Australian Government | Infrastructure Australia

Project business case evaluation summary

Bruce Highway: Caboolture-Bribie Island Road Interchange to Steve Irwin Way Interchange Project

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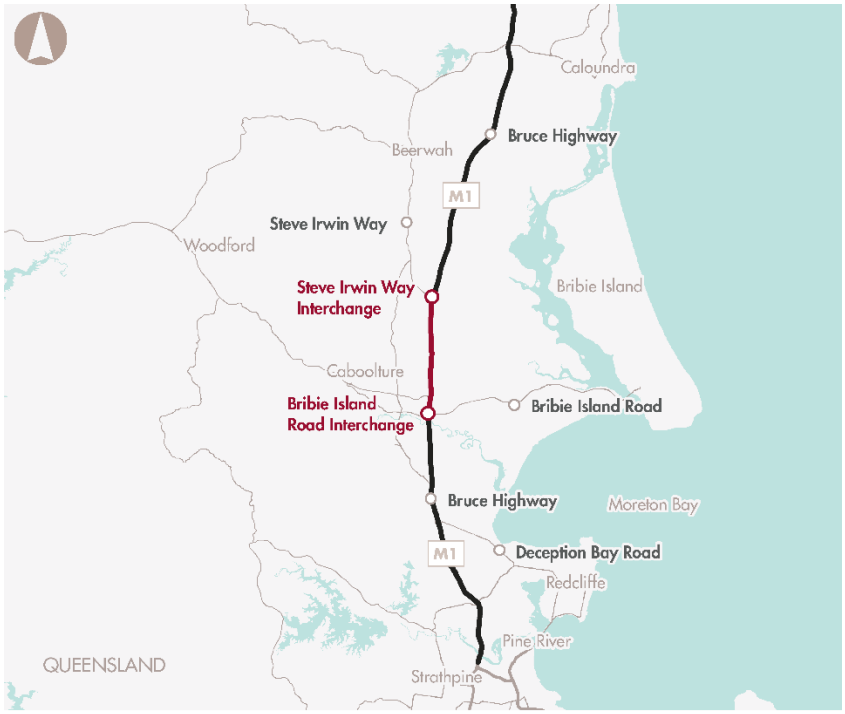

Proponent

Queensland Government

Location

South East Queensland

Capital cost

$614.9 million (P90, nominal)

Indicative timeframe

Detailed design: Q2 2019
Construction: Q1 2020
Project completion by: Q2 2022

1. Evaluation Summary

The **Bruce Highway: Caboolture-Bribie Island Road Interchange to Steve Irwin Way 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 primary north-south route for regional and local traffic on the east coast of Queensland between Brisbane and Cairns. In 2012, the Australian Government and Queensland Government committed to progressively upgrading the highway and its interchanges to meet modern design standards and to improve its resilience, reliability, efficiency and safety.

Infrastructure Australia recognises the strategic importance of the highway, with a program of works on the Bruce Highway Upgrade included as a Priority Initiative on the Infrastructure Priority List.

The 11-kilometre section of the highway between the Caboolture-Bribie Island Road interchange and the Steve Irwin Way interchange (Exit 163) serves commuter and freight traffic on weekdays and significant tourist traffic on weekends. This section of the highway is heavily congested at peak times, particularly on weekends, resulting in longer than usual and less reliable journeys for users. It is also severely affected by flooding events and is the highest crash rate section of the highway

between Brisbane and the Sunshine Coast. These issues are expected to worsen as the population living in the surrounding regions increases and traffic volumes grow.

The proposal is to widen the highway from two to three lanes in each direction, improve the design standards of the road to improve safety, and replace existing bridges to improve flood resilience.

Infrastructure Australia considers that the project has strong strategic merit. Our analysis found that the quantified benefits in the business case were understated and we are therefore confident that the social, economic and environmental benefits will exceed the costs. The proponent's stated net present value (NPV) for the project is $422 million, with a benefit-cost ratio (BCR) of 1.91 (using a 7% real discount rate and P90 capital costs). The proposed delivery model is appropriate, and risks are manageable, with the proponent experienced in delivering projects of a similar nature on the Bruce Highway.

2. Context

The Bruce Highway is the major north–south transport route 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).

The section between Pine River, on the outskirts of greater Brisbane, and Caloundra, on the southern edge of the Sunshine Coast, is an important part of the Bruce Highway as it connects metropolitan Brisbane to the growing regional areas of Moreton Bay and the Sunshine Coast. This 60-kilometre section of the highway currently has at least three lanes in each direction south of Caboolture with two lanes in each direction north of Caboolture and is the through-route to Gympie and northern communities beyond, particularly for freight traffic. The 2019 *Australian Infrastructure Audit* found that this section of the Bruce Highway is expected to become the third most congested in southeast Queensland by 2031 in terms of total delay hours.

The Queensland Government's Department of Transport and Main Roads (TMR) completed a strategic assessment of the corridor in 2016, which confirmed the need for action between Pine River and Caloundra. Planning and delivering for this program of works was separated into two discrete packages, with the section between Caboolture-Bribie Island Road interchange and the Steve Irwin Way interchange forming part of Package 2. This 11-kilometre section has two lanes in each direction, with a wide grassed median and four interchanges. It supports several transport functions, including:

- Long-distance trips and freight movements between Brisbane and regional Queensland
- Medium-length trips between south-east Queensland regions, including commuter, tourist and weekend traffic, which rely heavily on the highway due to limited public transport options, alternative routes and high car dependency
- Short-distance trips between local communities, due to lack of connecting local roads.

3. Problem description

Traffic volumes on the highway currently exceed capacity at peak times, which include both weekends (particularly during school holidays) and weekdays. From 2023 to 2031, average travel speeds are forecast to worsen from 94 km/h to 53 km/h in the weekday evening, and from 42 km/h to 30 km/h during the Sunday peak.

This section of the highway also has the highest crash rate[1] of the 60-kilometre section between Pine River and Caloundra. Between 2012 and 2017, 52 crashes were recorded. By 2031, crash rates are forecast to increase by 50%.

[1] Per 100 million vehicle kilometres travelled.

Poor flood immunity is also a problem for this part of the highway – it is rated as the most flood-affected section of the highway between Brisbane and Gympie, with bridges across five creeks well below the 1% Annual Exceedance Probability (AEP)[2] flood level. Highway closures due to flooding have averaged approximately 13 hours per year over the period from 2010 to 2017. When flooding or incidents close the highway, or traffic slows from congestion, the impact on users is high as there is no reasonable bypass or detour.

Urban expansion and increasing road freight are expected to generate traffic beyond the operating capacity of the existing infrastructure, with the populations of Moreton Bay and the Sunshine Coast anticipated to grow to more than 50% higher than 2011 levels by 2036. Without interventions, the highway will become more congested under normal conditions and severely congested when disrupted. Within five years, weekday commuter volumes during peak hours will exceed the capacity of the two highway lanes, slowing commuter trips, reducing the efficiency of road freight and impeding the economic productivity of the region.

4. Options identification and assessment

As part of the Preliminary Evaluation completed in August 2017, the proponent identified 28 infrastructure and non-infrastructure options for the project. These options were assessed against their ability to realise the project's objectives of: safety improvement; operational efficiency; and reliability (including road closures during flooding). No individual options were found to meet all three project objectives, and therefore a combination of bridge and alignment treatment options was required.

The shortlisted treatments for the potential bridge construction and alignment solutions for the entire length of the project were assessed through a multi-criteria analysis (MCA), with scoring and weighting components, to determine a preferred option.

The bridge options involved:

- "Online" widening of existing bridge assets i.e. within the existing road corridor, requiring continual management of traffic movements
- Construction of new bridges "offline" but in stages i.e. adjacent to the existing road corridor, reducing land resumption requirements
- Construction of new bridges fully offline i.e. outside the existing road corridor.

The proponent selected new bridges, constructed fully offline, as the preferred bridge option given that it minimised disruption to traffic during construction.

The three alignment options considered in the MCA, which incorporated the preferred bridge option, were:

- Option 3A – New southbound carriageway fully offline, east of the existing carriageway, and new northbound carriageway on the existing northbound carriageway
- Option 3B – New southbound carriageway fully offline, east of the existing carriageway, and new northbound carriageway on the existing southbound carriageway
- Option 3C – New southbound carriageway offline at bridges only, then back onto the existing carriageway, and new northbound carriageway on the existing southbound carriageway.

The preferred option, Option 3A, was subject to further review and enhancement to develop the reference project for the business case. Economic and risk analysis was only undertaken on the preferred option in the business case.

[2] [2] A 1% annual exceedance probability means there is a 1% chance of the highway being flooded in any year.

Infrastructure Australia considers the use of a qualitative MCA alone to not be a sufficiently rigorous means of option assessment and scope definition. We recommend using quantitative analysis, such as rapid cost-benefit analysis, to shortlist the options which are most likely to benefit the Australian community.

Infrastructure Australia's Assessment Framework (IAAF) also recommends assessing at least two project options (plus a base case) in the detailed cost-benefit analysis within the final business case. A detailed investigation of at least two feasible options would have given decision makers greater confidence that the proponent has selected the most effective and highest value-for-money solution. We note that the proponent finalised the business case in April 2018 (one month after the IAAF was updated), with the options analysis completed in August 2017.

5. Proposal

The proponent aims to improve the efficiency and safety of this section of the Bruce Highway through the following package of work:

- Expansion from a four-lane cross-section to a six-lane motorway-standard highway
- Allowance for a wide centre median, emergency stopping bays and safety barriers
- Realigned interchange entry and exit ramps
- New bridge structures, and creek crossing upgrades, built to withstand 1% AEP flood height levels and climate change
- Modification of the Caboolture-Bribie Island Road interchange southbound exit ramp
- The new Beerburrum Creek southbound bridge will be constructed to suit future upgrades of the highway to the north.

The proposal also supports implementation of Smart Motorways technology infrastructure. A separate and broader project will lead, inform and guide the delivery of Smart Motorways technologies for the highway between Pine River (to the south) and Caloundra Road interchange (to the north).

By 2031, the proponent expects the project to improve the average weekday evening peak travel speeds for this section of the Bruce Highway by 58%, from 52km/h to 83km/h. For the Sunday peak, the proponent forecasts travel speeds to improve by 67% on average, from 30km/h to 51km/h. The proponent suggests that there could be further average speed improvements with future upgrades to adjacent sections of the highway.

Modelling undertaken by the proponent also indicates that the project will:

- Address current and emerging safety issues, reducing future projected crash costs by 40%
- Improve flood immunity, removing the need for closures due to flooding.

We note that the allowance for future implementation of intelligent transport systems will contribute to better use of the existing asset.

6. Strategic fit

The project aligns with key national, state and local plans and priorities. Upgrading the Bruce Highway from Pine River to Cooroy (north of the Sunshine Coast) was listed in TMR's 10-year *Bruce Highway Action Plan* (2012), with the section between Pine River and Caloundra subsequently defined in the Australian and Queensland government's combined *Bruce Highway Upgrade Program*.

Upgrading the Bruce Highway is also identified on the Infrastructure Priority List as a Priority Initiative, and is recognised in key federal, state and government policy and planning documents, including the *Australian Infrastructure Plan* (2016)*, Queensland State Infrastructure Plan* (2018)*,*

ShapingSEQ: South East Queensland Regional Plan (2017)*, South East Queensland Regional Transport Plan* (2018) and *Moreton Bay Regional Council Planning Scheme* (2016).

The Bruce Highway Planning Project includes three discrete packages of work:

- Package 1: Bruce Highway Smart Motorway Stage 2: Pine River to Caloundra Road Interchange
- Package 2: Caboolture–Bribie Island Road Interchange to Caloundra Road Interchange Upgrade
- Package 3: Pine River (Gateway Motorway) to Caboolture–Bribie Island Road Interchange Upgrade.

This project is part of Package 2, and is therefore part of an integrated program of work on the corridor. Planning is underway to widen the highway further north to Caloundra Road interchange (the remainder of Package 2), as well as south to the Deception Bay Road interchange (part of Package 3).

The project supports delivery of Smart Motorways infrastructure in alignment with Package 1, Smart Motorways. The design allows for implementation on the on- and off-ramps at the interchanges as well as on the highway itself. The costs and benefits of Smart Motorways have not been included in this business case, as this will be investigated in the separate Package 1 business case.

In addition to supporting a range of national, state and local plans and priorities, the project would relieve congestion, and improve safety and freight efficiency. It will also support growth of the communities on the Sunshine Coast and improve access to employment, particularly those travelling to Brisbane, which in turn has flow-on economic and social benefits.

Overall, with the Bruce Highway being part of the NLTN, and the project being a part of a program of corridor works between Brisbane and the Sunshine Coast, the business case demonstrates that there is strong strategic merit for the project.

7. Economic, social and environmental value

The proponent's economic evaluation of the project indicates an NPV of $422 million, and a BCR of 1.91 using a 7% real discount rate and P90 capital cost estimate.

The benefits measured in the cost-benefit analysis are standard for a road project of this scale and have been estimated mostly in-line with the IAAF. The vast majority of the stated benefits are travel time savings (93% of the project's total benefits). A significant share of these benefits are for Sunday travellers (29%), which reflects the large volume of tourism and leisure travel on this section of the highway.

The proponent used three tiers of models to determine traffic volumes and road network performance. The traffic assessment used strategic and mesoscopic regional models for Moreton Bay and the Sunshine Coast, as well as a microscopic model for the project. We consider the modelling approach to be reasonable given the influence of these areas on traffic movements on the highway. The modelling did not include induced traffic as new travel movements are not expected to occur as a result of the project.

Our review of the economic appraisal found that the user benefits of the project are understated. Although the proponent's assessment included weekend and weekday travel peaks, it did not consider the inter-peak and off-peak periods. Quantifying these impacts for an entire day is likely to result in benefits higher than those presented in the business case. The estimated benefits of the project were also held constant after 2031, the last year of demand modelling, and therefore do not capture any benefits associated from population growth after this time.

Overall, recognising that the benefits could be higher than those presented in the business case, Infrastructure Australia is confident that the social, economic and environmental benefits of the

project will significantly exceed its costs. We note that a more thorough analysis of the project's benefits would have presented a stronger case for the value of the project.

The following table presents a breakdown of the proponent's stated benefits and costs, noting that:

- The negative externality benefit is driven by a small increase in the forecast vehicle kilometres travelled under the project scenario. In other words, more vehicle kilometres from the project will lead to higher external costs (e.g. local air pollution)
- There will be increased maintenance costs due to the greater pavement area as a result of the project.

Our evaluation also found that the business case identifies flooding and safety as major issues for this area, but they only make up about 4% of the total benefits[3] of the project.

Benefits and costs breakdown

Proponent's stated benefits and costs	Present value ($m,2017) @ 7% real discount rate		% of total
Benefits			
Travel time savings benefit	834.1		93%
Vehicle operating cost savings	28.1		3%
Reduced accident costs	25.9		3%
Avoided road closures due to flooding	5.8		1%
Residual value	3.6		0%
Externality benefits (such as environmental emissions)	-0.4		-0%
Total Benefits[1]	**897.1**	(A)	**100%**
Capital costs (P90)	464.9		98%
Operating and maintenance costs	10.3		2%
Total Costs[1]	**475.2**	(B)	**100%**
Net benefits - net present value (NPV)[2]	**421.9**	(C)	n/a
Benefit-cost ratio (BCR)[3]	**1.91**	(D)	n/a

Sources: Proponent's business case
(1) Totals may not sum due to rounding.
(2) The net present value (C) is calculated as the present value of total benefits less the present value of total costs (A – B).
(3) 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 table below.

Capital costs

Capital costs and funding[4]	
Total capital cost	$614.9 million (P90, nominal, undiscounted)
Proponent's proposed Australian Government funding contribution	$491.9 million
Other funding	$123.0 million (Queensland Government)

The cost estimate has undergone both internal Queensland Government and external peer reviews, which indicated that the costs were appropriate for the project.

[3] It is noted that the safety benefits exclude reduction to property damage as data was not available
[4] The project's capital cost has been revised from the original funding commitment of $662.5 million made in the 2017-18 Federal Budget, involving an 80:20 funding arrangement of $530 million Australian Government funding, and $132.5 million Queensland Government funding.

8. Deliverability

Three procurement options were assessed by the proponent for the delivery contract:

- Transport infrastructure contract – construct only (TIC-CO)
- Design and construct
- Design, construct and maintain.

The proponent explored a user-pays Public Private Partnership (PPP) model in the preliminary evaluation. However, this was not considered appropriate given that a user-pays PPP was unlikely to deliver additional value to Queensland when compared to public sector, or traditional delivery methods.

The proponent has selected a TIC-CO model given that the project has limited scope for innovation and that other delivery models would be more expensive in terms of contract administration and risk management. Infrastructure Australia considers that the proposed delivery model is appropriate. The contract would be managed by the proponent, who has extensive experience in delivering similar major highway and road upgrades, including on the Bruce Highway.

The approach adopted for managing project risk is consistent with TMR's Risk Management Framework. A risk analysis for the project was undertaken in accordance with Queensland Government guidance material and TMR's Project Cost Estimating Manual.

The environmental assessment undertaken for the project found that it is unlikely to have significant residual impact on matters of national or state environmental significance. While revocation of State Forest and land acquisition are project risks, the proponent has existing practices to mitigate and manage these matters through previous experience.

The business case includes a benefits management plan. The proponent has committed to undertaking a benefits management process throughout the project lifecycle and completing a Post Completion Review. Infrastructure Australia encourages the proponent to undertake and publish a Post Completion Review to assess the extent to which expected project benefits and costs have been realised. This will help inform the development of future highway projects.