



Infrastructure Australia

Project Business Case Evaluation

Project name	M4 Motorway upgrade
Rating	High Priority Project
Date of IA Board rating	April 2016

Location	Western Sydney, NSW
Proponent	NSW Government
Project timeframe	Anticipated start date: 2017 Anticipated end date: 2021

Evaluation Summary

Demand on the M4 Motorway – a key transport corridor in Western Sydney – routinely exceeds capacity during peak periods, resulting in congestion and travel delays. The impacts of this constraint are nationally significant. The population of the main catchment area for the M4 motorway is expected to grow by around 490,000 people (44.5%) between 2011 and 2031, and nearby developments such as the Western Sydney Airport at Badgerys Creek, and the Western Sydney Employment Area, are also likely to add to demand on the corridor. Without action, the impact of the capacity constraint will increase over time.

The proposed solution – making better use of existing infrastructure through the addition of smart motorways measures and related capacity – has high benefits relative to its cost. The proponent's economic evaluation indicates the proposal has a benefit-cost ratio (BCR) of 5.3 using a 7% discount rate and P90 cost estimate, and 5.8 when wider economic benefits (WEBs) are included. Given the high level of benefits expected to be derived from the project, there is a strong case for users to contribute to meeting its cost through the introduction of a toll. The business case does not propose introduction of a toll.

The proposed solution is expected to accommodate increased demand on the M4 for a period of 10 to 15 years. It is also expected to deliver other benefits, including by adding to Australia's experience in using technology to provide cost effective solutions to transport problems. This experience could inform the development of future managed motorways and other network optimisation projects.

Context and Problem Description

1. Strategic context

Congestion in Sydney is a nationally significant problem imposing considerable costs on the economy and the community. The *Australian Infrastructure Audit* (the Audit) projected that, in the absence of interventions to address the problem, the cost of congestion in the Sydney/Newcastle/Wollongong area would more than double from \$5.6 billion in 2011 to \$14.8 billion in 2031.

Finding innovative ways to improve the capacity and efficiency of existing infrastructure will be central to addressing Australia's congestion challenge. The *Australian Infrastructure Plan* noted that relatively modest investment focused on using technology to drive better use of the network can reduce congestion, deliver productivity gains and delay the need to build expensive new infrastructure capacity.

2. Problem

Demand on the M4 Motorway routinely exceeds capacity during peak periods. Traffic volumes on the section of the motorway that is the focus of this proposal vary between 64,000 vehicles per day at the western end and 153,000 vehicles per day near Parramatta. Transport modelling undertaken for the Audit noted that the corridor had a volume to capacity ratio of 1.1 in 2011 for both morning and afternoon peaks.

The impacts of the motorway's constraints are nationally significant. Greater Western Sydney currently accounts for almost 10% of Australia's population, and the M4 provides the area with an important connection for employment and other purposes.

Congestion on the motorway is chiefly the result of substantial population growth in Western Sydney. Projections prepared by the NSW Government suggest that the population of the M4 catchment area is expected to grow by around 490,000 people (or 44.5%) between 2011 and 2031. This is a higher rate of growth than that projected for Sydney and NSW as a whole over the same period.

Other drivers of demand on the corridor are anticipated, including employment growth associated with the development of Western Sydney Airport and the Western Sydney Employment Area, both of which are to the south of the M4 corridor. Development of WestConnex is also likely to increase demand for travel on the M4 corridor.

Without action, travel times on the motorway are projected to deteriorate. The proponent estimates that AM peak (eastbound) travel times for the section of the M4 addressed by the project will deteriorate from 58 minutes to 71 minutes between 2021 and 2031 in the absence of the project. Over the same period, travel time in the PM peak (westbound) is expected to deteriorate from 62 minutes to 71 minutes without the project.

Project description

3. Project overview

The proposed solution involves a range of measures aimed at making better use of existing infrastructure, and capacity augmentation, along a 35 km section of the M4 between Mays Hill (near Parramatta) and Lapstone at the base of the Blue Mountains. The better use components include:

- The introduction of Intelligent Transport System (ITS) measures, including ramp signals, vehicle detection devices, and electronic signage
- Upgrades to entry and exit ramps
- New freight bypass lanes at three entry ramps, westbound at the M7 and the Prospect Highway, and eastbound at Roper Road, Colyton
- A new communications and power 'backbone' along the motorway.

The proposed solution includes the construction of two additional lanes (one eastbound and one westbound) in the median along a 4.3 km section of the motorway between the Roper Road and Westlink M7 interchanges.

The primary objectives of the proposal are to improve travel time reliability, increase traffic throughput and improve traffic safety. Additional objectives for the proposal are to reduce vehicle emissions and enhance travellers' journey decision-making by providing real-time information on road conditions.

The introduction of smart motorways measures on the M4 Motorway has featured in several strategic planning documents released by the NSW Government, notably:

- Smart motorway investments on the M4, Southern Cross Drive and General Holmes Drive are a key recommendation in the *State Infrastructure Strategy Update 2014*.

- Implementing managed motorway technology on the M4 is an action in the NSW Government's *Long Term Transport Master Plan* published in 2012.
- The *NSW Freight and Ports Strategy* (published in 2013) recommended incorporating freight considerations into managed motorway access decisions, particularly for the M4.

Business Case and Economic Evaluation

4. Options identification and assessment

An initial options assessment for the M4 Motorway upgrade proposal was submitted to Infrastructure Australia in 2009 as part of a wider assessment of proposals for implementation of smart motorway solutions. Sixteen proposals from across the country were considered as part of that assessment, with the M4 proposal scoring second highest on a multi-criteria analysis.

The 2009 submission considered options ranging from land use planning, travel demand management, travel options (including public transport), infrastructure development and network efficiency. The initial options assessment for the M4 corridor concluded there was no plausible substitute for a managed motorways proposal.

The current submission to Infrastructure Australia focuses on comparing the smart motorway option to a 'do minimum' case, and has not revisited the wider set of options available. The current proposal reflects further review and refinement of the earlier proposition. It is both more ambitious and of substantially higher capital cost than previously envisaged. The cost increases for the current proposal reflect a number of changes in the initiative's scope since the 2009 submission, notably:

- Inclusion of the additional lanes on the M4 between Roper Road and the M7 interchange, because of a bottleneck at this point.
- Extensive works on 20 entry ramps to ensure sufficient storage of vehicles so that arterial roads do not become impacted by vehicles on entry ramps to the M4 and seven exit ramps to ensure queues do not occur. The ramp design in turn has reflected AustRoads' guidelines allowing for ramp storage capacity of four minutes of peak period traffic volumes.

5. Economic evaluation

The proponent's economic evaluation indicates the proposal has a benefit-cost ratio (BCR) of 5.3 using a 7% discount rate and P90 capital costs, excluding WEBs. Including WEBs, the BCR rises to 5.8. Parameters used in the economic evaluation are generally reasonable. However a more conservative approach to the estimation of benefits may have been warranted in some instances. These include:

- The modelling has not considered induced demand across the network. The inclusion of induced demand in the modelling can reduce project benefits if a project reaches capacity before the end of the evaluation period.
- The benefits of the proposal during non-peak periods are potentially overstated. The proponent has allowed for non-peak benefits to have the same magnitude as peak benefits for the times that motorway management is in operation. However, analysis for the Audit found that around two-thirds of congestion on the M4 occurs in peak periods.
- There is considerable uncertainty about the travel time impacts of smart motorway schemes. The proponent is intending to collate data on how the introduction of smart motorways changes the performance of the M4, which could be usefully shared to assist others in developing future proposals.

While Infrastructure Australia considers that the stated benefits could be higher than might be expected in practice, Infrastructure Australia is confident that the project will have overall net benefits.

Major cost items

The major cost elements are:

- Capital costs for M4 widening, interchange works, signals and controls, information and power backbone and motorway management
- Operating costs for the managed motorway system
- Routine and periodic maintenance of information technology.

Probabilistic costs estimates have been developed by the proponent. The estimates include significant contingencies for various construction risks, and provision for more general cost escalation. This approach provides confidence in the cost elements of the economic evaluation.

Total capital cost (nominal, undiscounted)	\$853 million (P90)
Proponent's proposed Australian Government funding contribution (nominal, undiscounted)	\$400 million
Other funding (source / amount / cash flow) (nominal, undiscounted)	The NSW Government has already allocated \$395m. The remaining \$58 million would also be provided by the NSW Government. No tolling is proposed.

Major sources of benefit

The economic evaluation considered the following benefits from the proposal:

- Travel time savings (\$2.4 billion net present value, 69% of benefits)
- Travel time reliability improvements (\$0.8 billion, 23% of benefits)
- Wider economic benefits (\$0.3 billion, 8% of benefits)
- Other benefits such as incident management and incident reductions (minimal).

Deliverability

The initiative would be delivered by the NSW Government, with procurement divided into three areas: civil works, intelligent transport systems, and motorway management system development and operation. The civil works would be delivered in stages that could be procured separately.

A review of environmental factors for the proposal has been prepared by the proponent. This formed the basis of public consultation on the proposal in early 2015.

The NSW Government commenced expression of interest processes for some packages of work (notably detailed design and documentation) in the third quarter of 2015. It has also developed plans to manage risks and realise benefits of the project. Conduct of a post-completion review (including reporting of a 'before and after' assessment of vehicle throughput and travel times) would ensure experience with this initiative informs development of other managed motorway and network optimisation proposals.

The business case does not propose introduction of a toll. Given the high level of benefits expected to be derived from the project, and the concentration of the flow of those benefits to users, there is a strong case for users to contribute to meeting the cost of the proposal through the introduction of a toll.

This evaluation summary was considered by the Infrastructure Australia Board in April 2016.

Following Infrastructure Australia's process of fact checking the evaluation summary with the proponent prior to publication, the brief was amended to clarify the number of entry ramps included in the project scope.