north west; and
- Viewpoint 12 – Windsor Wharf, looking south west.

These five viewpoints are generally located in open space areas, either close to the Hawkesbury River or within Thompson Square, where the sensitivity to visual change is high and existing views would be impacted by the replacement bridge.

A significant project design change provided in the Applicant's Submission Report involved raising the southern approach road height by 1 metre from 3.6 metres to 4.6 metres to increase the clearance of the new bridge over The Terrace to allow large coaches to directly access Windsor Wharf. This was the result of consultation with Hawkesbury City Council and is considered important for the viability of the Hawkesbury Paddle Wheeler business that operates from Windsor Wharf. The southern end of the bridge would be increased by 1 metre which would require a higher 45 metre long section of the southern approach road through Thompson Square between No. 4 Bridge Street and the southern abutment. The grade of the bridge would also increase slightly. A visual impact assessment of this design change was conducted in the Submissions Report and determined that eight of the 18 viewpoints would be impacted by this change, six to a high degree and two to a moderately-high degree. This is further discussed in the 'Department's Consideration below.

A total of 12 public submissions and one agency submission (Hawkesbury City Council) raised issues regarding the visual amenity, urban design and landscape issues for the project including tree removal, landscape treatments, the presence of modern approach roads and new bridge in the historical setting of the Windsor township and the final form of Thompson Square Conservation Area. The Applicant's Submissions Report responded by explaining that mature trees in the upper part of the parkland would be retained and protected while overall landscaping design and tree planting in the lower part of the parkland would designed and implemented to complement the overall visual character of the parkland area. The new bridge design includes contemporary features which aim to reduce its overall visual presence in its river setting, such as fewer piers and graffiti-resistant surfaces. Furthermore, the final form of Thompson Square Conservation Area would be the subject of final urban design plans and would consider the current uses and character of the area, in consultation with the Heritage Office and Hawkesbury City Council.

5.2.1 Department's Consideration

The Department acknowledges that the construction impacts to the existing visual and landscape setting would be characteristic of any major road works and would be temporary in nature. The project is expected to take 20 months to complete and is expected to occur in one continuous period. During this time, parkland closures within Thompson Square and limited pedestrian access to the southern foreshore and The Terrace would be required. However, based on the construction design, no road closures are anticipated. The Department understands that visual impacts associated with construction would be minimised by the implementation of management measures such as fencing, signage, pedestrian diversions, post-construction rehabilitation of all work sites and compounds, and landscaping and would be detailed in a Visual, Urban Design and Landscape Plan that is required to be prepared under the conditions of this project approval.

The Department has considered the operational and permanent design features of the project within the existing visual and landscape setting. The key changes imposed by the project are considered to be acceptable as follows:

- The deck height of the new bridge is substantially higher than the existing bridge. The new bridge would have greater visual presence, compared to the existing low lying bridge. However the bridge has been designed taking into account its visual prominence incorporating specific bridge design components to minimise its visual presence. The Department concurs that these design features are acceptable and consistent with contemporary standards and practises. Furthermore, it is well documented that the existing bridge lies in a flood prone area and has been subject to historical flooding since its initial construction. This is attributable to its low deck height. Balancing flooding with visual impact is an important consideration in designing the deck height of the new bridge. A higher deck height of 9.8m Australian Height Datum (AHD) has balanced the benefit of eliminating flooding issues with a more visible bridge;
- The relocation of the southern approach road from its existing diagonal orientation across Thompson Square to the eastern edge of Thompson Square will provide greater activation and a more useable public domain by consolidating the parkland area and provide continuous access to the southern foreshore bank via The Terrace. The Department recognised that while changing the character of the local southern bank setting joining the Thompson Square parkland, the project would provide beneficial outcomes for recreational users of the parkland and improve its overall visual setting; and
- Ancillary items required for operation of the new roadway including retaining walls, scour protection, traffic safety barriers, street lighting, street furniture, construction of a new water quality basin on the northern bank of the new bridge and plantings are acceptable. The Department is satisfied that the proposed ancillary items can be finalised at the detailed design stage and that they will further minimise the overall visual and landscape impact of the project.

The Department has also considered the additional visual impacts associated with raising the bridge and southern approach by 1 metre over The Terrace, which was detailed in the Applicant's Response to Submissions.

No photos of the raised bridge were provided in the Applicant's Submissions Report, however visual impact assessment ratings are provided at eight viewpoints. The assessment indicates that the view impact is 'high' at six of the viewpoints and 'moderate to high' at the two remaining viewpoints. The additional visual impacts due to the proposed 1 metre increase were considered by the Department at the eight viewpoints. Increases in the visual impact due to a higher southern approach road, more prominent raised bridge abutments and foreground views within the project area are rated as high. On balance, the Department considers the additional adverse visual impact outweighs the benefits of access improvements for coaches. Therefore this design change does not form part of the project consent.

Furthermore, terracing that was proposed as part of the landscaping work of the project is considered to potentially result in a negative visual impact and change in landscape character within the project area. Therefore, terracing is not supported by the Department. Pre-construction conditions include the need for the Applicant to prepare an Urban Design and Landscape Plan in consultation with the NSW Heritage Council and Council, for the Director-General's approval prior to the commencement of construction. This is required to include all landscaping and urban design works for the project, including lighting, footpaths, seating and other street furniture, justification for selection of specific plants and materials and maintenance regimes for the project area in the long term. The Department is satisfied with this approach.

5.3. Heritage

The proposed Windsor Bridge Replacement Project involves construction on the northern and southern banks of the Hawkesbury River at Windsor; an area recognised as an historical centre of early British settlement in NSW and prior to that, an area associated with Aboriginal activity. Based on the heritage assessment conducted for the project, the Department has identified heritage (both non-Aboriginal and Aboriginal) as a key issue. In particular, the Department considers that the proposed construction works within Thompson Square Conservation Area for the new southern approach road and demolition of the existing Windsor Bridge would change the existing heritage value and character of these areas.

The Applicant's EIS acknowledges that the project would have 'significant residual adverse impacts on historical heritage, as well as adverse impacts on Aboriginal heritage' and submissions received from the Heritage Council of NSW expand upon this view, by stating its unequivocal objection to the project on the grounds of long term irrevocable and serious negative impacts on the Thompson Square Conservation Area and the heritage of Windsor.

The Department's assessment of heritage impacts of the project has taken into consideration the following information:

- EIS, RMS, November 2012;
- Submissions Report incorporating Preferred Infrastructure Report, RMS, April 2013;
- Submissions received during the exhibition period; and
- Independent Heritage Review as commissioned by the Department of Planning and Infrastructure, Casey and Lowe, June 2013.

5.3.1 Non-Aboriginal Heritage

There are a total of 21 State Heritage Register items and one locally listed item within the vicinity of the project area. This includes the Thompson Square Conservation Area which contains individually listed items. Furthermore, the existing Windsor Bridge is listed on the s.170 Register of the *Heritage Act 1977* and is also a Local Heritage Item.

The Thompson Square Conservation Area, located south of the existing Windsor Bridge, is widely documented as being one of the oldest public squares in Australia and it is listed on the State Heritage Register. The Independent Heritage Review identified multiple aspects of the Square that contribute to its overall heritage value, being its setting, connection to the river, open spaces, historic plantings and structures including its roadways, fences, monuments and buildings. The buildings located around the Square were constructed between 1815 and 1880 in the Colonial Georgian style and provide examples of the early colonial character of Windsor. The Thompson Square Conservation Area is currently a residential and commercial precinct and contains Bridge Street, being the southern current approach road to the existing Windsor Bridge.

An overall view of Thompson Square Conservation Area is provided in **Figure 10**. RMS has provided a separate map of Thompson Square Conservation Area to the Department as its Strategic Conservation Management Plan study area, which is shown in **Figure 11**. This map extends further to the south-east of George Street and includes specific sections along the south-western border. Examples of some existing buildings in the Thompson Square Conservation Area are shown in **Figure 12**.

Figure 10: Thompson Square Conservation Area (Source: Google images)

Figure 11: Strategic Conservation Management Plan study area (Source: RMS 2013)

Figure 12: Typical buildings in Thompson Square Conservation Area (Source: Heritage Council of NSW website).

In addition to the Thompson Square Conservation Area, other areas of heritage significance dating to the time of early settlement, within the project footprint include:

- former Windsor Wharf area at the southern bank of the Hawkesbury River, first constructed in 1795, The Terrace, located immediately west of the existing Windsor Bridge and the site of the Government Wharf dated to 1815. According to the 2008 survey and subsequent desktop studies, the wharf site is considered to have high maritime archaeological potential. Remains that have been identified and reported in the EIS include remnant timber beans, structural remains associated with the 1815 wharf and rock ballast;
- northern river bank and turf farm, located east of the existing Windsor Bridge, including the location of a punt landing site dated to 1835;
- above water and underwater maritime archaeological resources associated with construction of the Windsor Bridge, including retaining walls and anchors; and
- the existing Windsor Bridge

These areas are shown in **Figure 13**.

Figure 13: Key heritage features

Windsor Bridge was constructed in 1874 by the Public Works Department as the first crossing over the Hawkesbury River at this location, replacing a punt service. Since its initial construction, additional work has been undertaken on the bridge, including raising its level by 2.5 metres in 1897, likely to be a flood avoidance measure, the hardwood superstructure was replaced with reinforced concrete in 1922, and a new approach road was constructed in 1934 to meet traffic demands at that time. Some sections, including the caisson deck supports are original and over 130 years old. Windsor Bridge is the oldest existing bridge crossing the Hawkesbury River. The Department recognises the historical importance of Windsor Bridge, as evidenced by its individual listing on the Hawkesbury LEP and on the RMS s170 Register of the Heritage Act 1977. The existing Windsor Bridge is shown in **Figure 14.**

Figure 14: Existing Windsor Bridge (Source: Google images)

The existing Windsor Bridge would be demolished as part of the project. As detailed above, the existing bridge has been assessed to be of State significance and is listed as a heritage item on the RMS Heritage Register and the Hawkesbury LEP. The current use of the bridge contributes to its significance as it continues to function as it was originally intended. Notwithstanding modification to the bridge superstructure in 1922 by the removal of the timber deck and replacement with concrete girders, cross girders and deck, the original form of the bridge has been retained. Furthermore, it is noted that the 1922 refurbishment was an early use of mass concrete and the construction methods where one lane was kept open, were unusual.

According to the information sources, the construction of the project would have the following impacts upon non-Aboriginal heritage:

- Disturbance and destruction of archaeological evidence from the early settlement period related to 18th and 19th century buildings and road alignments;
- Potential damage to heritage items and buildings due to construction vibration;
- Potential direct and indirect damage to land and maritime archaeological items;
- Impact to Thompson Square Conservation Area by the removal of the existing approach road to the existing bridge;
- Temporary closure of Thompson Square parkland areas; and
- Demolition of the existing Windsor Bridge.

Further detail of impacts to specific heritage sites is provided in **Table 7**.

There is a marked difference in the existing non-Aboriginal heritage value of the northern and the southern sides of the Hawkesbury River at the project location. The northern side is characterised by past flooding events and development, whereas the southern side has a higher existing non-Aboriginal heritage value. Predicted heritage impacts resulting from construction of the project on the northern and southern side are different and the conditions of approval reflect this difference.

Table 7: Summary of Non-Aboriginal Heritage Sites (Source RMS 2012)

Site	Name	Heritage listing	Significance	Potential impact type
001	Thompson Square Roads	SHR (#00126;excluding 1934 cutting) LEP (I526; C4)	State	Fabric – Yes Curtilage – Yes Visual – Yes Construction Vibration – Yes (High)
002	Thompson Square Lower parkland	SHR (#00126) LEP (I529; C4)	State	Fabric – Yes Curtilage – Yes Visual – Yes Construction Vibration – Yes (High)
003	Thompson Square Upper parkland	SHR (#00126) LEP (I529; C4)	State	Fabric – Yes Curtilage – Yes Visual – Yes Construction Vibration – Yes (High)
004	The Doctors House	SHR (#00126) LEP (I525; C4)	State	Visual – Yes Construction Vibration – Yes
005	House and Outbuilding *5 Thompson Square*	SHR (#00005) LEP (I527; C4)	State	Nil
006	Hawkesbury Museum Tourist Information Centre	SHR (#00126) LEP (I528; C4)	State	Nil
007	Macquarie Arms Hotel	SHR (#00041) LEP (I442; C4)	State	Nil
008	House *4 Bridge Street* Retaining wall, archaeological deposit are the significant items	SHR (#00126) LEP (I73; C4)	State	Fabric – Yes Visual – Yes Construction Vibration – Yes (High)
009	House *6 Bridge Street*	SHR (#00126) LEP (I206; C4)	State	Fabric – Yes Visual – Yes Construction Vibration – Yes (High)
010	House and Outbuildings *10 Bridge Street*	SHR (#00126) LEP (I253; C4)	State	Fabric – Yes Construction Vibration – Yes (High)
011	Former School of Arts building	SHR (#00126) LEP (I273; C4)	State	Fabric – Yes Visual - Negligible Construction Vibration – Yes (High)
012	Cottage *20 Bridge Street*	LEP (I147)	Local	Nil

Site	Name	Heritage listing	Significance	Potential impact type
013	Cottage *17 Bridge Street*	SHR (#00126) LEP (I300; #C4)	State	Visual – Negligible
014	Shops *62-68 George Street*	SHR (#00126) LEP (I295; C4)	State	Fabric – Yes Visual – Yes Construction Vibration – Yes
015	Shops *70-72 George Street*	SHR (#00126) LEP (I400; C4)	State	Visual – Yes
016	AC Stern Building *74 George Street*	SHR (#00126) LEP (I400; C4)	State	Visual – Yes
017	Shops *80-82 George Street*	SHR (#00126) LEP (I402; C4)	State	Nil
018	Shops *84 & 88 George Street*	SHR (#00126) LEP (I479; C4)	State	Nil
019	Shops *92 George Street*	LEP (I485; #C4)	State	Nil
020	Windsor Bridge	S.170 (RTA #4309589) LEP (I276)	State	Fabric – Yes Curtilage – Yes Visual – Yes
021	Bridgeview	LEP (I274)	Local	Visual – Yes Construction Vibration – Yes
022	Green Hills Wharf c1795	Nil	Provisionally State	Fabric – Yes Curtilage – Yes Construction Vibration – Yes
023	Government Wharf site c. 1815	Nil		Fabric – Yes Curtilage – Yes Construction Vibration – Yes
024	Government house wharf site c. 1800	Nil	Provisionally State	Fabric – Undetermined Curtilage – Possibly
025	The Terrace *west of Windsor Bridge*	Nil	Undetermined	Fabric – Undetermined Curtilage – Undetermined Visual - Yes Construction Vibration – Yes
026 (old 24)	River bank – south bank *west of Windsor Bridge*	Nil	Undetermined	Fabric – Undetermined Curtilage – Undetermined

Site	Name	Heritage listing	Significance	Potential impact type
027 (old 25)	North river bank and turf farm *east of Windsor Bridge*	Nil	Undetermined	Fabric – Undetermined Curtilage – Undetermined Construction Vibration - Undetermined
028 (old 26)	Existing Bridge Approach – north side	Nil	No	Curtilage – Yes
029 not numbered	Turf farm *Wilberforce Road potential archaeological*	Nil	Undetermined	Fabric – Undetermined Curtilage – Undetermined
030 (old 28)	Macquarie Park	Nil	Potential State	Visual - Low
031 No numbers	Terrestrial archaeological resources not identified in this report	Nil	Undetermined	Fabric – Undetermined Curtilage – Undetermined Construction Vibration – Undetermined
032 No numbers	Maritime archaeological resources not identified in this or the maritime report (Cosmos Archaeology 2012)	Nil	Undetermined	Fabric – Undetermined Curtilage – Undetermined Construction Vibration – Undetermined

5.3.2 Aboriginal Heritage

The Aboriginal cultural heritage assessment conducted for the EIS comprised Aboriginal archaeological investigations at the northern and southern banks of the Hawkesbury River at the project location and consultation with the Deerubbin Local Aboriginal Land Council, OEH and other Aboriginal stakeholders, in accordance with OEH and RMS guidelines.

A total of six Aboriginal sites were identified by previous Aboriginal archaeological investigations within the project footprint, as recorded on the AHIMS database; one on the southern bank (PAD) and five on the northern bank (comprising one PAD and five isolated finds). Two additional Aboriginal sites have been recorded within 150 metres of the project footprint, most notably a site located adjacent to the Windsor Museum. Test excavations conducted for the EIS on the northern and southern banks of the Hawkesbury River resulted in the following findings:

- Northern Bank: a total of six artefacts were identified from four separate test squares. However as this area has been subject to substantial flooding, it is expected that the remaining artefacts may have been moved and therefore remaining artefacts in this area are of low density and low heritage value; and
- Southern Bank: a total of 185 artefacts were identified from two test pits, the most significant test pit being located high on the river bank in the south east corner of Thompson Square adjacent to George Street. No artefacts were identified in the three remaining test pits. This is attributed to historical road work, flooding and landscaping in these areas.

The impact of the project on Aboriginal heritage would be associated with construction and demolition activities. Specifically, the EIS determined that six known Aboriginal sites, which are located within the construction areas, would be impacted by the project. Five of these sites (located on the northern bank) are considered to be of low Aboriginal heritage value due to past disturbance which is likely to have moved subsurface archaeology objects from their original location. The remaining site (located on the southern bank of the river) contains a partially intact archaeological deposit which is suitable to be dated and a disturbed shell midden and is therefore considered to be of high scientific value. However because this overall area is highly disturbed, the EIS does not consider that the potentially impacted Aboriginal objects would be suitable for conservation. The six sites are detailed in **Table 8**.

The southern bank is considered in the EIS to be of higher Aboriginal archaeological value then the northern bank of the river. Both areas contain known and potential Aboriginal items, however due to the history of flooding and development in both areas the significance of such deposits is considered to be limited. The EIS concluded that because of the disturbed nature of the northern and southern banks, the value of existing Aboriginal relics lies in information that may be obtained from the items more so then the heritage value gained through conservation efforts. Mitigation measures provided in the EIS have this focus.

Community consultation, which included meetings of a project dedicated Aboriginal Focus Group, (AFG) indicated that there is a strong association with the land due to historical Aboriginal and European interactions with Windsor. The Deerubbin Local Aboriginal Land Council raised concern about preserving burial sites of unknown location within the project footprint and landscape features (sand bodies) along the Hawkesbury River. There is also a high Aboriginal heritage value associated with the Windsor Museum.

Table 8: Aboriginal Heritage sites (Source RMS 2012)

Site ID	Site Type	Description	Significance
W-SP AHIMS ID 45-5-3581	Artefact Scatter	Located on the southern bank of the Hawkesbury River. A portion of the site is above the 1 in 100 year flood zone within Thompson Square at the corner of George and Bridge streets. Contains fine grained sand layers and high artefact densities. A second more disturbed portion of the site is located below the 1 in 100 year flood zone between Bridge Street, Old Bridge Street and the wharf car park. This area contains moderate artefact densities, including displaced midden material.	High
W-NP AHIMS ID 45-5-3580	Artefact Scatter	Located on north bank of Hawkesbury River within flood prone terrace. Deep homogenised profile with no evidence of buried soils	Low
W1 AHIMS ID 45-5-3582	Isolated find	As above	Low
W2 AHIMS ID 45-5-3583	Isolated find	As above	Low
W3 AHIMS ID 45-5-3584	Isolated find	As above	Low
W4 AHIMS ID 45-5-3585	Isolated find	As above	Low

5.3.3 Submissions

Submissions received during exhibition of the EIS raised heritage impacts as a key issue, with a clear focus on Thompson Square Conservation Area. The predicted heritage impacts on Thompson Square Conservation Area was the most commonly raised issue totalling 55.3% of all submissions. According to the Applicant's Submissions Report, submissions regarding heritage raised concerns included but not limited to impacts on the following items:

- the heritage value of the existing Windsor Bridge;
- the heritage buildings within Thompson Square Conservation Area;
- archaeological records;
- Aboriginal heritage; and
- maritime heritage.

Two agency submissions raised heritage as a key issue, as detailed in **Section 4.2**, as follows:

- the Heritage Council of NSW objects to the project on heritage grounds, as detailed in **Section 4.2**, and provided recommended conditions of approval should the project proceed; and
- OEH (Aboriginal Cultural Heritage) recognised the significance of archaeological deposits of the project site and recommended salvage if disturbance cannot be avoided.

The Applicant responded to each submission in the Response to Submissions by acknowledging impacts to the heritage value of the project area by construction of the project, and committing to a range of actions aimed at recording the unique heritage value of the area. Such actions presented in the Applicant's Response to Submissions included archival recording of the project footprint and immediate vicinity, documenting the unique construction methodology that was used to construct Windsor Bridge during the course of its dismantle and urban design and landscape treatments of the project in a manner that is sympathetic to the unique heritage character of Thompson Square Conversation Area and the Windsor township, and in consultation with the community, Hawkesbury City Council, the Department and the Heritage Council of NSW.

5.3.4 Department's Consideration

The Heritage Assessment conducted for this project has identified a high level of impact on non-Aboriginal heritage, in particular on Thompson Square Conversation Area in terms of its heritage fabric and character. While to some degree historic heritage impacts could be offset through project design refinement and other mitigating measures, it is acknowledged that the project would still result in a high level of impact.

The submitted EIS acknowledges that demolition of the existing Windsor Bridge would be a loss to the historic character of the Windsor locality and is a significant individual heritage item. The Department concurs with this conclusion. The Department also acknowledges that heritage impacts arising from the construction, demolition and operation of the project would also extend beyond the project footprint and affect views and vistas, particularly in relation to Thompson Square Conservation Area.

In addition to historic heritage, the Department acknowledges that Aboriginal archaeology occurs within the project area and the area has Aboriginal cultural value to the local Aboriginal community. Impacts due to construction of the project could potentially destroy both non-Aboriginal and Aboriginal heritage items.

The Department notes the strong views expressed in submissions in relation to heritage impacts. Furthermore, the Department acknowledges the submission by the Heritage Council of NSW objecting to the project on heritage grounds.

As part of its assessment, the Department commissioned an Independent Heritage Review (Casey and Lowe) which identified a number of shortcomings in the Applicant's Heritage Assessment and Statement of Heritage Impact (SoHI) provided in the EIS, including:

- an inadequate description of the State significant heritage values of the Thompson Square Conservation Area and analysis of heritage design principles or policies for the impact assessment;
- inadequate assessment of the effectiveness of the mitigation measures commensurate to the high level of impact; and
- absence of a clear statement as to whether the conservation area will still be of State significance after the project is constructed.

The Department accepts its Independent Heritage Review finding that placement of a new major road along the side of Thompson Square Conservation Area would affect the relationship between the building on each side of the square and the open space. Therefore, while the project may not directly impact on the physical structure of individual historical buildings, the heritage value of the Square as a whole would be altered. The Department further recognises that while the RMS has identified a range of mitigation measures, the main offset to the impacts associated with the Square is a redesign of Thompson Square Conservation Area and The Terraces which does not fully preserve existing heritage values within the project footprint.

The Department consulted with RMS regarding the shortcomings identified by the expert review. In response, RMS prepared a draft Conservation Management Plan (CMP). This outlined RMS's intention to construct the project in a manner which far as practicable conserves the unique heritage value of the project area via specific project design features and implementation of other mitigation measures. The Department concurs with the Applicant's approach and has expanded upon this by recommending stringent pre-construction conditions of approval for the conservation of heritage value.

Whilst acknowledging the heritage impacts, the Department has considered these impacts within the context of the benefits of the project overall. On balance, taking into consideration the immediate and long term regional and local benefits of the project including improvements to local traffic, safety and reliability of the road network, the Department is satisfied that the Windsor Bridge Replacement Project is consistent with the objects of the Act and is in the broader public interest.

Overall, the Department accepts the level heritage impacts associated with the project, which to some degree can be managed by the range of stringent conditions that have been recommended by the Department for inclusion in the conditions of approval. These include:

- the preparation of a Strategic Conservation Management Plan and Archival Recording on the southern side of the Hawkesbury River;
- an Archaeological Investigation Program in accordance with the Heritage Council's Archaeological Assessment Guideline (1996) and comprising Aboriginal and non-Aboriginal Heritage with the results detailed in a Historic Archaeological Report;
- a Detailed Salvage Strategy, prepared in consultation with OEH and Aboriginal stakeholders;
- a Hawkesbury Region Sand Bodies Study to locate and evaluate sand bodies likely to contain evidence of Aboriginal activity, should any Pleistocene and/or early Holocene be encountered during construction works; and
- an Urban Design and Landscape Plan.

The Department has recommended these conditions on the project with a view to:

(a) minimise impacts on heritage sites, including sites within the Thompson Square Conservation Area and archaeological sites in, and in the vicinity of, the site;
(b) salvage and interpret any impacted heritage sites, including historical archaeologically significant sites within, and in the vicinity of, the site;

(c) conduct archival recording and further research of the Thompson Square Conservation Area;
(d) enhance and conserve the Thompson Square Conservation Area, the heritage items identified in Table 1 of Appendix 1 of the recommended Conditions of Consent, with the exception of Item 3 (the Thompson Square lower parkland area) and Item 20 (Windsor Bridge) and any archaeological sites within, and in the vicinity of, the site, while providing for the construction of a replacement bridge at Windsor; and
(e) incorporate changes in the final design of the SSI, where practical, to achieve Objectives (a), (b) and (d) above.

The Department has distinguished between the relative heritage impacts on the southern and northern sides of the Hawkesbury River within the project area in the pre-construction conditions. The required Archaeological Investigation Program shall comprise Aboriginal and non-Aboriginal Heritage at the southern side of the Hawkesbury River and Aboriginal heritage at the northern side of the Hawkesbury River in the project area to reflect the relative presence and location of significant heritage items. Although the heritage value of Aboriginal heritage items in the northern side of the project area was determined in the EIS to be of low significance, the Department nevertheless considers that further investigation in the form of an Archaeological Investigation Program is warranted.

In addition, the Department has required the establishment of a specialist heritage manager and heritage consultant team to oversee construction of the project with regular reporting requirements. Furthermore, a Construction Heritage Management Sub-plan would be required to be prepared as part of the Construction Environmental Management Plan for the project.

In addition to these conditions, the Applicant has committed to conduct further research work and heritage assessment work for the endorsement of the Director-General focussing on the Thompson Square Conservation Area and the southern bank of the Hawkesbury River at the project location. This would enable an accurate record to be kept of the heritage value of the project location, prior to construction of the project, in perpetuity. The Department considers this approach would ensure complete and robust heritage research is conducted in conjunction with the development of the bridge.

Notwithstanding the recognised heritage impacts, on balance, the Department considers that this approach is in the public interest and ensures the best possible outcome for heritage conservation of key items within the project footprint, while enabling the project to proceed.

5.4. Noise and Vibration

An assessment of construction noise impacts was undertaken for the EIS in compliance with the *Interim Construction Noise Guidelines* (ICNG) (DECC, 2009). Noise management limits for residential receivers are based upon the L_{A90} noise levels in the day, evening and night periods - with 10 dB(A) added to the L_{A90} noise level for the day time period and 5 dB(A) added the L_{A90} noise levels for the evening and night time periods as follows:

- Day time - 7am to 6pm
- Evening time – 6pm to 10pm
- Night time – 10pm to 7am

Non-residential noise management levels according to the ICNG were also applied.

While a total of 175 sensitive receivers were identified within a 200 metre radius of the project (comprising a mixture of residential and commercial receivers), the EIS considered the highest noise impact affected receivers to be located adjacent to the project. This is due to shielding provided by buildings beyond the adjacent receivers. Noise modelling conducted for

the EIS at the adjacent receiver locations considered eight main phases of construction and was based on the worst case scenario of all construction equipment operating simultaneously. On this basis, a total of 8 exceedences of daytime ICNG 'highly noise affected criteria' were identified, all of which were located at the southern approach road work area. Furthermore, exceedences of the daytime noise management level were identified and in the Applicant's Submission Report, it was identified that up to 30 sensitive receivers are anticipated to experience noise levels in excess of construction noise objectives at some point of the overall construction works. Noise modelling for work outside the standard construction hours indicated exceedences of noise management levels across all work phases and construction locations. Therefore the Applicant has established stringent mitigation measures for construction work adjacent to sensitive receivers and during out of hours work activities.

The construction noise impact assessment conducted for the EIS provided the outcomes detailed in **Table 9**.

Table 9: Summary of Construction Noise Impact Assessment

Construction Phase	Exceedence of noise management level	Exceedence of highly noise affected criteria
Site establishment and early works	Yes; at 1 receiver due to short term jack hammering	No
Bridge piers	Yes: at 16 receivers along the southern riverbank and within Thompson Square during impact piling	No
Construction and launching of the bridge*	Yes; at 1 receiver due to steel formwork Yes: at 13 receivers due to concrete pours and paving work	No
Southern approach road*	Yes: at 15 receivers	Yes: at one receiver
Northern approach road*	Yes: minor at 2 receivers Yes: at 12 receivers due to final paving work.	No
Southern approach road tie-in*	Yes: at 3 receivers	No
Existing bridge demolition	Yes: at 14 receivers due to short-term saw and grinder use	No
Southern laydown/compound use	Yes: at 1 receiver	No

*Likely to involve work out of standard construction hours

It is noted that construction of the southern approach road phase may involve out of hours construction work that are predicted to exceed the evening and night time criteria at two sensitive receivers. The southern approach tie-in work would also involve work outside the standard construction hours.

Mitigation measures provided by the Applicant include further detailed noise impact assessments that would be undertaken based on detailed construction planning for the project. This would include assessment of compliance with noise management levels and the effectiveness of noise mitigation measures. Use of temporary noise barriers and shielding in part of Bridge Street would be considered in location where substantial noise exceedences of noise criteria are predicted. Construction programming would be developed to minimise noise impact, including time and duration limitations and the scheduling of noisy construction

activities. Overall construction noise impacts that are predicted in the EIS and Submissions Report would be typical of a construction project of this scale and the predicted impacts and mitigation measures are consistent with other large construction projects.

The operational noise impact assessment conducted for the EIS indicated that there would be an improvement to noise experienced by sensitive receivers that are not located directly adjacent to the project, due to the new road pavement, the change of alignment and location of the new approach roads. Specifically, relocating the southern approach road to the north-east of the Thompson Square parklands would remove local noise that is currently generated by traffic on this road from the centre of the parklands to the north-eastern boundary. This would benefit park users and improve the overall amenity of the parklands. Four sensitive receivers were identified as being located directly adjacent to the project. The following findings resulted from the operational noise impact assessment:

- One sensitive receiver located at the corner of Freeman's Reach Road and Wilberforce Road would experience a reduction in operational noise levels due to the relocation of the northern intersection further to the south-east;
- Two sensitive receivers located in Bridge Street adjacent to the project would continue to experience the same level of operational noise;
- One sensitive receiver located in George Street would experience an increase in operational noise of approximately 2dB(A) over existing levels.

Four additional sensitive receivers located in George and Bridge Streets were identified in the Submission Report as residential properties and may require acoustic treatment.

Acoustic treatment would be available for the seven sensitive receivers, with consideration of the construction material and the heritage value of buildings, where relevant. The Applicant consulted with a qualified heritage architect during preparation of the EIS for this purpose. Such acoustic treatment would be selected and installed prior to commencement of construction. . Further noise mitigation measures are proposed by the Applicant.

Existing vibration issues are limited to traffic vibration impacts within the project area. Attended vibration monitoring was conducted for the EIS at two locations along Bridge Street and it was determined that at these locations, road traffic would be the only source contributing to vibration levels. Furthermore, the recorded vibration levels would not be perceptible to humans and would not cause damage to heritage structures.

Potential vibration impacts due to construction activities include impact piling, rock breaking (jack hammering) and vibratory rolling. An assessment of potential vibration impacts was conducted for sensitive residential receivers and heritage buildings in the proximity of the locations where these construction activities would occur. The estimated vibration levels from high vibration activities and a comparison to relevant structural damage and human comfort vibration criteria indicate that impact piling would generate the highest vibration levels. This would be undertaken in the river for the piers and therefore is distant from sensitive receivers. This activity would not exceed the vibration criteria at any sensitive receivers.

Rock breaking would be undertaken in close proximity to sensitive receivers located along the southern approach road. The EIS Reports that vibration levels from rock breaking would exceed the human comfort criterion at one sensitive receiver (known as R2; 4 Bridge Street) and exceed the structural damage criterion at two locations (known as H1 which is a heritage wall at 4 Bridge Street and at C2). However the location of C2 is not provided in the EIS, nor shown on Figure 7-30 which provides the location of sensitive receivers. This information was also omitted from the Applicant's Submissions Report. The EIS reports that vibration levels from vibratory compaction would exceed the human comfort criterion at adjacent sensitive residential receivers and would be below the structural damage criterion for heritage structures at all sensitive heritage receivers.

During operation of the project, it is expected that no additional vibration impacts would arise at sensitive locations. As the project itself would not increase traffic volumes in the project area, any additional operational vibration impacts are considered to be negligible.

A total of 18 public submissions and one agency submission raised issues regarding noise and vibration associated with the project.. The main issues related to increased traffic noise due to heavy construction vehicles and in the long term due to the raising of the road level. The Applicant's Submission Report identified that seven properties may require architectural treatment in the long term to meet contemporary standards. This and other appropriate mitigation measures would be investigated during the detailed design phase of the project and implemented where feasible and reasonable. The Submissions Report also identified that other residential properties would experience a reduction in traffic noise, as described above.

5.4.1 Department's Consideration

The Department has assessed information relating to construction and operational noise and vibration impacts provided by the applicant in the EIS and the Response to Submissions.

Construction Noise

The Department concurs with EIS findings that there will be exceedences of the predicted noise management levels at sensitive receivers. Exceedance of daytime noise criteria at the southern approach road work area during construction was identified and furthermore, up to 30 sensitive receivers are anticipated to experience noise levels in excess of construction noise objectives at some point during the construction works.

The Department considers that the predicted construction noise impacts are consistent with a road construction project of this scale and being temporary in nature, can be managed adequately through the implementation of mitigation measures. To ensure a robust construction management framework, the Department has recommended a requirement for a Construction Noise and Vibration Management Sub-Plan to be prepared for the approval of the Director General as part of the Construction Environmental Management Plan prior to the commencement of construction.

The Department has also stipulated standard and out-of-hours construction work hours are specified in the conditions of approval. Specific activities requiring out-of-hours construction work are detailed in the conditions of approval.

Operational Noise

Operational noise is limited to traffic-generated noise by vehicles using the project. The Department concurs with the EIS findings that the project itself would not increase traffic volumes. An overall improvement in operational noise experienced by sensitive receivers that are not located directly adjacant to the project is expected to arise from the use of new road surface material and the change of alignment and location of the new southern approach road. Specifically, relocating the southern approach road to the north-east border of the Thompson Square parklands would remove local traffic-generated noise that currently is experienced by park users and improve the overall amenity of the parklands. The Department considers this to be a key benefit of the project.

Based on information provided in the EIS, the Department acknowledges that operational noise levels would remain constant at two sensitive receivers located on Bridge Street and slightly increase at five sensitive receivers that are located directly adjacent to the project on George Street and Bridge Street. The Department concurs with the use of architectural treatment and other mitigation measures to reduce operational noise at the identified residential properties.

Vibration
The information provided by the Applicant indicates some construction vibration impacts would occur at sensitive receivers. To ensure construction vibration impacts are managed adequately, the Department has recommended a Construction Noise and Vibration Management Sub-Plan be prepared as part of the Construction Environmental Management Plan prior to the commencement of construction.

As a road project, operational vibration impacts are not expected to arise.

5.5. Other Issues

5.5.1 Biodiversity

The flora and fauna assessment undertaken for the EIS included desktop studies of publicly available information and databases and field investigations, including targeted surveys for threatened species, populations and ecological communities considered to have the potential to occur within the construction footprint area and any adjoining or adjacent habitat where potential impacts may occur.

The project is located entirely within the Cumberland Plain sub-region of the Sydney Basin Bioregion on the east coast of NSW. Mapping undertaken for the EIS indicated the presence of two threatened ecological communities (TEC) within the study area (Cumberland Plain Woodland and River-flat Eucalypt Forest) however field surveys did not identify these TECs. The existing environment is characterised by a long history of human activity and development. The sub-catchment is reported in the EIS to be heavily degraded as a result of historical vegetation clearing and urbanisation, with little or no remnant vegetation. There are no known areas of critical habitat for native fauna species. Two Council managed recreational reserves lie in the project area, being Macquarie Park on the northern bank and Thompson Square on the southern bank.

A total of 15 threatened flora species and 48 threatened fauna species were identified in the study area based on reviews of state and federal government databases, including the OEH NSW Bionet data (OEH, 2012) and the EPBC Act Protected Matters Search Tool (DSEWPaC, 2012). A moderate likelihood of five threatened fauna species occurring within the study area was identified, including:

- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Eastern Freetail Bat (*Mormopterus norfolkensis*)
- Southern Myotis (*Myotis macropus*) and
- Freckled Duck (*Stictonetta naevosa*).

However targeted field surveys conducted as part of the EIS did not identify any threatened species or habitats in the study area.

The EIS identified the possibility of the existing Windsor Bridge providing a suitable roosting habitat for a range of bats, including two of the threatened bats listed above. However the EIS reported that no bats were observed to be roosting under the bridge during field surveys.

Likewise, the desktop review identified a total of 13 migratory species as potentially occurring within the study area but none of these species were identified via field survey. Furthermore, no important habitat for migratory species was identified in the field survey.

The EIS reported that the Hawkesbury River is a Class 1 Waterway, as a permanently flowing waterway containing a major fish habitat. No existing barriers to fish passage were

observed within the study area. No threatened aquatic fauna species were reported to occur in the study area, based on the existing condition of habitat for these species.

Construction impacts reported in the EIS are limited to the loss of vegetation/habitat and resultant impacts on threatened fauna. The project would require clearing of approximately 1.7 hectares of vegetation, which includes 1.2 hectares of park or grasslands. The EIS considers that this clearing would not have a significant ecological impact given the vegetation communities in the study area are of low ecological value.

It is reported that approximately 0.5 hectares of riparian vegetation along the Hawkesbury River would require clearing for the project. This riparian community does not constitute a TEC and also is reported to be in relatively poor condition. Construction of the bridge would require the removal of woody debris/snags in addition to clearing of riparian vegetation. This type of activity has been identified to be a key threatening process under the FM Act. However given the relatively poor condition of the riparian vegetation on the river banks and the lack of any substantial snags in this section of the river, as well as the temporary and spatially limited nature of the construction of the project, the resultant impact on aquatic species and ecosystems is not considered to be substantial.

The greatest potential for construction impacts on species within local waterways would be from sedimentation and erosion, water-based construction activities, dredging and the risk of spills. These activities would result in increased turbidity and suspended solids in the river and could be managed by appropriate water quality management measures.

The EIS reported that the main potential impact on biodiversity from the operation of the project would be from stormwater runoff from the approach roads and the bridge or from accidental spills of fuels or chemicals. To alleviate these potential impacts, design of the project includes a permanent water quality basin on the northern bank, and a litter net and shut-off valve on the southern bank.

No public submissions were received or reported in the Applicant's Submission Report regarding biodiversity. One agency submission (Department of Primary Industries) raised issues regarding riparian vegetation impact, which was addressed by the Applicant.

Department's Consideration

The Department considers biodiversity impact to be of low significance for this project given the low existing biodiversity value of the project area, the high extent of vegetation clearing for urban purposes and the absence of any confirmed sightings of threatened flora and fauna species during the field surveys conducted for the EIS.

Notwithstanding, a Vegetation Management Plan is required to be prepared as part of the Department's conditions of project approval to demonstrate the protection of remnant native riparian vegetation and the rehabilitation of the riparian corridor, including monitoring and maintenance.

In addition a Flora and Fauna Management Sub-Plan as part of the Construction Environmental Management Plan is required in accordance with the conditions of project approval prior to the commencement of construction of the project. Furthermore, a Soil and Water Quality Management Sub-Plan as part of the Construction Environmental Management Plan is required to be prepared and include erosion and sedimentation control measures and a spill management procedure to prevent adverse water quality impacts on aquatic species within the Hawkesbury River.

5.5.2 Water Quality

Water quality monitoring has been conducted by the Sydney Catchment Authority and Sydney Water since the 1980s at many locations in the Hawkesbury River. The records were

assessed as part of the EIS and indicate general compliance with ANZECC/ARMCANZ (2000) guideline values for conductivity, pH, turbidity levels, dissolved oxygen levels. An improvement in phosphorus (total and filterable phosphorus) levels over time was reported with recent monitoring data meeting the ANZECC/ARMCANZ (2000) guideline values. Nitrogen (total, oxides of nitrogen, and ammonium) levels and chlorophyll-a levels frequently exceed the ANZECC/ARMCANZ (2000) guideline values over the whole record.

The existing Windsor Bridge and approach roads do not have any water quality management devices to treat stormwater runoff or capture spills of hazardous materials. The only water quality management device in close proximity to the project is a Gross Pollutant Trap located near the intersection of Baker Street and The Terrace.

A new permanent water quality basin would be constructed as part of the project to capture and treat stormwater runoff from the new bridge and northern approach roads intersection. The water quality basin would be located near the south eastern corner of the new roundabout on the northern bank. The basin is designed to remove suspended solids and gross pollutants from stormwater runoff before discharging to the river. The dimensions of the basin are reported in the EIS to be approximately 25 metres long, 12 metres wide, and 1.5 metres in water depth. The size of the basin would be refined during the detailed design phase.

Regular maintenance of the water quality basin by RMS or Hawkesbury City Council would be required to remove sediment and other captured pollutants from the basin. According to information provided in the EIS, the water quality basin would be fitted with an underflow baffle arrangement to provide accidental spill capture and containment for a minimum volume of 20 cubic metres. The baffle would prevent hazardous liquid spills from entering the river during dry weather and smaller more frequent rainfall events. Any captured spills would be removed from the basin and disposed of appropriately.

Department's Consideration
On review of the project information, the Department concurs with the concept and design of a permanent water quality basin as part of the project and recognises improvements in water quality within the Hawkesbury River that are likely to result. However, given the size and scale of the water quality basin, the Department has recommended landscaping including planting to screen and improve visual amenity impacts associated with the water quality basin to be included as part of the Visual Amenity, Urban Design and Landscape Plan in its conditions of approval for the project.

5.5.3 Flooding
The Hawkesbury River at Windsor is located within a floodplain area and is characterised by a history of flooding. Flooding of the Hawkesbury River at Windsor is influenced by flows from upstream tributaries (including upper catchment tributaries) as well as inflows from South Creek and constriction of flows through downstream gorges (located downstream of Wilberforce/Sackville). The township of Windsor is primarily built on the ridge above the river. However the existing Windsor Bridge and northern bank is at a lower elevation and has been subject to a number of major flood events. This issue has been raised by the Applicant as a key driver and justification for the project.

The hydrology assessment conducted for the EIS in accordance with NSW flood guidelines comprised a desktop review of published information relating to floods in the project area and the *Draft Hawkesbury Floodplain Risk Management Study and Plan* (Hawkesbury City Council, 2012). RMS also undertook additional survey of actual floor levels of buildings near and immediately upstream of the project. These buildings were generally in the 5 year ARI floodplain.

Data shows that peak flood levels at Windsor Bridge are 11.1 metres AHD and 17.2 metres AHD for the five year and 100 year ARI events respectively. The existing Windsor Bridge height of seven metres is overtopped by about four metres and 10 metres for the five year and 100 year ARI events respectively.

The EIS reports that it is possible for a flood event to occur during construction of the project and impact work activities and cause erosion of bed and bank material if the proposed scour protection measures have not yet been constructed. Furthermore, before the demolition of the existing bridge is completed, it could fail during a flood event causing damage to the new bridge. This is considered to be unlikely to occur in the next three years prior to opening of the new bridge in 2015.

Construction of the new bridge at a height of 9.8 metres AHD would improve the flood immunity of the project area.

A total of 7 public submissions were received raising flooding issues including the flood immunity of the project, development on the floodplain and flood impacts of the project. In addition, agency submissions were received from OEH regarding flood impacts of the project and from DPI Fisheries NSW regarding hydrological impacts.

Department's Consideration
The Department recognises that the project area is prone to flooding and the existing Windsor Bridge has been subject to regular flooding throughout its history. Furthermore, the Department recognises that in the past the existing Windsor Bridge has closed during flood events while surrounding roads have remained open due to the low existing bridge level of 7 metres AHD. The new bridge design has a deck height of 9.8 metres AHD. This increase in deck height has been designed taking into consideration historical flood levels at this location and the need to mitigate the level of impacts on Thompson Square. Specifically, the new bridge has been designed to achieve 1 in 5 year flood immunity.

The Department considers that a key benefit of the project would be increasing access across the river for traffic during flood events. The proposal will improve flood immunity from a 1 in 2 year flood event to a 1 in 5 year flood event. The new bridge (with a flood immunity similar to surrounding roads) would provide improved evacuation opportunities for properties north of Windsor and would provide greater access across the Hawkesbury River for a wider range of flood events.

To manage any potential down strem flooding impacts associated with the proposal the Department recommends that a Hydrological Mitigation Report for properties in the Hawkesbury River floodplain areas be prepared as part of the conditions of consent, where flood impacts are predicted to increase as a result of the project. Furthermore, pre-construction conditions that form part of the project consent require completion of any works that are deemed to be required by the Hydrological Mitigation Report prior to commencement of construction of the project.

5.5.4 Contamination and Acid Sulphate Soils
Soil contamination was investigated as part of the preliminary site investigations for the project in the EIS. This involved an assessment of historical and existing land uses and a review of contaminated sites databases to identify areas that may contain potentially contaminated soils. Based on historical land use information, the northern bank of the Hawkesbury River at the project location has primarily been used for agriculture since 1793, and the southern bank for residential and urban development since 1810. Several small scale industrial activities also occurred in this area in the past.

Investigations conducted for the EIS included soil sampling and analysis at 10 locations within potential sites of concern identified from historical information. These included the turf

farm/agricultural activities on the northern bank, underneath the existing Windsor Bridge at the first pier due to deterioration of bridge structures and along river banks and sediments to detect any deposition of potentially contaminated sediments from upstream during flooding events.

Contaminants tested included Organochlorine Pesticides (OCP), Organophosphorus Pesticides (OPP), herbicides and heavy metals. Contaminant concentrations in all soil samples were below relevant ecological and human health soil contamination guidelines, suggesting that there are no contaminated soils or materials in the project area.

Lead based paints (ie. lead at concentrations of greater than one per cent by weight) were detected in paint samples collected from the iron piers and iron cross bracings of the existing bridge. No other potentially hazardous materials were identified. The EIS provides appropriate management measures for the containment, stabilisation and removal of lead based paints for any demolition of bridge structures containing lead based paints. This would be conducted in accordance with the appropriate Australian Standards.

The EIS reports that the risk of encountering contaminated soils during construction of the project would be low given that no exceedances of contamination guidelines were detected in the soil samples. These risks would be further reduced given the relatively minor nature of earthworks for the project (ie. the majority of works involve placing fill on the existing land surface). Past studies of the Hawkesbury river sediments (Birch et al, 1998) did not identify the river sediments at Windsor as being contaminated with heavy metals and therefore the risk of impacts due to mobilising contaminated sediment during construction would be negligible.

The risk of spillage or leakage of fuels and/or chemicals from plant and equipment and from storage areas during construction of the project would be managed by the implementation of standard environmental management measures to prevent the contamination of soils from this activity.

Acid sulfate soils (ASS) risk maps from the NSW Natural Resource Atlas database were reviewed to ascertain the presence of ASS within the project area, as part of the EIS. In addition, sampling and analysis of river bed sediments were undertaken to determine the presence of acid sulfate soils and any requirements for management based on the Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998).

Sampling of river bed sediments indicated the presence of potentially low strength acid sulfate soils within sediments near the southern bank. While the EIS recognises the possibility of false positives for the presence of ASS especially if there is a high proportion of organic matter in the sediments (as noted in the Acid Sulfate Soils Assessment Guidelines (ASSMAC 1998)), management measures are available to minimise the risk of disturbance of potential acid sulphate soils and exposure to air during the piling and dredging works for the installation of scour protection. Environmental management measures would be put in place to avoid or minimise these impacts.

Further ASS investigations would be undertaken during detailed design of the project. If the presence of ASS is confirmed in the river sediment, an ASS management plan would be developed and implemented. The plan would detail the management, handling, treatment and disposal of ASS and would be prepared in compliance with the Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998) and the Guidelines for Managing Acid Sulfate Soils (RTA, 2005).

The Applicant's Submissions Report does not report any public submissions raising issues of contamination or ASS.

Department's Consideration
Based on the information provided, the Department acknowledges the absence of contaminated soils and the presence of potential acid sulphate soils within sediments near the southern bank of the project area. The Department also recognises that the presence of other potentially hazardous materials is limited to some lead-based paint.

The Department concurs with the approach provided by the Applicant in relation to potential acid sulphate soils and has included in the conditions of approval, as part of a Construction Soil and Water Quality Management Sub-plan, a requirement for the preparation of a contingency plan to deal with actual or potential sulfate soils. This is required to include procedures for investigating, handling, treatment and management of such soils and water seepage. The Department is satisfied with this approach.

Furthermore, the Department concurs with the management measures provided in the EIS for management of lead-based paints including containment, stabilisation and removal in accordance with the appropriate Australian Standards. This also forms part of the conditions of project approval.

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6. RECOMMENDATION

The Windsor Bridge replacement project is required for a number of reasons including:

- The poor condition of the existing bridge and its associated repair and maintenance costs;
- The poor current and future traffic performance and capacity constraints of the existing bridge and intersections;
- The existing bridge and approach roads do not meet current engineering and safety standards; and
- The existing bridge is more susceptible to flooding than the surrounding roads.

The project is State significant infrastructure. The Department has assessed the EIS, submissions, the Submissions Report incorporating the Preferred Infrastructure Report and the Applicant's environmental management measures in accordance with the objects of the EP&A Act and ESD. In addition, the Department commissioned independent expert reviews in relation to traffic, bridge engineering, and the heritage related impacts to help inform its assessment. The key issues resulting from the Department's assessment of the project include traffic, visual amenity, urban design and landscape, Aboriginal and non-Aboriginal heritage impacts and noise.

The Department considers the project to be justified as it would provide a long term efficient and safe road crossing of the Hawkesbury River which would support the social and economic welfare of the community. The design of new roads meets road safety standards, improving upon the existing shortcomings in the local road network. Furthermore, the Department recognises substantial benefits in joining the existing two areas of the Thompson Square parklands to create one large consolidated parkland area by relocating the southern approach road from its current location to the north-east boundary of the Thompson Square parklands area, improving its overall amenity. Furthermore, the Department considers that the contemporary design features of the new bridge, which have been specifically designed for its river setting, would enhance the overall visual amenity of Hawkesbury River crossing at Windsor.

The Department acknowledges the heritage impacts associated with the project including the loss of the existing Windsor Bridge and the impact on the heritage value of the Thompson Square Conservation Area. The Department also recognises the strong views expressed in submissions in relation to heritage impacts. However, on balance, the Department is satisfied that despite these impacts, the Windsor Bridge Replacement Project is consistent with the objects of the Act and is in the broader public interest given its immediate and long term regional and local traffic benefits. The Department considers that the heritage impacts associated with the project can, to some degree, be managed by a range of stringent conditions, including:

- The preparation of a Strategic Conservation Management Plan and Archival Recording on the southern side of the Hawkesbury River;
- Archaeological Investigation Programs comprising Aboriginal and non-Aboriginal Heritage with the results detailed in a Historic Archaeological Report and preparation of a Detailed Salvage Strategy;
- A Hawkesbury Region Sand Bodies Study should any Pleistocene and/or early Holocene be encountered during construction works; and
- An Urban Design and Landscape Plan.

In addition, the Department has recommended conditions requiring the Applicant to record the heritage value of the Thompson Square Conservation Area and Windsor Bridge in perpetuity. Furthermore, the urban design and landscape treatment of the project is required to be consistent with the current heritage character of the project area. The project is considered to be consistent with the principles of ESD and local and regional strategic planning frameworks relevant to the Windsor area. Overall the project would manage, develop and conserve natural and artificial resources appropriately.

The Department considers that on balance, the project is in the public interest and should be approved by the Minister for Planning and Infrastructure, subject to stringent conditions that have been devised to protect the unique heritage value of the area, and other environmental values associated with construction of the project.

20.9.13

Executive Director
Development Assessment, Systems and Approvals

Sam Haddad

Director-General 20/9/2013

APPENDIX A ENVIRONMENTAL ASSESSMENT

See the Department's website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4951

APPENDIX B SUBMISSIONS

See the Department's website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4951

APPENDIX C APPLICANT'S RESPONSE TO SUBMISSIONS

See the Department's website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4951

APPENDIX D RECOMMENDED INSTRUMENT OF APPROVAL