Australian Government | Infrastructure Australia

Project business case evaluation summary

Bruce Highway – Deception Bay Road Interchange Upgrade

23 August 2019

Proponent

Queensland Government

Location

South East Queensland

Capital cost

$152.1 million (P90, outturn)

Indicative timeframe

Detailed design: Q4 2019
Construction: Q2 2020
Project completion by: Q2 2022

1. Evaluation Summary

The **Bruce Highway – Deception Bay Road Interchange Upgrade** 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. In 2012, the Australian Government and Queensland Government committed to progressively upgrading the highway and its interchanges to meet modern design standards and improve its capacity, reliability and safety.

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

The Deception Bay Road Interchange is located approximately 35 kilometres north of Brisbane Central Business District and 12 kilometres south of Caboolture, and connects Deception Bay Road with the Bruce Highway. It is an important connection for commuters travelling to and from Moreton Bay and surrounding regional areas, and also serves freight trips between the industrial areas of Moreton Bay and Brisbane City.

As a result of growing traffic, the interchange is heavily congested during the morning and evening peak periods. Traffic queues back up along exit ramps and can sometimes block lanes on the Bruce Highway. In addition to significant congestion, there is also a safety problem at the interchange, with 255 reported crashes on the highway or on the nearby connector roads over the decade to 2017. These are issues that are likely to worsen as the populations of Moreton Bay and its surrounding regions grow and increase pressure on the road network.

The Deception Bay Road Interchange Upgrade proposes new parallel bridges over the Bruce Highway, upgrading signalised intersections on Deception Bay Road and increasing the length and capacity of existing entry and exit ramps.

The Queensland Government's economic evaluation of the project reports a net present value (NPV) of $234 million, with a benefit-cost ratio (BCR) of 3.03 using a 7% real discount rate and P90 capital costs. Infrastructure Australia considers that the project has strategic merit and is confident that the benefits of the project will exceed its costs and that the proposed delivery model is appropriate.

2. Context

The Bruce Highway is the major north–south transport route between Brisbane and Cairns, and is part of the NLTN. 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 interchange is located on a section of the highway that connects the growing communities of Moreton Bay and the Sunshine Coast to Brisbane. In 2017, the section of the highway from Pine River Bridge to Deception Bay interchange recorded an annual average daily traffic (AADT) of over 100,000, with heavy vehicles accounting for 8-10% of these trips. It is a critical interchange for north–south and east–west travel in the region, and is particularly important for commuter trips from Moreton Bay and surrounding regional areas. The Sunshine Coast Region is the third most popular tourist region for domestic visitors in Queensland, and the fourth most popular region for international visitors.

The interchange also serves as a distributor for subregional and local freight trips between the industrial areas of Moreton Bay and Brisbane City.

Traffic volumes have increased due to population growth in South East Queensland (SEQ), particularly in the Moreton Bay and Brisbane City local government areas. These areas are expected to continue growing, with populations forecast to increase by 33% and 50% respectively from 2016 to 2041 (or by 1.1% and 1.6% each year, on average). This growth has compromised the Bruce Highway's ability to safely and efficiently cater for major regional and local traffic.

3. Problem description

The interchange does not have enough capacity for the traffic it carries during the morning and evening peak periods. By 2021, average travel speeds are forecast to worsen to 39 kilometres per hour (kph) and 32kph in the morning and evening peaks respectively, further reducing to 23kph in the morning and evening peaks by 2031.

Currently, the interchange comprises an east-west, two-lane bridge (one in each direction) over the Bruce Highway and connects to the highway with entry and exit ramps in both directions. It also intersects with Old Gympie Road to the west of the highway and the Eastern Service Road to the east, but both intersections are situated close to the ramps. This means that queues for the exit ramps sometimes extend back onto the Bruce Highway, forcing drivers to merge into the median-side lanes and increasing safety risks.

Over the decade to 2017, there were 255 crashes on the Bruce Highway at the project location or on the connector roads. This is higher than has been experienced at other major interchanges on the highway over the same period.

The business case also identifies the following issues:

- Flooding – This section of the Bruce Highway can flood during large rainfall events, which can either slow trips or cause major delays for users if the road is closed. However, the interchange itself has a low annual flood risk rating and the business case has not demonstrated whether the impacts of flooding are a significant or frequent problem.
- Active Transport – Active transport provisions were identified as a service need in the project area, and community members and stakeholders confirmed this need during consultation.

Without intervention, the interchange will become more congested and force more queuing onto the national highway, reducing its safety, capacity and efficiency.

4. Options identification and assessment

The proponent identified 21 potential options to address capacity issues during a preliminary evaluation phase, with five options shortlisted for detailed assessment. A detailed multi-criteria assessment (MCA) was conducted to select the preferred option, but the strategic cost estimate for this option exceeded the committed joint-government funding of $150 million (Australian Government funding capped at $120 million in an 80:20 arrangement).

To better meet the funding available, the proponent developed two alternatives based on the preferred option, but with slightly reduced scope:

- Option 16S – a new multi-lane bridge crossing and a new partial clover interchange (excluding new entry/exit ramps and grade separation at Old Gympie Road). This option will not address the flooding issues identified for the study area.
- Option 16I – Option 16S plus longer dual-lane entry and exit ramps, improved flood protection at Little Burpengary Creek, and a new continuous-flow western intersection to replace the four-phase signals at Old Gympie Road.

Economic and risk analysis was only undertaken in the business case for Option 16S (the project), as the costs for Option 16I still exceeded the budget.

Infrastructure Australia's Assessment Framework recommends considering at least two project options (against a base case) in the detailed economic appraisal for a business case to ensure that the best option is identified. Although Option 16I may have exceeded the budget envelope, assessing its benefits against its costs would have led to a more robust options selection process. For instance, in comparison to Option 16S, a relatively small increase in capital for this option could have achieved substantially more benefits – including improved flood immunity, which the project does not provide.

The use of MCA alone is also not the most rigorous means of option identification and scope definition. We recommend using quantitative analysis, such as rapid cost-benefit analysis, to identify and shortlist options which are most likely to benefit the Australian community.

5. Proposal

The proponent aims to improve the efficiency and safety of this section of the Bruce Highway by:

- Upgrading the existing interchange with two new two-lane parallel bridges over the highway and removing the existing two-lane bridge
- Upgrading two signalised intersections on Deception Bay Road, immediately west of the interchange at Old Gympie Road and immediately east of the interchange at Eastern Service Road
- Increasing the length and capacity of existing entry and exit ramps

- Provision of a new active transport cycle and pedestrian bridge and a shared path down all major connector roads to the intersection.

The proponent expects the project to improve the average peak hour travel speeds at the interchange, with the evening peak improving by over 100% by 2031 (from 23kph to 50kph), and addressing current and emerging safety issues by reducing projected crash rates by over 40%.

Due to funding constraints, works to enhance traffic flow and deliver a higher standard of flood immunity at Little Burpengary Creek were excluded from the scope. The business case notes that these improvements could be incorporated if additional funding is made available.

6. Strategic fit

The project aligns with key national, state and local plans and priorities. It is incorporated within the *Bruce Highway Action Plan* as part of the 'High Priority 2' initiatives to be delivered between 2017 and 2019. There are no critically interdependent projects associated with this project.

Upgrading the Bruce Highway is also identified in the Infrastructure Priority List as a Priority Initiative, and is specifically identified in key federal, state and government policy and planning documents, including the *Australian Infrastructure Plan, Queensland State Infrastructure Plan, ShapingSEQ: South East Queensland Regional Plan, South East Queensland Regional Transport Plan* and *Moreton Bay Regional Council Planning Scheme.*

In addition to supporting a range of national, state and local plans and priorities, the project will relieve congestion, and improve safety and freight efficiency. It will also improve access to employment for the Moreton Bay community, which in turn has flow-on economic and social benefits.

The proponent has consulted stakeholders who would be impacted by the project, and community consultation has informed the design.

Overall, the business case demonstrates that there is strong strategic merit for the project.

7. Economic, social and environmental value

The proponent's economic, social and environmental evaluation of the project indicates an NPV of $234 million, and a BCR of 3.03 using a 7% real discount rate and P90 capital costs.

The benefits measured in the cost-benefit analysis are standard for a road project of this scale and have been estimated in line with Infrastructure Australia's Assessment Framework. The majority of the stated benefits are travel time savings (67% of the project's total benefits) and vehicle operating cost savings for users (25%).

Our review of the economic appraisal suggests that the user benefits of the project are understated. The proponent's assessment only considered impacts during the morning and evening peaks on weekdays. Considering impacts across the whole day, and the weekend, would lead to higher benefits than those presented in the business case. Although non-peak periods typically have less traffic and therefore lower benefits, the large regional tourism usage of the interchange on weekends means that the unquantified non-peak period benefits of the project may be significant. In addition, the benefits of improved active transport facilities was omitted from the appraisal.

Conversely, our analysis found that crash costs may be over-stated and that disruption costs were not assessed, although these issues are unlikely to have a material impact on the appraisal outcome.

Relative to typical results of road projects, our assessment observed that:

- Reduction in crash costs make up a high proportion (8%) of overall benefits
- Business trips make up a high proportion of overall travel time savings.

These results are considered reasonable for the location and usage of this section of the Bruce Highway. As the region is growing rapidly, there is a significant light industry footprint and all road freight being transported between Brisbane and Central and North Queensland utilise the Highway.

In summary, Infrastructure Australia is confident that the social, economic and environmental benefits of the project will significantly exceed its costs.

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

- The negative externality benefit is driven by a marginal increase in the forecast vehicle kilometres travelled under the project scenario
- There will be increased maintenance costs due to the greater pavement area created as a result of the project.

Benefits and costs breakdown

Proponent's stated benefits and costs		Present value ($m,2018/19) @ 7% real discount rate		% of total
Benefits				
Travel time savings benefit		$235.6		67%
Vehicle operating cost savings		$86.0		25%
Reduced accident costs		$27.0		8%
Residual value		$2.0		1%
Externality benefits (such as environmental emissions)		- $0.5		0%
Total Benefits[1]		**$350.1**	(A)	**100%**
Capital costs (P90)		$115.3		99%
Operating and maintenance costs		$0.9		1%
Total Costs[1]		**$116.1**	(B)	**100%**
Core results	**Net benefits - net present value (NPV)[2]**	**$234.0**	(C)	n/a
	Benefit-cost ratio (BCR)[3]	**3.03**	(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	
Total capital cost	$152.14 million (P90, nominal, undiscounted)
Proponent's proposed Australian Government funding contribution	$120 million (P90, nominal, undiscounted)
Other funding	$30 million (P90, nominal, undiscounted), Queensland Government The Queensland Government has indicated that further work will be undertaken to reduce the total capital cost to achieve the total funding commitment of $150 million.

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

8. Deliverability

Three procurement options were assessed for the delivery contract:

- Transport infrastructure contract – construct only
- Design and construct, including with early contractor involvement
- Competitive alliance contracting.

The proponent has selected a Transport infrastructure contract – construct only model given that:

- the project has limited scope for innovation
- a compressed timeframe favours a construct only delivery model
- project risks, issues and sensitivities (particularly relating to property impacts and compatibility with future upgrades) are best handled by the Queensland Government
- the risk transfer inherent in interactive models is unlikely to generate sufficient benefits to outweigh the costs of the model.

This delivery model was supported by participants in a market-sounding process completed for the project. Infrastructure Australia agrees with the approach, given the reasons outlined by the proponent, and notes that the proponent has extensive experience in delivering similar major highway upgrades.

The approach adopted for managing project risk is consistent with the Queensland Government Department of Transport and Main Roads' Risk Management Framework. A risk analysis for the project was undertaken in accordance with Queensland Government guidance material and the department's Project Cost Estimating Manual (PCEM). A contingency of approximately $41 million (40% of the base estimate) has been included in the forecast total cost of the project (P90 costs), which is consistent with PCEM Guidelines.

The business case submitted by the proponent includes a Review of Environmental Factors (REF) and an Environmental Management Plan. The REF identified key environmental risks and impacts associated with the project, finding that an area of non-juvenile koala habitat trees would be cleared. With the implementation of mitigation measures, such as species management programs and a financial or land-based offset for the loss of koala habitat, the residual environmental impacts were assessed in the REF as negligible to moderately adverse. Consideration during delivery of a fauna crossing of Deception Bay Road has the potential to both discharge offset obligations and provide ongoing fauna movement opportunities.

The business case includes a benefits management plan, but does not include a full Post Completion Review 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 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.