Infrastructure Australia

Project Business Case Evaluation

Project name	Bruce Highway Upgrade - Mackay Ring Road – Stage 1
Rating	Priority Project
Date of IA Board rating	9 February 2017

Location	Mackay, Queensland
Proponent	Queensland Government
Project timeframe	Stage 1 – Construction 2017-2020

Evaluation Summary

The Bruce Highway is a major urban arterial connection between key residential and employment areas in Mackay, a vital component of the supply chain for mines in the Bowen Basin, as well as Queensland's primary north-south road route. The road also connects to the Port of Mackay, which serves as a terminal for mining inputs, as well as an export base for sugarcane. The existing route is hampering accessibility to the port, and the movement of large commercial vehicles through local residential areas is reducing safety and urban amenity.

Upgrading the Bruce Highway to improve connectivity between Queensland's coastal cities is a Priority Initiative on the Infrastructure Priority List. The Stage 1 Mackay Ring Road project (MRRP) would construct a 2-lane, 11.3-kilometre highway bypass of urban areas in Mackay with 1-in-100 year flood immunity. The project would improve the safety, capacity and accessibility of the road network in Mackay, improve travel times (for both commercial freight and commuters), and remove heavy and dangerous goods vehicles from congested urban areas.

The proponent's economic evaluation of the project indicates a net present value (NPV) of $589 million and a benefit-cost ratio (BCR) of 3.3 using a 7% real discount rate and P50 cost estimate. The project's key benefits – travel time and safety benefits – were derived from modelling based on traffic volumes in 2011 – which was at the peak of the coal mining boom. Traffic volumes have since reduced, so the related economic benefits of the project would be expected to have reduced commensurately. The proponent has undertaken sensitivity testing which shows that the project's benefits remain higher than its costs even when benefit levels are significantly reduced.

Infrastructure Australia considers that the Stage 1 MRRP will generate significant travel time and safety benefits, and is an appropriate means of addressing the congestion and safety issues associated with high traffic volumes, including heavy vehicles travelling through residential and commercial areas in Mackay. Overall, Infrastructure Australia is confident that the project's benefits will exceed its costs, and that it will provide a net benefit to the Australian economy.

1. Strategic Context

The Bruce Highway is Queensland's major north-south corridor, connecting coastal population centres from Brisbane to Cairns. It is part of the Queensland's Priority Freight Network and forms part of the National Land Transport Network and the nationally-accredited Key Freight Network, with commercial vehicles making up a large proportion of

traffic along the corridor. The importance of this highway in connecting regional centres, and in facilitating freight movements, is recognised by both the Queensland and Australian Governments.

Over its length of approximately 1,700 kilometres, the Bruce Highway varies significantly in capacity, safety and flooding vulnerability. Both governments have committed to incrementally upgrade the condition of the highway to meet technical standards commensurate with its strategic importance. The upgrade of the Bruce Highway to improve connectivity between various Queensland coastal cities is listed as a Priority Initiative on the Infrastructure Priority List.

The *Bruce Highway Action Plan* 2012, developed by the Queensland Government, aims to bring about a step change in the condition of the Bruce Highway through progressive priority upgrades to the Bruce Highway over 10 years. The Action Plan identified approximately 25 'High Priority' projects to improve capacity at various sections of the highway. The MRRP is one of these 'High Priority' projects.

In 2013, the Australian and Queensland Governments committed $8.5 billion ($6.7 billion: federal; $1.8 billion: state), over 10 years (2013-14 to 2022-23) to address safety, flood immunity and capacity deficiencies on this nationally-significant road corridor. The scoping phases of the MRRP have been funded with $10 million from the Australian Government under the Regional Infrastructure Fund.

2. Problem description

In the Mackay region, the Bruce Highway acts as an urban arterial connection, a primary access route to the Port of Mackay, and the major connection between Queensland's coastal cities. The Queensland Government argues that limitations on the highway's capacity to serve the port are hampering economic growth in the region. High numbers of large commercial vehicles travelling through the city's urban areas are also impacting on local safety and amenity.

Future population growth in the region will drive an increase in traffic, exacerbating existing problems and reducing service levels. Cross-river traffic movements in the Mackay urban area are estimated to increase from 90,000 vehicles per day in 2011 to 147,000 vehicles per day by 2031. Traffic modelling results indicate that, by 2021, the city's three bridges will become capacity constrained. By 2026, traffic into the Port of Mackay is also forecast to exceed capacity in peak periods. Congestion in the urban corridor is reducing the efficiency of freight movements and will impact on the supply chains of key industries such as mining and agriculture.

Safety is also a concern, with the Bruce Highway in the Mackay region having a significant number of crashes per kilometre. Without improvement, it is likely that the current highway configuration will hamper productivity and economic growth as well as impacting on safety and amenity in the region.

3. Project overview

Stage 1 of the MRRP is designed to improve safety and efficiency by removing regional through traffic, and in particular major freight movements including sugar and fuel, from the urban section of the Bruce Highway through Mackay.

The proponent proposes to address this through the construction of a 2-lane, 11.3-kilometre bypass, providing 100 km/h posted speeds where possible and 80 km/h approaches to the terminating junctions. The bypass will have limited access to allow inter-regional traffic travelling from south to north or north to south to bypass Mackay's urban area.

Provision of a mid-point overtaking opportunity in both directions is included in the design, to coincide with entry ramps for slow moving heavy vehicles. Dual lane roundabouts at major junctions and a grade separated overpass of the existing Peak Downs Highway also forms part of the proposed project.

A total of 13 bridges are required for Stage 1 of the MRRP. Flood immunity of 1 in 100 years is proposed and would require major bridge crossings of the Pioneer River and Fursden Creek, as well as nine overpasses of existing local roads and the cane rail network.

Expected project outcomes include:

- Enhancing the capacity, safety and accessibility of the road network in Mackay
- Reducing accidents and improving travel times by avoiding 13 kilometres of low speed urban roadway with 10 sets of traffic signals and over 200 private access connections
- Improving freight efficiency by reducing travel time for through traffic by 50%, and for port-bound fuel and sugar trucks by 20-30% on opening
- Removing heavy and dangerous goods vehicles from urban streets
- Reducing travel times for commuters from the northern suburbs to southern job centres.

The Mackay Ring Road is expected to carry approximately 3.65 million vehicles per year, of which 15% will be heavy vehicles. The width of the corridor that has been secured is sufficient to accommodate future duplication of the highway. Stage 1 of the MRRP lays the foundation for future works which will link to the port in the east as well as support the potential development of the port. Future stages are planned to be developed over the next 10-15 years.

4. Options identification and assessment

Three separate options were compared during the Options Analysis/Preliminary Evaluation stage of the project using multi-criteria analysis. The initial study area extended from Sandy Creek in the south to Farleigh in the north, and east to the port of Mackay.

Options that were assessed included:

(a) Upgrading the existing route through residential areas
(b) The Cowleys Road bypass option which is generally parallel to the existing route and 1.6 kilometres to the west
(c) The Calrossie Road bypass option which is generally parallel to the existing route and 2.6 kilometres to the west of the existing route.

Both western alignments (Cowleys Road and Calrossie Road) were also assessed in “hybrid” options which considered upgrading sections of the existing highway combined with limited sections of the bypass alignments. This allowed a much smaller section of the bypass (Ring Road) to be considered as a stand-alone project. Three high level tests were applied, namely:

- Effectiveness – freight efficiency, commuter connectivity, safety and amenity, network flexibility and congestion management
- Feasibility – cost, economics, ability to stage works and network redundancy
- Acceptability – flooding, land use and environmental impacts and stakeholder input.

While the scores were very close, a hybrid option including an upgrade of the existing highway and the Calrossie Road bypass was preferred. This is the option (MRRP Stage 1) that is the subject of this evaluation. The economic costs and benefits for each option were not quantified. Instead, the proponent identified the following key benefits of the preferred option over alternatives:

- The ability to bypass future urban development areas and provide a suitable buffer to sensitive land uses
- Less impact on the supporting local network by retaining the parallel local road network on Cowleys Road for local traffic and appropriate spacing between network bridges
- Less impact on good quality agricultural land by using the existing highway where possible
- Fewer dwelling resumptions and fewer environmental impacts.

Public consultation on the project confirmed strong community support for a ring road.

5. Economic evaluation

The proponent's economic evaluation of the project indicates an NPV of $589 million and a BCR of 3.3 using a 7% real discount rate and P50 cost estimate, not including wider economic benefits (WEBs). However, given the project's location, WEBs are unlikely to be significant.

The proponent's traffic modelling uses 2011 as the base year for traffic volumes. This coincided with the peak of the coal mining boom, when traffic volumes in the region were at a high point. Traffic volumes have since reduced, so the related economic benefits of the project would be expected to have reduced commensurately. The proponent agreed that there has been a decline in traffic volumes of around 12.5% since 2011, but noted that sensitivity testing showed that the project's benefits would remain higher than its costs even after a significant reduction in benefits to account for reduced traffic volumes.

The proponent also noted that a conservative population growth figure of 2.2% per year was adopted for the 30-year evaluation for traffic modelling purposes, consistent with historical, 30-year population growth trends in Mackay.

Overall, Infrastructure Australia is confident that the project's benefits will exceed its costs.

Benefits and costs summary

Proponent's Stated Benefits and Costs	Present Value ($m, 2013) @ 7% real discount rate		% of total
Benefits			
Travel time savings	$761		90%
Vehicle operating cost savings	$21		2%
Avoided crash costs	$44		5%
Environment cost savings	$11		1%
Residual value	$11		1%
Total Benefits[1]	**$848**	(A)	**100%**
Costs			
Capital costs (P50)	$250		96%
Operating and maintenance costs	$9		4%
Total Costs[1]	**$259**	(B)	**100%**
Net Benefits - Net Present Value (NPV)[2] without WEBs	**$589**	(C)	n/a
Benefit-Cost Ratio (BCR)[3] without WEBs	**3.3**	(D)	n/a

Source: Proponent's Business Case

Notes:
(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).

Major sources of benefits

The largest benefit of the project is travel time savings, particularly for users who will avoid congested urban areas and up to 10 sets of traffic lights within Mackay. Vehicles that divert to the bypass will reduce congestion within Mackay, which will also save time for local road users in the area.

The second largest benefit is avoided crash costs. The existing route has a large number of private accesses, traffic lights, pedestrians and a combination of heavy and light vehicles. Traffic shifting to the bypass, and in particular heavy vehicle traffic, will reduce the likelihood of accidents in the urban area.

Other benefits include reduced vehicle operating costs from vehicles taking the more direct bypass route, and avoided environmental and urban amenity costs.

Capital costs and funding

Total capital cost (nominal, undiscounted)	$477 million (P50) $497 million (P90)
Proponent's proposed Australian Government funding contribution (nominal, undiscounted)	$381.7 million
Other funding (source / amount / cash flow) (nominal, undiscounted)	$95.4 million from the Queensland Government

6. Deliverability

The project will be delivered by the Queensland Department of Transport and Main Roads (TMR). During development of the Business Case, a qualitative analysis was undertaken to consider potential for private financing for the MRRP. Given the regional nature of the project, it was considered unlikely that there would be private sector interest in the project. A Public Private Partnership delivery model was deemed unlikely to create additional value for money to the Queensland Government for this project when compared to traditional delivery. The project team considered that the state could achieve a similar level of innovation through traditional delivery models that encouraged early contractor involvement.

The proposed project is relatively straightforward to deliver, and TMR has extensive skills and experience in delivering projects of this nature. Key project risks and mitigation strategies have been identified. The timing of the procurement process to facilitate construction commencement early in the 2017 dry season is intended to eliminate one wet season from the construction schedule.

An Environmental Scoping Report and Review of Environmental Factors have been undertaken as part of the project Scoping Phase and an Environmental Management Plan is being finalised. Stage 1, the current project, has no issues of significant environmental concern, and does not trigger consideration under the Commonwealth Environment Protection and Biodiversity Conservation Act. There is no requirement for an Environmental Impact Study under Queensland legislation.

Infrastructure Australia recommends that the proponent conduct a post-completion review of the project to accurately understand the benefits realised.

While the proponent has not investigated opportunities for direct user funding of the project, Infrastructure Australia would encourage the proponent to consider network-based road user charging as part of its funding options assessment.