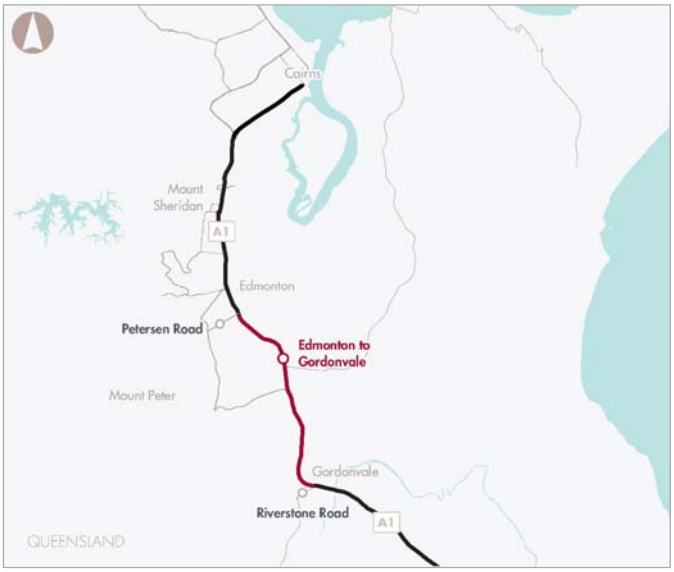
Project Evaluation Summary

Bruce Highway – Cairns Southern Access Corridor – Stage 3: Edmonton to Gordonvale

Proponent Queensland Government
Evaluation date 13 June 2019



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1. Summary

Infrastructure Australia has added the **Bruce Highway – Cairns Southern Access Corridor – Stage 3: Edmonton to Gordonvale** project to the Infrastructure Priority List as a **Priority Project**.

The Bruce Highway provides the only direct road connection from Cairns to the south and is part of the National Land Transport Network (NLTN). It is a critical link to other parts of Queensland and to other interstate areas. As the primary freight access to Cairns, it handles more freight than the Port of Cairns and the North Coast Railway combined. Approaching Cairns from the south, the Bruce Highway passes through the urban growth areas of Gordonvale, Mount Peter and Edmonton. Upgrading the Bruce Highway is a Priority Initiative on the Infrastructure Priority List.

The northern extent of the project is at Edmonton, approximately 13 km south of the Cairns CBD, and continues south for approximately 10 km to Gordonvale. Currently, this section of the highway is congested during morning and evening peaks, and has a high crash rate. Increasing industry diversification, densification of the CBD, and urban expansion in southern Cairns is forecast to grow traffic beyond the reliable capacity of the highway. Without intervention, this traffic growth would lead to severe congestion and poorer safety conditions on the road.

The project aims to ease capacity constraints by creating a four-lane highway (two lanes in each direction) between Edmonton and Gordonvale and would significantly reduce interfaces with properties, the North Coast Railway and arterial roads. New service roads would draw local traffic away from the highway, reducing travel times and improving amenity for the local residents of Mount Peter and Gordonvale.

The Queensland Government's stated benefit-cost ratio (BCR) for the project is 1.14, with a net present value (NPV) of $49.3 million (using a 7% real discount rate and P90 capital costs). Infrastructure Australia identified some minor limitations in the cost-benefit analysis, but also found several project benefits which were not included in the analysis. Overall, Infrastructure Australia considers that there is strategic merit in upgrading this part of the NLTN to improve accessibility for Cairns' local communities, regional traffic, tourism and freight, and that the project would provide a small net benefit to the Australian economy.

2. Strategic context

The Bruce Highway is part of the NLTN, connecting Cairns to the bulk of Queensland and servicing both local and regional traffic. It is the primary freight access route to Cairns and handles more freight (3.1 million tonnes per year (Mt/year)) than the Port of Cairns (1.1 Mt/year) and North Coast Railway (1.2 Mt/year) combined.

In 2012, the Queensland Government prepared the *Bruce Highway Action Plan*, which prioritised sections of the highway for upgrades based on safety, flooding and capacity issues. This included the Edmonton to Gordonvale duplication, which was identified as a high priority. In 2013, the Australian Government and Queensland Government commenced the *Bruce Highway Upgrade Program*, with $8.5 billion in investment generally funded by the Australian Government (80%) and the Queensland Government (20%) over 10 years (2013–14 to 2022–23). In 2018–19, based on 80:20 funding arrangements, the *Bruce Highway Upgrade Program* was increased to $12.6 billion and extended by five years to 2027–28. Upgrading the Bruce Highway is a Priority Initiative on the Infrastructure Priority List and we recognise the strategic merit of this project as part of the overall program of upgrades.

In Far North Queensland, the Queensland Government published the *Cairns Bruce Highway Upgrade – Master Plan* in 2010. This plan sets out four stages of upgrades to the Cairns southern access road network:

- Stage 1: Sheehy Road to Kate Street – completed in 2014
- Stage 2: Foster Road to Robert Road – completed in mid-2017
- Stage 3: Edmonton to Gordonvale – the subject of this business case
- Stage 4: Kate Street to Aumuller Street – commenced construction in mid-2018.

The challenges for these sections of the Bruce Highway are driven by strong population growth in the southern suburbs of Cairns. The population of these suburbs is expected to grow by about 40,000 people from 2016 to 2036, or by about 3% each year. This area is the only remaining large scale developable land in the region and is therefore expected to cater for the bulk of Cairns' population growth into the future.

The *Far North Queensland Regional Plan* 2009-2031 provides the strategic basis for development in the Cairns southern corridor. Mount Peter, to the west of the study area, is designated in the regional plan as the priority urban growth corridor for Cairns, but this was based on the assumption that the Bruce Highway would be duplicated between Edmonton and Gordonvale.

3. Problem description

Strong population growth in southern Cairns will lead to more congestion, and worsen safety and freight reliability on the Bruce Highway and its surrounding roads near Cairns. The section from Edmonton to Gordonvale is the busiest two-lane, at-grade section of the Bruce Highway between Brisbane and Cairns. It experiences significant delays during morning and evening peaks, and has a high crash rate. Between 2007 and 2012, a total of 79 crashes were reported along this section of the highway, four of which were fatal. Over this period, there were approximately 28 crashes per 100 million vehicle kilometres travelled. This is almost double the average crash rate for a rural single carriageway road in Queensland.

Increasing traffic, beyond the reliable capacity of highway, is expected to worsen travel times, particularly at the highway's intersections with local roads. The Bruce Highway on this section has both single-lane and two-lane sections, several signalised and non-signalised intersections, and 24 property accesses.

The proponent's traffic modelling suggests the level of service on most of these intersections will deteriorate to heavy congestion by 2036. Traffic on the highway near Edmonton is expected to grow from about 21,800 vehicles per weekday in 2016, to about 41,200 vehicles per weekday in 2036 – a compound annual growth rate of 4.5%.

In response to these challenges, the proponent has identified the following service needs:

- improve the condition, efficiency and capacity of the highway to support population growth
- improve road safety
- support the economic growth of the region
- address community issues, including access and modal choice
- improve separation of local and regional trips
- increase flood resilience.

While this section of the highway has a Q2[1] level of flood immunity, flooding is not prevalent in the area. For example, the proponent estimates that a Q50 flood event would only close the highway for approximately four hours. This section of the highway also meets the Queensland Government's flood targets for the Bruce Highway, with it being closed for less than 10 hours per year on average, and for a maximum closure time of 48 hours for a Q50 flood event.

4. Proposal

The project would upgrade the Bruce Highway to four lanes (two lanes in each direction) between Edmonton and Gordonvale, including:

- 16.4 km of new two-lane carriageway (9.4 km northbound and 7.0 km southbound)
- realigning and upgrading 4.7 km of the Queensland Rail North Coast Line to accommodate the duplicated highway, as well as removing multiple at-grade rail crossings and upgrading boom gates at other crossings
- 6.4 km of highway posted at 100 km/h and 3.2 km of highway posted at 80 km/h
- removing 23 direct property accesses and 10 intersections from the highway
- upgrading two existing signalised intersections and constructing two new signalised intersections
- constructing one grade-separated intersection at Maitland Road
- improving the flood immunity of the highway from Q2 to a minimum of Q50
- constructing an off-road cycle path.

Construction on the duplication would begin in early 2020, with completion targeted for 2024. The proponent's P90 capital cost estimate for the project is $516.9 million.

5. Options identification and assessment

The proponent's options development and selection process used their previous planning from the *Cairns Bruce Highway Upgrade – Master Plan*, which set out the objective of developing the Bruce Highway corridor as a sustainable, high-quality multi-modal transport network. For the third stage of this program (the Edmonton to Gordonvale section), the proponent undertook a Strategic Assessment of Service Requirements (SASR) to identify options that could meet the following requirements:

- Address current and emerging safety issues
- Improve condition, efficiency and capacity
- Address community issues, including access and modal choice
- Improve separation of local and regional traffic
- Provide value for money infrastructure.

The SASR investigated five non-asset options (demand management, flow regulation, alternative modes of transport, land use planning, reducing road freight traffic), an option for capital upgrades in the existing corridor and an option to construct a new road in a new corridor. The proponent used multi-criteria analysis (MCA) to assess these options against the five project service requirements and found that the option for capital upgrades along the existing corridor performed the best. While the scale of the problem meant capital upgrades were likely required, there may have been an opportunity to integrate some of the non-capital options to deliver better project outcomes and value-for-money.

[1] A Q2 rainfall event is one that happens once in every two years on average.

The proponent developed an appropriate 'do minimum' base case using the relevant population projections from the Queensland Government Statistician's Office. Consistent with the Assessment Framework, they considered a range of capacity improvements to cater for the high population growth expected in the southern suburbs. Most of these improvements would have required significant capital expenditure and, therefore, were not included in the base case.

The proponent then explored sub-options by dividing the existing corridor into a northern and southern section, with several lane and intersection sub-options for each. These sub-options were assessed using MCA to form two complete options for detailed assessment. While both options would result in a four-lane highway, one option would use an entirely new carriageway near the corridor, while the other option would use a mix of new carriageway and parts of the existing highway.

The proponent used rapid cost-benefit analysis to assess both options, which found a 13% higher NPV for the option to construct an entirely new carriageway, compared with the alternative option. While more expensive, it provided greater benefits in terms of safety, travel time and separation of local trips from highway trips and was better aligned with the proponent's long-term planning. This option was taken forward to the detailed business case and split into two scope variations: (1) an at-grade solution; and (2) a grade-separated solution that would replace two signalised intersections with a single grade-separated intersection near Maitland Road.

The proponent assessed both of these solutions using MCA and cost-benefit analysis, with the grade-separated option performing slightly better in both. In particular, it would avoid the risk of the maximum highway speed being restricted to 80 km/h due to closely-spaced at-grade intersections.

Overall, the proponent undertook an extensive process to identify and assess options to address the problem. While non-capital options could have been explored further, we were pleased to see a range of route, lane and intersection configurations investigated in detail. However, Infrastructure Australia believes it would have been better practice to retain a wider range of these options for detailed investigation, as the two options (in addition to the 'do minimum' base case) assessed in the business case only differ slightly in scope and performance. Retaining a wider range of options helps demonstrate that the most effective and highest value-for-money solution has been selected.

6. Economic, social and environmental evaluation

The proponent's stated BCR for the project is 1.14 with an NPV of $49.3 million (using a 7% real discount rate and P90 costs). Users would benefit from the project through shorter travel times, lower crash costs and lower vehicle operating costs (VOC). The project would also result in some road maintenance cost savings. However, the proponent's analysis also forecasts a small increase in environmental emissions because of a minor total increase in the distance travelled by vehicles with the project.

Infrastructure Australia's analysis found that, overall, the assumptions and methodology used by the proponent in the economic evaluation were reasonable and generally aligned with Infrastructure Australia's Assessment Framework. In particular, our evaluation considered whether the proponent had defined an appropriate 'do minimum' base case, given the significant population growth forecast for the southern suburbs, but only one north–south arterial route. The base case traffic modelling forecasts that peak travel times on the route will grow from just under 10 minutes in 2021, to over an hour in 2036. However, as noted in the previous section, Infrastructure Australia agrees with the proponent's approach to developing the base case and incorporating appropriate capacity improvements.

Our analysis also found a number of project benefits that were not included in the proponent's analysis:

- Benefits associated with travel on Sundays and public holidays – the proponent did not include these days in their annualisation factor, which scales daily traffic forecasts to annual traffic forecasts
- The residual value for capital assets beyond the 30-year evaluation timeframe – the project includes a bridge, which is likely to have an asset life longer than the evaluation period
- The capital cost for new signalised intersections under the base case was not included.

Together, these unquantified benefits would improve the economic case for the project. The proponent also identified, but did not measure, the benefits of improved flood immunity, the new off-road cycle path and removing at-grade rail crossings. They considered that measuring these impacts would only slightly improve the benefits of the project as the area is not prone to flooding, there is little information available on how many cyclists would use the path, and rail services already have priority over vehicles at the rail crossings.

The project is expected to deliver substantial travel time and crash cost savings, but has significant capital costs – estimated at $516.9 million (P90, nominal, undiscounted). Taken together, Infrastructure Australia considers that the project is likely to deliver benefits that marginally exceed its costs.

The Bruce Highway will play a critical role in catering for the growing population in southern Cairns. Without intervention, both local and regional traffic is likely to face heavily congested and stop-start traffic. However, as the only north–south arterial route serving Cairns, this upgrade would help maintain its accessibility and liveability in the region.

A breakdown of the benefits and costs reported in the proponent's business case is set out in the following table.

Benefits and costs breakdown by the proponent

Proponent's stated benefits and costs		Present value ($m, 2018) @ 7% real discount rate	% of total
Benefits			
Travel time savings		$355.6	88%
VOC savings		$7.9	1%
Emission savings		-$2.1	-1%
Crash cost savings		$38.8	10%
Total Benefits[1]		**$400.2**	**100%**
Costs			
Capital costs (P90)		$359.1	102%
Operating costs		-$8.1	-2%
Total Costs[1]		**351.0**	**100%**
Core results	**Net benefits - net present value (NPV)[2]**	**$49.3**	n/a
	Benefit–cost ratio (BCR)[3]	**1.14**	n/a

Source: Proponent's Business Case

Notes:

(1) Totals may not sum due to rounding.

(2) The net present value is calculated as the present value of total benefits less the present value of total costs.

(3) The benefit cost ratio is calculated as the present value of total benefits divided by the present value of total costs.

Capital costs and funding

Total capital cost (P90, nominal, undiscounted)	$516.9 million
Proponent's proposed Australian Government funding contribution	$413.5 million (80:20 Australian Government to State Government split)
Other funding (source / amount / cash flow) (nominal, undiscounted)	$103.4 million from the Queensland Government

Note: $481 million is the current total joint funding commitment of the Australian Government and the Queensland Government, based on 80:20 funding arrangements.

7. Deliverability

As part of a Project Assurance Framework compliance process, the proponent assessed different delivery and procurement strategies that could be used to deliver the project. This involved an internal options workshop using multi-criteria assessment, and a desktop assessment. During the preliminary evaluation phase, the proponent completed a market-sounding process with key industry groups and construction companies. At the detailed business case stage, the outcomes of the market sounding were reinvestigated to confirm the earlier findings on the potential delivery options. As a result of this process, the proponent identified the preferred delivery model as a dual Early Contractor Involvement (dECI).

The proponent considers that there is significant potential for innovation in the project and that the costs of running a dECI contract would justify its costs and additional resourcing demands. They also believe that the dECI approach would also improve risk management compared with a traditional Construct Only contract for the rail relocations. A value-for-money assessment used market sounding conducted for other projects of this scale and concluded that a Public-Private Partnership (PPP) would not be appropriate for this project.

The governance arrangements for delivering the project would be similar to those for other road corridor projects delivered by the proponent. It involves a Project Control Group, Project Director and Project Manager roles, providing oversight and undertaking management activities throughout the delivery phase. The proponent intends to finalise a detailed Project Management Plan during the project development and procurement phase. The plan will consider timelines, procurement and construction phase objectives, activities and resourcing, risks, stakeholder engagement and detailed project phase costs.

The proponent has completed a detailed risk analysis process, which is consistent with their internal Risk Management Framework. Risks during the procurement and delivery of the project include geotechnical issues, environmental approvals, weather, stakeholder considerations and perceptions, interface with Queensland Rail, traffic management, and latent conditions. Risks were continually identified, reviewed and the risk register updated throughout the preliminary evaluation and detailed business case phases. Risk workshops were also held throughout the process, along with a constructability workshop to identify significant construction risks and issues that might impact on project commencement dates, program, constructability and costs. All risks identified have been captured in a project risk register and incorporated into the probabilistic cost estimate. The proponent has also proposed future treatment strategies for all residual risks rated at ‘medium’ or higher.

The proponent has developed an appropriate Risk Management Framework to deal with the added complexities of the dECI contract. Given that the project is estimated to provide only a small overall benefit, we encourage the proponent to continue developing the Project Management Plan to ensure best possible outcomes.

The proponent has also prepared a Communication and Engagement Plan to ensure accurate, timely and relevant information is provided to stakeholders regarding project scope, timeframes, impacts and progress. This plan is a living document that will be updated during the implementation phase.

The measurement of the project benefits would be undertaken against links (segments) on the Bruce Highway. Information on the progress of benefits realisation during the project would be incorporated within the project’s health check, gate check and post-implementation review activities and reports. We encourage 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.