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Project business case evaluation summary

Bruce Highway – Maroochydore Road Interchange Project

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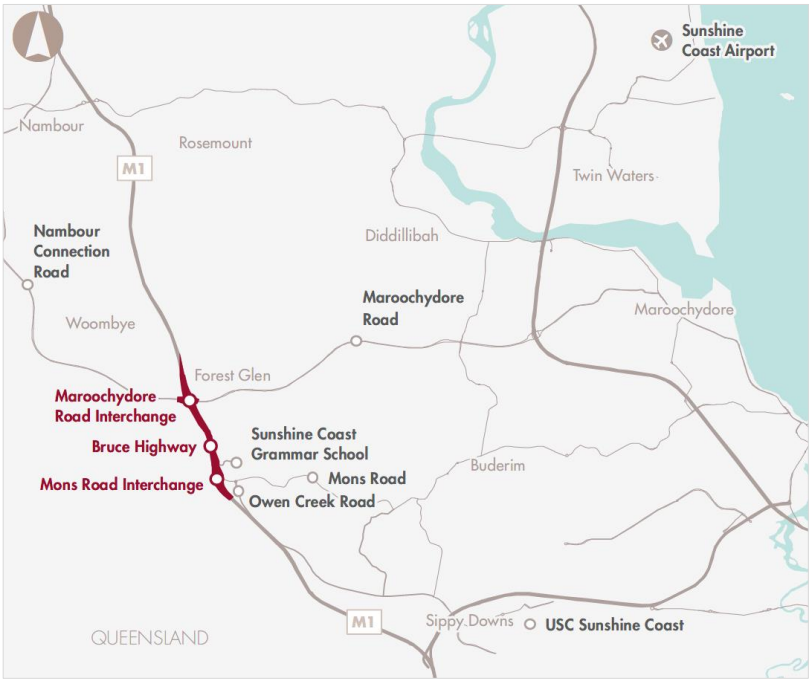

Proponent
Queensland Government

Location
Sunshine Coast, Queensland

Capital cost
$301 million (P90 outturn)

Indicative timeframe
Planning: Q1 2018
Construction: Q4 2019
Project completion by Q3 2022

1. Evaluation Summary

The **Bruce Highway Maroochydore Road Interchange Project** has been added to the Infrastructure Priority List as a **Priority Project**.

The Bruce Highway is part of the National Land Transport Network (NLTN) and is the major coastal road transport route between Brisbane and Cairns. On the Sunshine Coast, Maroochydore is connected to the highway via Maroochydore Road – a major east–west link for tourists and commuters. Just 420 metres south of where the Maroochydore Road intersects the highway, Mons Road connects to the highway and provides access for the residential suburb of Mons.

The Maroochydore Road and Mons Road interchanges are congested during peak periods, a problem which is partly due to the short distance between the interchanges. The configuration of this section of the highway also leads to drivers rapidly accelerating and slowing down at entry and exit ramps, which causes unstable traffic flows. This has led to a high number of accidents, with the crash rate in the project area reported to be more than twice the Bruce Highway average.

The Bruce Highway Maroochydore Road Interchange Project aims to address the congestion and safety issues at both interchanges by upgrading the Maroochydore Road interchange, reconfiguring entry and exit ramps at Mons Road, constructing new service roads and widening the Mons Road underpass.

The Queensland Government's business case states that the net present value (NPV) of the project is $529 million, with a benefit-cost ratio (BCR) of 3.21, using a 7% real discount rate and P90

capital cost estimate. Infrastructure Australia has evaluated the business case and is confident that the benefits of the project will exceed the costs. The project demonstrates strong strategic merit and the proponent's proposed delivery model is appropriate.

2. Context

The Bruce Highway is part of the NLTN and serves both local and regional traffic between Brisbane and Cairns. The highway is being progressively upgraded by the Australian Government and the Queensland Government, guided by the 10-year *Bruce Highway Action Plan* (2012). Developed by the Queensland Government, this plan sets out priorities to improve the capacity, safety and flood resilience of the highway.

The Sunshine Coast's population is projected to grow by around 2% each year to 2031. The number of visitors to the region is also forecast to increase, with tourism being a major economic driver for the Sunshine Coast region. Together, these increases will place further pressure on the region's road transport network. To cater for this growth, and address existing capacity and safety issues, the *Bruce Highway Action Plan* identified upgrading the Brisbane to Gympie section by 2022 as a priority.

This section of the highway intersects with Maroochydore Road and Mons Road. Maroochydore Road is an important east–west link for freight, tourists and commuters moving between Sunshine Coast communities and Brisbane or Gympie (via the Bruce Highway) and the Sunshine Coast hinterland. Mons Road provides access to the suburb of Mons and the Sunshine Coast Grammar School.

3. Problem description

The Bruce Highway interchanges at Maroochydore Road and Mons Road are congested and accident-prone. Trips are taking longer for users and are less reliable. Between 2001 and 2017, the number of crashes per road kilometre within the project area was twice the Bruce Highway average. These problems are largely caused by configuration of the intersections, their proximity to each other and the design of the on- and off-ramps.

At the Maroochydore Road interchange, it is difficult for drivers to safely exit from the southbound and northbound exit ramps, as high rates of acceleration and deceleration are required. Meanwhile, the curve of the southbound entry ramp onto the highway also makes it difficult for drivers to enter the highway safely. Together, these deficiencies make the intersection less safe for drivers and cause long queues of traffic.

The 420-metre distance between the Maroochydore Road and Mons Road entry and exit ramps is significantly shorter than that required by current Austroads standards (minimum spacing 1.5 – 2 km) and leads to excessive vehicle merging and weaving, further increasing safety issues.

At the Mons Road interchange, the southbound exit ramp from the Bruce Highway is close to the drop-off and pick-up areas for a school. This leads to a higher crash risk and congestion. Furthermore, a review of the three-way, signal-controlled intersection at Mons Road east found that it does not comply with current standards and presents a safety risk.

4. Options identification and assessment

The proponent considered a range of infrastructure options to address the problems using both multi-criteria analysis (MCA) and cost-benefit analysis (CBA).

Initially, during the Preliminary Evaluation, the proponent used MCA to assess the identified long-list of options. The refined list of options resulting from this process, and some new options introduced by the proponent, were then assessed using a second MCA. Infrastructure Australia was pleased to see the MCA incorporating both qualitative and quantitative measures, and that criteria were based

on service requirements that were previously defined in a Strategic Assessment of Service Requirement report. Based on this analysis, the proponent shortlisted four options for further consideration: a 'do nothing' base case, a 'do minimum' (interim early works) base case and two signalised roundabout options with different service road configurations: one option included a one-way northbound western service road and a one-way southbound eastern service road (Option 6), with the other being an eastern service road (Option 6A).

The proponent assessed these four options using CBA, which found that both Options 6 and 6A were economically viable, with Option 6 having a marginally higher NPV and BCR. This option was taken forward and investigated further in the business case. The business case also considered additional scope for improvements, which resulted in the following discrete packages:

- Base case – a 'do minimum' scenario which ensures the maintenance and rehabilitation of the existing infrastructure. This only includes committed and funded capital investment.
- Stage 1 – based on Option 6, upgrading the Maroochydore Road Interchange, including a new four-lane bridge, an improved roundabout, extended entry and exit ramps and new service roads.
- Pre-agreed Modification 1 – additional safety and efficiency improvements beyond Stage 1, including the widening of the Mons Road underpass to four lanes.
- Pre-agreed Modification 2 – additional upgrade of the Mons Road southbound entry ramp.

These packages were assessed in a final CBA as the following options:

- Option 1 = Stage 1 upgrade
- Option 2 = Stage 1 + Pre-agreed Modification 1
- Reference Case Option = Stage 1 + Pre-agreed Modifications 1 and 2.

The proponent's use of both MCA and CBA in shortlisting options helps demonstrate that the options taken forward to the business case are those that are most likely to benefit the Australian community.

5. Proposal

The proponent's preferred option (the Reference Case Option) comprises three distinct work packages:

- Stage 1:
  - At the Maroochydore Road intersection, constructing a four-lane west-to-east bridge with a shared user path over the Bruce Highway, reconfiguration and signalisation of ramp intersections and ramp upgrades.
  - Constructing two-way service roads on both sides of the highway between the interchanges.
  - Upgrading drainage under the Bruce Highway to manage water flow created by the service roads across the Eudlo Creek flood plain. The business case states that these works will deliver marginal flood immunity improvements for northbound lanes and significant improvements for southbound lanes. The drainage improvements will also support a future upgrade of this section of the Bruce Highway to Q100 flood immunity levels[1].
  - Removing north-facing ramps at Mons Road Interchange.
  - Extending Owen Creek Road between Mons Road and the Sunshine Coast Grammar School.
- Pre-agreed Modification 1:

[1] Q100 refers to a '1 in 100 year' flood. A '1 in 100 year' flood has a 1% (1 in 100) chance of being equalled or exceeded in any given year. It may also be referred to as having a 1% annual exceedance probability.

  - Widening the Mons Road underpass.
  - Relocating the Mons Road northbound exit ramp to Chevallum Road and upgrading the exit ramp/Chevallum Road intersection.
- Pre-agreed Modification 2:
  - Extending the Mons Road southbound entry ramp onto the Bruce Highway.

The proponent expects the project to deliver a range of benefits, including:

- reducing congestion at intersections and eliminating vehicles queuing onto the Bruce Highway
- helping to reduce angle, rear-end and on-curve crashes
- meeting community expectations, including for pedestrian and bicycle access and connectivity
- separating local and regional traffic, and protecting the integrity of the Bruce Highway as a national freight route
- complying with national guidelines (Austroads) for the treatment of crash locations.

6. Strategic fit

The upgrade is identified in the *Bruce Highway Action Plan* as a 'High Priority 1' action, which should be delivered within the first four years of the 10-year plan, under the 'Capacity Improvements' category.

The Maroochydore Road Interchange Project is expected to provide improvements in efficiency on the National Land Transport Network, improve safety on a section of the Bruce Highway with a high crash rate, improve access, connectivity and safety for local traffic by improving their separation from regional traffic, and provide benefits for freight traffic.

The project also aligns with Australian, state and local government policy and planning documents. For example, the Maroochydore Road Interchange Project contributes to the objective of the Australian Infrastructure Plan to upgrade urban passenger transport networks, by improving the capacity, safety and level of service of the road network. The project also aligns with the Queensland State Infrastructure Plan and the Queensland Department of Transport and Main Roads' Strategic Plan by improving regional connectivity and freight market access through a more integrated traffic network.

The proponent has engaged with a range of external stakeholders and the business case states that there is strong stakeholder support for the project. Community consultation has informed the reference design to enhance connectivity and safety outcomes. Overall, the business case demonstrates the strong strategic merit of the project.

7. Economic, social and environmental value

The proponent's economic, social and environmental analysis states an NPV of $529 million for their preferred option, with a BCR of 3.21 when using a real discount rate of 7% and P90 capital costs. The vast majority of the estimated benefits from the project are travel time savings (84% of total benefits) and vehicle operating costs savings for users (15%). There is a small (-0.1%) externality disbenefit due to a small increase in vehicle kilometres travelled.

The economic analysis suggests that the additional scope packages have costs greater than their benefits. The Stage 1 option had the highest NPV and BCR of the three options included in the CBA. However, the proponent has stated that additional packages would improve road safety and efficiency at the intersections, and have therefore been included in their preferred option. The preferred option is still expected to deliver benefits in excess of costs.

The business case indicates that the project will be effective in addressing congestion issues at the intersections, with travel time savings representing 84% of the estimated project benefits. Avoided

crash costs represent 1% of project benefits, due to the relatively high proportion of low impact crashes in this section of the Bruce Highway. That is, while there are more crashes in this section of the highway, they tend to be relatively less severe.

Our evaluation also noted that a significant proportion (61%) of the estimated travel time savings go to vehicles assumed to be queueing outside the simulated transport model. This queueing occurs as the extent of congestion on the simulated traffic network exceeds the network's modelled capacity. We recommend that the proponent define transport model areas to capture the full extent of traffic congestion in the appraisal of future projects.

The transport model simulates traffic over a two-hour AM and four-hour PM peak period to represent an average weekday. Traffic flows outside of peak periods were not modelled, and the proponent did not use a daily expansion factor to capture the inter-peak and off-peak in the appraisal. An annualisation factor was applied to estimate the traffic patterns for these periods over each year. Not measuring or accounting for off-peak and inter-peak periods underestimates the project's benefits, and we strongly recommend the proponent capture these benefits in future business cases.

Taking these limitations into consideration, Infrastructure Australia remains confident that the benefits of the project will significantly exceed its costs.

Benefits and costs breakdown

Proponent's stated benefits and costs		Present value ($m, 2017) @ 7% real discount rate		% of total
Benefits				
Travel time savings		$642.7		83.5%
Vehicle operating cost (VOC) savings		$117.2		15.3%
Avoided crash costs		$8.1		1.0%
Residual values		$1.8		0.2%
Externalities		- $0.4		- 0.1%
Total Benefits[1]		**$769.3**	(A)	**100%**
Capital costs (P90)		$239.0		99.5%
Operating costs[2]		$1.2		0.5%
Total Costs[1]		**$240.2**	(B)	**100%**
Core results	**Net benefits - net present value (NPV)[3]**	**$529.0**	(C)	n/a
	Benefit-cost ratio (BCR)[4]	**3.21**	(D)	n/a

Sources: Proponent's business case
(1) Totals may not sum due to rounding.
(2) Operating costs are incremental to the Base Case.
(3) The net present value (C) is calculated as the present value of total benefits less the present value of total costs (A − B).
(4) The benefit–cost ratio (D) is calculated as the present value of total benefits divided by the present value of total costs (A ÷ B).

A breakdown of the proponent's reported capital costs and funding is presented in the following table.

Capital costs and funding	
Total capital cost	$301 million (P90, nominal, undiscounted)
Proponent's proposed Australian Government funding contribution	$241 million
Other funding	$60 million (Queensland Government contribution)

Sources: Proponent's business case

8. Deliverability

The Queensland Government's Department of Transport and Main Roads (TMR) will lead delivery of the project. The proponent assessed various delivery options, including a Transport Infrastructure Contract – 'construct only', a Design and Construct contract with early contractor involvement, and competitive alliance contracts. This analysis indicated that a 'construct only' contract is the preferred delivery model for the project for the following reasons:

- There is limited scope for innovation given the characteristics of the project.
- A 'construct only' contract model offers the best project delivery timeframes.
- Interactive delivery models impose significant pressure on internal resources and would yield limited benefits given the nature of the project.
- TMR is best placed to handle risks and sensitivities in areas such as managing property impacts.
- The transfer of risk associated with an interactive model does not offer sufficient benefits in the context of this project.

Infrastructure Australia considers that a 'construct only' contract delivery model is appropriate given the reasons outlined by the proponent. The contract would be managed by TMR, which has extensive experience in delivering similar major highway and road upgrades. The proponent has developed a governance structure to guide the delivery of the project in accordance with TMR's internal project management framework. It includes standard project roles (project control group, Project Director and Project Manager), in addition to a project steering committee.

The proponent has undertaken a detailed environmental assessment process for the proposed project, documented in an Environmental Scoping Report, a Preliminary Ecological Assessment Report and a Review of Environmental Factors. This process identified a range of risks, seven of which were rated as medium or high. These risks included potential impacts on creek systems, and fauna and flora listed under the Nature Conservation Act.

Having identified these risks, the proponent referred the project to the Australian Government Department of the Environment and Energy, which decided the project does not require approval under the Environmental Protection and Biodiversity Conservation Act 1999. The risks will therefore be managed under appropriate state or local government environment approval frameworks. The proponent has documented this process in an Environmental Management Plan and in the Environmental Design Report.

The proponent assessed the potential to attract private funding and concluded that it was highly unlikely that there would be scope for greater value for money through the use of a privately-financed model. The proponent has not investigated opportunities for direct user funding, i.e. tolling of the project as road usage charges are inconsistent with Queensland Government's project funding decisions regarding major roads such as the Bruce Highway.

The business case includes a benefits management plan, but does not include a full Post Completion Plan. The proponent has committed to undertaking a benefits management process throughout the project lifecycle and completing a Post Completion Review. We encourage the proponent to assess the extent to which expected project benefits and costs have been realised and publish the Post Completion Review to inform the development of future projects.