Australian Government | Infrastructure Australia

Business case evaluation summary

Mooloolah River Interchange

Location
Sunshine Coast, Queensland

Geography
Smaller cities and regional centres

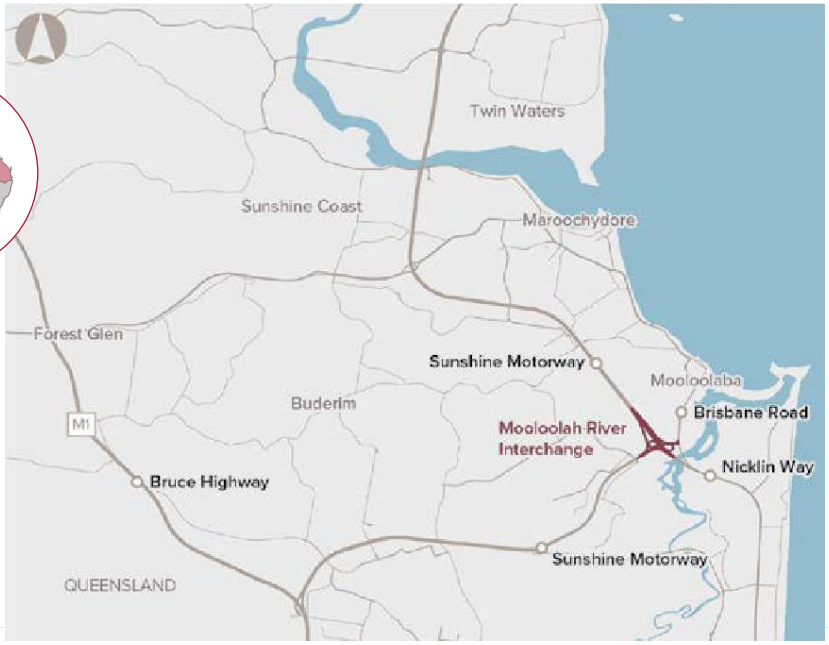
Category
Regional Connectivity

Capital cost
$780.7 million (P90, outturn)

Indicative timeframe
Construction Start: 2023
Project completion by: 2027
(Note: assuming full delivery)

Proponent
Queensland Government

Evaluation date
18 February 2022



1. Evaluation Summary

Infrastructure Australia has evaluated the **Mooloolah River Interchange** business case in accordance with our current Statement of Expectations, which requires us to evaluate project proposals that are nationally significant or where Australian Government funding of $250 million or more is sought.

The proposal responds to the nationally significant problem of capacity and safety at the interchange, which has been included on the *Infrastructure Priority List* since April 2020 as an early-stage (Stage 1) proposal. **Based on our review of the business case, the proposal has been updated on the *Infrastructure Priority List* to an Investment-ready (Stage 3) proposal.**

The existing Mooloolah River Interchange is located at a key intersection of major routes on the Sunshine Coast, including routes west to the Bruce Highway, north to Maroochydore and south to the Sunshine Coast University Hospital and growing residential development areas. The Sunshine Coast's rapidly growing population, and the disconnect between the location of homes and jobs, is increasing traffic demand at the interchange. This is worsened by its configuration, which requires traffic to weave, creating a high safety risk to road users. Without intervention, traffic speed and safety at the Mooloolah River Interchange is expected to significantly deteriorate.

The proposal includes a range of new connections and upgrades to existing infrastructure to improve safety, reduce travel times between the major routes and increase capacity. It directly supports future planning for the region to establish a north-south transport spine.

The Australian and Queensland Governments have committed $320 million (50:50) towards the first two packages of the proposal. Subject to further funding availability, the proposal can be delivered as a single project or as a series of packages. There would be significant benefits in delivering the full solution as a single project rather than a sequentially delivered upgrade, by generating cost savings and enabling the proposal's benefits to be realised sooner.

The proponent's business case states that the Net Present Value (NPV) of delivering the proposal as a single package is $1,876.5 million, with a Benefit Cost Ratio (BCR) of 4.01[1]. Our evaluation identified some elements in the analysis that may overstate the economic benefits of the proposal. However, we agree that expected road network benefits are likely to outweigh the proposal's costs.

It will be critical to integrate and optimise the existing and future public transport network with the proposal to achieve broader strategic objectives of the Queensland Government for public transport usage and to ensure there is a cohesive and integrated multi-modal network.

The proponent has undertaken detailed preparation for delivering the proposal and has extensive experience in delivering comparable projects under similar delivery models. **If the proposal proceeds, the proponent will need to continue managing active risks around cultural heritage and environmentally sensitive areas.**

Overall, the proposal demonstrates strategic fit, strong social, economic and environmental merit and appropriate delivery planning for its current stage of development.

2. Context

The Sunshine Coast population is growing rapidly. The 2019 *Australian Infrastructure Audit* estimated the population would grow by around 120,000 people between 2016 and 2031, or 33% of its current population.

The existing Mooloolah River Interchange plays an important role in the Sunshine Coast's transport network, connecting major tourist, education, residential, commercial and industrial precincts. Four routes currently intersect at the Mooloolah River Interchange:

1. Sunshine Motorway (northern end), connecting to the major centre of Maroochydore and the Sunshine Coast Airport
2. Brisbane Road (eastern end), providing access to the Mooloolaba suburb and beach
3. Nicklin Way (southern end), leading to Birtinya town centre, the Sunshine Coast University Hospital and to the major centre of Caloundra
4. Sunshine Motorway (western end), providing connectivity to the University of the Sunshine Coast and the Bruce Highway.

The nearby road network experiences substantial traffic volumes. Over 65,000 vehicles per day were recorded on the Sunshine Motorway north of the Nicklin Way interchange in 2018, with a compound annual growth rate averaging 6.3% per year since 2014.

The growing demand on these corridors is partly driven by greenfield residential development in the south and west (e.g. Caloundra), as well as employment which is growing strongly to the north around Maroochydore. The Queensland Government has a strategy to improve the connectivity of the north-south transport network that better links population growth and jobs. The Mooloolah River Interchange proposal is a key element of this, along with planning announced by the Queensland Government for a future Kawana Motorway to the south and upgrading an interchange to the north along the Sunshine Motorway (at Buderim Avenue).

Local bus services provide a public transport alternative for users, but these are relatively uncompetitive compared to the road options. As a result, there is very low public transport usage on the Sunshine Coast. Only about 2% of people use public transport for work trips, whereas over 80% of people use private vehicles. The remaining share uses other modes or work from home. The Sunshine Coast Council is currently investigating options for a mass transit network on the Sunshine Coast to help manage growing transport demand and provide more travel choices for users.

3. Problem description

Traffic demand is expected to soon exceed the capacity of the Mooloolah River Interchange and surrounding road network during peak periods, leading to congestion and unreliable travel times. This congestion will be exacerbated by the configuration of the existing interchange, which requires

[1] Using a 7% real discount rate and P50 capital cost estimates in 2021 prices.

some drivers to weave across multiple lanes or take less direct routes to reach their destination, resulting in risks to safety and increased travel times.

The proponent forecasts that, by 2031, large sections of the Sunshine Motorway and parts of Kawana Way and Nicklin Way will be at, or over capacity in the afternoon peak. Average speeds on Nicklin Way during peak periods are expected to reduce from 40km/h in 2026 to less than 20km/h by 2041. This congestion is likely to encourage more people to drive on local and residential roads to avoid the intersection. The 2019 *Australian Infrastructure Audit* projected the cost of congestion on Sunshine Coast roads to increase from $123 million per year in 2016 to $324 million in 2031 – an increase of 163%.

Growing congestion coupled with problems of the current configuration of the interchange has the potential to increase the frequency and severity of safety incidents. The area around the Mooloolah River Interchange reported 122 crashes between 2013 and 2018, leading to a 'high risk' crash rating by the Australian Road Assessment Program (AusRAP).

The *Mooloolah River Interchange capacity and safety* proposal was included on the *Infrastructure Priority List* in April 2020 to recognise this as a nationally significant problem in the near-term. The congestion and safety related issues identified in the immediate study area are valued by the proponent at over $76 million per annum and without intervention are anticipated to grow to $220 million by 2031 and $401 million by 2041.

The proponent's business case identifies further opportunities to improve public and active transport connectivity, amenity in the local area and sustainability of the built environment. There is also an opportunity to improve the resilience of the transport network as Nicklin Way is currently the only crossing over the Mooloolah River.

4. Options identification and assessment

The Queensland Government has undertaken extensive planning to address the transport connectivity issues in the area for over two decades. Initial studies included the Multi-Modal Transport Corridor project and the Sunshine Coast Transport Project, both of which considered a range of road and public transport responses to the connectivity problems and recognised the need for upgrades to the Mooloolah River Interchange.

Following this work, planning for road and public transport improvements appear to have been undertaken separately. The business case evaluated by Infrastructure Australia has been developed following a series of road network studies and a Preliminary Business Case (PBC). The proponent's PBC considered 12 sub-options for the Mooloolah River Interchange and also included analysis of longer-term upgrades to the nearby road network. These longer-term upgrades are not in the scope of this business case but are compatible with the proposal. While the PBC was finalised and approved by the Queensland Government in November 2015, the government announced a preferred configuration for the upgrade a year prior in November 2014.

Key changes in the current proposal since the preliminary design include:

- Eliminating the need for a new signalised intersection, which may have presented capacity and safety issues, by providing a free-flow connection between the Sunshine Motorway and Kawana Way
- Establishing the Sunshine Motorway as a regional distributor by removing local trips and providing a faster free-flow connection
- Spatial allowance for both a proposed passenger rail service branching off the North Coast railway line at Beerwah (extending through Caloundra to Maroochydore) and a Sunshine Coast mass transit project
- Active transport provision (off-road cycleway/shared paths that link to existing active transport connections).

Transport modelling undertaken for the business case demonstrates that these refinements improve the performance of the intersection and surrounding road network. While the costs for the preliminary design were lower, the economic appraisal in the business case shows the benefits associated with the refined scope outweigh the cost increase. While we note the work undertaken

to optimise the proposal, the business case only formally evaluates one option, which is considered a limitation for decision making.

Furthermore, with public transport interventions being investigated separately, there is limited consideration of how the preferred option will impact public transport usage. While the proposal's scope allows for future public transport corridors, the effectiveness of these solutions could be weakened as the proposal will encourage further reliance on private vehicles on the Sunshine Coast.

5. Proposal

The scope of the Mooloolah River Interchange proposal includes a range of new connections and upgrades to existing infrastructure to improve the efficiency, capacity and safety of the interchange. Key elements of the scope include:

- A new undivided two-lane, two-way arterial road over the Mooloolah River to connect Kawana Way (from the south) to the Sunshine Motorway (to the west)
- Separation of northbound motorway traffic from local eastbound traffic on the Sunshine Motorway to eliminate weaving, with a new connection from Karawatha Drive to Brisbane Road
- New Nicklin Way to Brisbane Road overbridge to provide more direct connectivity
- Sunshine Motorway northbound upgrade on the motorway between Mooloolah River Interchange (Nicklin Way) and Buderim
- New Karawatha Drive connection road (between Brisbane Road and Karawatha Drive)
- Sunshine Motorway duplication between Mooloolah River Interchange (Nicklin Way) and Kawana Way Interchange
- New active transport network links via off-road cycleways
- Spatial allowance for future public transport corridors.

The proponent estimates that construction of the upgraded Mooloolah River Interchange would commence in 2023 and be open to traffic in July 2027 if delivered as a single project. The proponent has also developed a packaging approach to delivery if sequencing is required for funding reasons:

- Packages 1 & 2: Separation of local traffic movements
- Package 3: New Mooloolah River crossing to Kawana Way
- Package 4: Third lane on Sunshine Motorway to Buderim-Mooloolaba Road
- Package 5: Sunshine Motorway duplication to Kawana Way.

The following table summarises key differences between the delivery approaches:

	Full delivery	Packaged delivery
Number of packages	1 package	5 packages
Timing	Construction commences in 2023 Open to traffic in July 2027	Delivered in sequence, with: Packages 1 & 2 open to traffic in Q4 2025 Package 3 open to traffic in Q1 2029 Package 4 open to traffic in Q2 2030 Package 5 open to traffic in Q3 2031
Outturn cost (P90, undiscounted)	$780.7 million	$809.2 million
Delivery model (see Section 8)	Design & Construct	Transport Infrastructure Contract - Construct Only

The proponent has undertaken a detailed process to develop the packaging and sequencing, taking into consideration the infrastructure dependencies, traffic performance, cost impacts and more. This analysis shows that the final package (5) is crucial for achieving the overall benefits of the proposal, with the majority of travel time improvements being delivered once Package 5 is operational. While delivering the proposal as a series of packages may promote the procurement of multiple contractors and provide delivery flexibility, it delays the majority of project benefits being realised and does not provide any material cost or delivery efficiencies. In light of this, we support the full delivery approach for delivery of this proposal.

6. Strategic fit

The proposal responds to the nationally significant problem of capacity and safety on the Mooloolah River Interchange. It supports Queensland Government strategies and policies to improve connectivity and accessibility on the Sunshine Coast, as set out in *The Queensland Plan* and *ShapingSEQ 2031*. This is reflected in the proposal's benefits measured by the proponent, which includes significant travel time and vehicle operating cost savings for road users.

The 2021 *South East Queensland Regional Transport Plan* recognises planning for upgrades to the interchange as a short-term action to support residential development around the Birtinya Town Centre. However, it also recognises that expanding road capacity to meet demand is costly and typically not sustainable. Higher road usage has environmental consequences, with the proponent estimating an additional $288 million (present value) in environmental costs[2], partially offset by $55 million in greenhouse gas savings from reduced fuel usage.

The *South East Queensland Regional Transport Plan* states that providing additional capacity on public transport networks, in coordination with the road network, can be more efficient for catering for growth. The proponent has considered longer-term corridor planning for public transport investments within the Mooloolah River Interchange. However, there is a risk that the current design could discourage public transport use in the short term (in favour of private vehicles) and, in the longer term, it could undermine the effectiveness of major public transport improvements. Optimising the local bus network to take advantage of the additional road capacity from the proposal will make public transport more attractive and contribute to the proposal's benefits. Future public transport investments will need careful planning to ensure that there is a cohesive and integrated multi-modal network.

The proponent has undertaken extensive design work to develop a configuration that will help improve road safety at the Mooloolah River Interchange, for example through reducing conflict points and providing more space for merging and turning lanes. This is supported by a Safe System Assessment which was undertaken in accordance with Austroads' *Safe System Assessment Framework*. The assessment estimated a 17% reduction in the overall safety risk. However, the strategic merit of these improvements is somewhat weakened by the proponent's economic appraisal, which estimates $171 million in disbenefits from higher crash costs due to increased vehicle kilometers travelled.

7. Economic, social and environmental value

The proponent's business case states that the NPV of the full delivery approach for the proposal is $1,876.5 million, with a BCR of 4.01[3]. The analysis tested the sensitivity of the discount rate:

- Using a 4% discount rate results in an NPV of $3,547 million and a BCR of 5.98
- Using a 10% discount rate results in an NPV of $1,023 million and a BCR of 2.83.

The proponent also undertook a range of sensitivity testing on key parameters and assumptions in the appraisal which provides confidence in the potential outcomes. Sensitivity tests included cost contingency levels, annualisation and expansion factors and assumptions on growth beyond the final year of traffic modelling (2041). The most sensitive assumption was on the treatment of 'latent' or 'unreleased' demand, which is discussed further below.

[2] Environmental costs include air pollution, noise and water pollution.
[3] Using a 7% real discount rate and P50 capital cost estimates in 2021 prices.

The majority of benefits from the proposal are travel time savings (105% of net benefits) and lower vehicle operating costs for road users (10% of net benefits). The proponent estimates that these benefits are slightly eroded by higher safety costs (-7% of net benefits) and environmental costs (-12% of net benefits). This is as a result of road users choosing faster, but longer distance trips with the proposal, leading to higher vehicle kilometres travelled across the network. The table below provides a breakdown of the benefit streams.

The base case includes funded and committed projects, as well as some minor improvements and maintenance for local roads and intersections to help ensure the modelling outputs are reasonable. This complies with the Infrastructure Australia Assessment Framework[4] which recognises that minor capacity enhancements may be required when modelling areas of high growth. The proponent has not modelled Wider Economic Benefits or urban development benefits for the project. We consider this appropriate given that the proposal primarily benefits commuter trips and does not forecast land use changes.

The proponent used a three-tier transport modelling process to assess the larger population and demand trends for the region, their impact on the local road network and on the operational performance of the Mooloolah River Interchange itself. This process is often undertaken for projects of this nature but has led to some limitations as the transport modelling did not include public or active transport use, meaning the impact of the proposal on these users or the broader public and active transport network is not quantified.

We have identified some potential upsides to the economic appraisal:

- The safety and environmental disbenefits are conservative as the methodologies used by the proponent do not fully reflect the traffic improvements provided by the proposal. For instance, the proponent used an average crash rate per vehicle kilometre travelled to measure safety impacts but this does not take into account the reduction in potential conflict points (e.g. merging) with the proposal.
- The proponent did not measure the residual value for infrastructure with an asset life longer than the appraisal period.

We have also identified some risks that may impact the benefits quantified by the proponent, including:

- The levels of 'latent' or 'unreleased' demand in the transport model occur when demand exceeds capacity in modelling simulations. The proponent took steps to reduce the impact of this issue through transport modelling adjustments, however, some latent demand is still captured in the economic appraisal. There is a risk that this limitation overstates the benefits of the proposal. The proponent's sensitivity testing found that applying the rule-of-half to latent demand could reduce the BCR to 2.47.
- The use of volume expansion factors, rather than cost expansion factors which take into account the non-linear relationship between traffic volumes and congestion. Correcting this issue would reduce project benefits by about 15%.
- If the proposal is staged, we estimate that the NPV for the proposal would be lower. This is because the delay to benefits is likely to be more significant than any potential cost savings.
- The appraisal did not estimate any disbenefits from construction disruption. However, we note that a significant proportion of works would be completed 'offline' and, where there are construction impacts, these will be scheduled to avoid peak congestion hours.

Overall, our review found that the scale of benefits from the proposal is somewhat overstated, but that they would still be greater than the costs of delivering and maintaining the upgraded Mooloolah River Interchange.

[4] www.infrastructureaustralia.gov.au/publications/assessment-framework

Benefits and costs breakdown

Proponent's stated benefits and costs	Present value ($m, 2020/21) @ 7% real discount rate		% of total
Benefits			
Road user travel time savings	$2,627.4		105%
Reduced vehicle operating costs	$251.8		10%
Fuel greenhouse gas savings	$55.3		2%
Freight benefits	$25.0		1%
Crash costs[4]	-$171.4		-7%
Environmental costs[4]	$-288.0		-12%
Total Benefits[1]	**$2,500.0**	(A)	**100%**
Total capital costs (P50)	$582.4		93%
Operating costs	$41.2		7%
Total Costs (incl. contingency)[1]	**$623.5**	(B)	**100%**
Net benefits – Net present value (NPV)[2]	**$1,876.5**		n/a
Benefit-cost ratio (BCR)[3]	**4.01**		n/a

Source: Proponent's business case.

(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 (A – B).
(3) The benefit–cost ratio is calculated as the present value of total benefits divided by the present value of total costs (A ÷ B).
(4) The proponent estimates negative benefits (i.e. costs) for safety and environmental impacts, as a result of increased vehicle kilometres travelled on the network with the proposal. This is due to users switching from shorter but slower trips on local roads to faster but longer trips on the major routes through the Mooloolah River Interchange. These environmental costs include air pollution, noise and water pollution.

The proponent's reported capital costs and funding is presented in the following table.

Capital costs and funding	
Total capital cost (full delivery)	$734.6 million (P50, undiscounted) $780.7 million (P90, undiscounted)
Total capital cost (packaged delivery)	$745.5 million (P50, undiscounted) $809.2 million (P90, undiscounted)
Existing funding contributions	The Australian and Queensland Governments have committed $320 million (50:50) towards Packages 1 & 2 of the proposal.
Funding to be confirmed	The balance of funding to deliver the full scope of the proposal is subject to future Federal and State budgetary considerations.

The proponent has undertaken probabilistic modelling for the capital costs of the full delivery and packaged delivery approaches. The contingency levels are appropriate for a project at this stage of maturity, with contingency comprising 31.2% of the outturn P90 estimate for full delivery. This is within the range recommended in the Queensland Government's *Project Cost Estimating Manual* for a major project at this stage of business case development.

We note that the difference in outturn costs between the full and packaged delivery costs is relatively minor ($28.5 million or about 4% at the P90 level), despite the packaged delivery taking place over a longer period. The proponent has advised that this is due to different construction rates and escalation rates that have been used by the two different cost estimators, as well as the difference in delivery timing. Consistent construction and escalation rates would have improved the comparability of the estimates. **If a packaged delivery approach is taken, we recommend**

further review of potential risks and associated contingencies for the later stages of the program, given the longer delivery timeframe.

8. Deliverability

The proponent considers that a Design & Construct (D&C) delivery model would be most appropriate if the proposal can be delivered as a single package as it would drive greater innovation and enable risk sharing. The proponent also undertook a detailed analysis of the packaged delivery approach which found that a series of Transport Infrastructure Contract - Construct Only (TIC-CO) models would be most appropriate. We consider these delivery models appropriate for a proposal of this nature and reflective of the Queensland Government's track record of delivering similar road upgrades across South East Queensland. The proponent has also incorporated lessons learned from the recent delivery of similar major road projects[5], including completing key investigations before tendering, greater engagement with local government, undertaking community consultation prior todelivery , and placing a greater emphasis on cultural heritage.

The proponent has undertaken desktop market sounding for the works. The proponent recognises that there is currently substantial construction work over the forward program and uncertainty in the longer-term pipeline that will need to be carefully monitored. In particular, the proponent will need to manage the delivery of these works alongside other major programs such as the Bruce Highway upgrades[6].

The proponent has undertaken extensive studies and reviews to prepare for delivery, including community consultation, a Review of Environmental Factors, an Environmental Management Plan, geotechnical and hydraulic and flood modelling analysis. The proponent's risk register includes 11 overarching risks which we consider is fairly high-level for a proposal of this nature. The business case considers that no change management processes are required for the proposal, given the proponent's experience on similar projects.

A high risk rating was initially applied to managing environment, cultural heritage and Native Title areas, as well as potential community and stakeholder resistance. The business case notes that there is a high-risk environment and cultural heritage area located in and around the Mooloolah River, and agreement with Aboriginal communities and local environmental groups will be required before construction. The proponent is developing detailed environmental and cultural heritage management plans to mitigate these risks.

We recommend the risk register be continuously reviewed and updated to reflect the full range of active and potential future risks for the proposal, as well as any associated change management processes.

The full proposal also requires 169 property acquisitions, two-thirds of which have already been completed. The proponent has undertaken community engagement activities and there appears to be minimal issues identified by stakeholders. The proponent has advised that the remaining acquisitions are on track for completion before construction.

The business case does not include a Post Completion Review Plan, which is recommended by the Infrastructure Australia Assessment Framework. However, the proponent has advised that the final gate of the mandated Project Assessment Framework process in Queensland includes benefits realisation reporting. This will include a post-implementation review report that evaluates asset performance, determining whether it is serving its intended purpose, a project benefit assessment and identifying any organisational issues or required strategy changes required and the lessons learned. We encourage the proponent to publish the findings of any reviews undertaken to capture the lessons learned from design and delivery for the benefit of future projects.

[5] Including: Bruce Highway – Caloundra Road to Sunshine Motorway (D&C project completed in 2021); Haughton River Floodplain upgrade (D&C project currently under delivery); Bruce Highway – Cooroy to Curra Section D (TIC-CO project currently under delivery).
[6] For further information, see: https://www.tmr.qld.gov.au/projects/programs/bruce-highway-upgrade-program