Australian Government | Infrastructure Australia

Project business case evaluation summary

Bindoon Bypass

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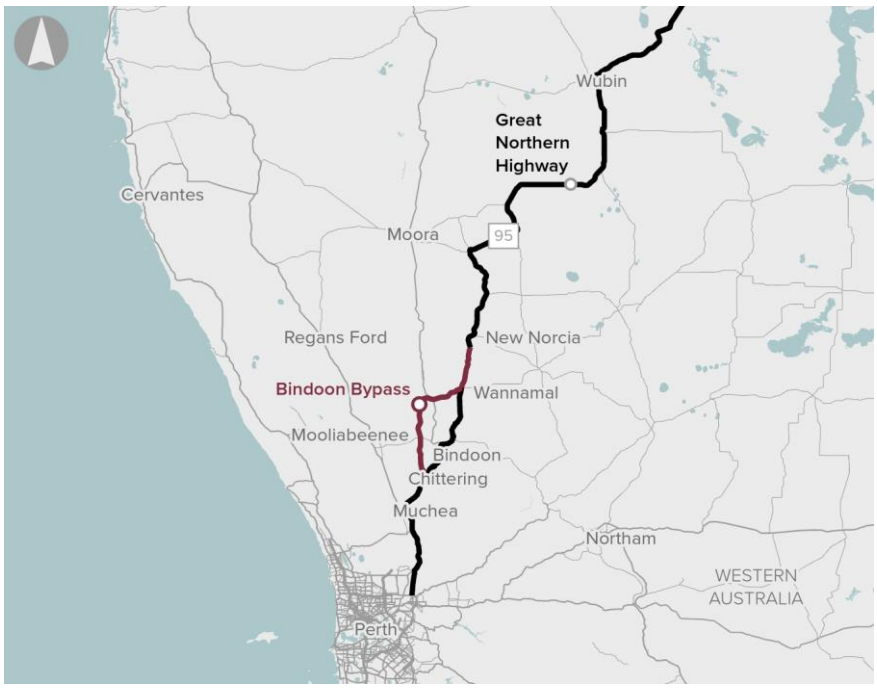

Proponent
Western Australian Government

Location
Bindoon, Western Australia

Capital cost
$275 million (P90, outturn)

Indicative timeframe
Planning: 2019 – 2021
Construction: Q4 2021
Project completion by: Q2 2024

1. Evaluation Summary

The **Bindoon Bypass** has been added to the Infrastructure Priority List as a **Priority Project**.

The Great Northern Highway (GNH) forms part of the National Land Transport Network and provides a strategic freight link between the Perth metropolitan area and Western Australia's north-west. The GNH services Western Australia's growing mining, agricultural and northern tourist industries, carrying a mix of passenger and freight traffic. However, triple road trains (53.5 metre trucks) travelling on the GNH are restricted from the section of the highway between Wubin (276 km north of Perth) and Muchea (50 km north of Perth). These restrictions are caused by road alignments and gradient conditions that are unsuitable for triple road trains.

The Bindoon Bypass would address this problem by enabling triple road trains to travel along the entire length of the corridor, thereby avoiding the need to stop and decouple at Wubin. The proposed project area is 66 km in total length, including construction of 61.6 km of new highway and 4.4 km of improvements to the existing GNH.

The proponent's reported net present value (NPV) for the project is $462 million, with a benefit-cost ratio (BCR) of 3.4 using a 7% real discount rate and P50 capital cost estimate. Infrastructure Australia has independently reviewed the business case and agrees with the proponent that the proposed project benefits would outweigh its costs.

To inform project delivery, the proponent undertook a high-level risk assessment and delivery strategy for the project. The risk identification, assessment and mitigation approach developed in the business case is appropriate, although it requires further detailing and updating as part of future project planning and development works.

2. Context

The GNH forms part of the national highway and freight network that links the Perth metropolitan area and Port of Fremantle with the significant economic activity zones spread across the mid-west and north-west of Western Australia (the Pilbara). The corridor carries a mix of passenger and freight traffic, and services Western Australia's mining, agricultural and northern tourist industries. On the Bindoon section of the corridor, heavy vehicles comprise approximately 63% of the total traffic, of which 36% are currently double road trains (36.5 metre trucks).

Iron ore production in the north-west has expanded from 168 million tonnes in 2000 to 504 million tonnes in 2012. The Pilbara's population and economy are forecast to continue growing rapidly, with a projected gross regional product of $88.7 billion by 2031. This growth in production is increasing the freight and transport task along the GNH. The proponent forecasts heavy vehicle traffic to grow from approximately 402,500 vehicles in 2019, to 648,100 vehicles in 2031. This is a 61% increase over the period, or a 3.6% compound annual growth rate.

The Australian Infrastructure Audit 2019 identifies the challenges and potential development opportunities in Northern Australia[1]. Investment in infrastructure is part of the requirement for realising these opportunities. Australia's north-western region will continue to develop minerals deposits and natural resources opportunities, including iron ore, natural gas, gold and bauxite, as well as new sites containing rare earths that are integral components for batteries and green technologies.

Perth's population is expected to grow by between 30% to 40%[2] from 2012 to 2031. Strong economic growth associated with mining activities has also resulted in the growth of regional centres in the surrounding north-west areas.

Given the growth forecast in the population and economy, the GNH will form an increasingly important strategic link between Perth and Australia's north-west.

3. Problem description

Existing road alignments and gradients on the GNH between Wubin and Muchea are currently unsuitable for triple road trains travelling between Perth and the north-west regions (e.g. Pilbara). Currently, road regulations do not permit access for triple road train combinations on the 218 km section between Wubin and Muchea. Instead, drivers are required to stop at Wubin to decouple and reconfigure their vehicles into smaller truck and trailer configurations, such as double road trains (or smaller) for this section of the highway.

This operation decreases freight productivity and efficiency since more truck trips are then required to deliver the same freight task, leading to an overall net increase in transport costs per unit of freight transported. The proponent estimates that the cost of this problem at $62 million by 2025, and expects it to grow to $86 million by 2045.

The proponent also states that these additional truck trips between Muchea and Wubin increases the safety risk and potential number of crashes for vehicles travelling through Bindoon and other sections of the corridor. Between January 2012 and December 2016, there were 69 safety incidents, of which 4 were fatalities. The number of heavy freight vehicles currently passing through the town centre of Bindoon also impacts on amenity for the local community.

[1] Infrastructure Australia Audit 2019, Page 194
2 Directions 2031 and Beyond. Department of Planning August 2012.

4. Options identification and assessment

The proponent's final business case assessed and shortlisted a total of three project options using multi-criteria analysis (MCA) and cost-benefit analysis (CBA). The MCA used a mix of quantitative and qualitative measures for criteria, including network reliability, freight efficiency, strategic alignment, safety and community impact.

As part of an earlier corridor selection strategy, the proponent considered a wider range of options that were assessed using a two-stage MCA process. The longlist of options included a wide range of infrastructure and non-infrastructure solutions. Non-infrastructure solutions included a permit regime for Restricted Access Vehicles and use of alternative modes such as ocean shipping and rail. The assessment process considered environmental, heritage and social factors, as well as travel time forecasts and capital cost estimates to arrive at a shortlist of three bypass options, as presented in the final business case.

The three shortlisted options are:

- Option A – Western Bypass alignment of 61.6 km to the west of Bindoon, Bindoon Hill, and Little Bindoon Hill, re-connecting to the north of Bindoon, near Calingiri West Road.
- Option B – Western Bypass alignment of 20 km running north-west from the Chittering Roadhouse, before passing to the west of Bindoon, and following the alignment of Wells Glover Road, and reconnecting back into GNH before a short offline upgrade over Little Bindoon Hill.
- Option C – Eastern Bypass, which is a shorter 8.5 km bypass to the east of Bindoon that more closely follows the alignment of the GNH.

The proponent used CBA to evaluate these three options against a 'do minimum' base case, which assumed that triple road trains coming south on the GNH will continue to stop and decouple at the existing facility in Wubin.

The proponent estimated that the BCRs for the two Western Bypass options were both similar and higher than the Eastern Bypass option. Option A was selected as the preferred option based on its economic merit, relatively lower community impact and better alignment with government strategic objectives.

5. Proposal

The proposed Bindoon Bypass aims to increase freight efficiency and productivity by enabling access for triple road trains for the entire trip between Muchea and Wubin on the GNH. The scope of work includes:

- 61.6 km of new highway to the west of Bindoon, comprising a single carriageway in each direction and a one-metre wide centre line treatment
- 4.4 km of infrastructure improvements to the existing highway in the vicinity of Seven Mile Hill, and the connection to New Norcia Bypass, which was recently constructed
- Two grade-separated intersections and 13 at-grade intersections to assist in providing safe connections to the local road network. The two grade-separated intersections will provide a connection to the Bindoon township via the old GNH, and at Mooliabeenee Road, to facilitate the movement of traffic between Bindoon and Gingin via Mooliabeenee Road
- New bridge structures at each of the grade-separated intersections and the crossing of the Brockman River
- 12 km of service roads, which will help facilitate any future upgrade to dual carriageway
- Overtaking lanes every five to 10 km, with eight proposed northbound locations and eight southbound locations.

- Four new rest stops suitable for accommodating light vehicles and road trains (two northbound and two southbound).

The private sector is also planning to develop a logistics hub at Muchea, which is being completed as part of the Northlink WA project. While this is not part of the scope of the project business case, it is an important facility to achieving the full benefits of the project. Although this infrastructure will be privately funded, these capital costs were appropriately included in the project's economic analysis given that the project's benefits cannot be fully realised without this capital expenditure.

6. Strategic fit

The GNH is an important strategic link between Perth's metropolitan area and Australia's north-west. Due to the significant growth of the resources sector in Western Australia, there continues to be considerable demand to move freight along the GNH corridor between ports located in the metropolitan Perth area and the north-west of the state, such as at Port Hedland, Cape Lambert and Dampier. The proposed project supports Australia's economic and mining activity by enabling more efficient and cost-effective freight transport.

The project aligns with other Australian, state and local governments' policy and planning documents, including the *Pilbara Cities Initiative*, Western Australian *Regional Freight Transport Network Plan*, *Western Australia Road Safety Strategy 'Towards Zero'*, as well as the State's *'Keep Western Australia Moving'* Strategy.

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

7. Economic, social and environmental value

The proponent's economic, social and environmental appraisal of the project estimates an NPV of $462 million and a BCR 3.4 using a 7% real discount rate and P50 capital cost estimate when evaluated over a 30-year operational period.

The majority of the project's benefits are vehicle operating cost savings (making up 85% of the total project benefits). This benefit is driven by the ability for freight transport operators to shift to triple road train vehicle combinations over a greater length of the corridor. As a result of the project, the proponent estimates a total net reduction of 216 freight trips per day between Muchea and Wubin.

Infrastructure Australia undertook a review of the proponent's methodology, economic analysis and results, and carried out sensitivity testing to consider the robustness of the economic results.

Our analysis found that the project case increased the average travel speed, which materially increased the project benefits. The proponent assumed relatively high travel speeds (of up to an average of 110 km/h) for freight vehicles for some sections of the corridor. A lower average speed in practice would reduce the benefits of the project.

In addition, while the project enables the use of triple road trains for the entire length of the corridor, we found the proponent's assumptions on the estimated take-up of triple road train vehicles (in total and over time) to be optimistic given the types of vehicles currently being used. A lower rate and volume change in vehicle composition would also reduce the benefits of the project.

While our analysis did identify some downside risks, the proponent's economic appraisal mostly aligned with the Infrastructure Australia Assessment Framework. Taking into consideration the impacts of these downside risks, we are confident that the project's economic, social and environmental benefits will significantly outweigh its costs.

The proponent took adequate account of all relevant project costs including annual routine maintenance, and significant periodic maintenance for resurfacing and rehabilitation, which is appropriate for the composition of heavy vehicles on the new roads.

The following table presents a breakdown of the proponent's stated benefits and costs.

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	$83.1		12.7%
Vehicle operating cost savings	$554.5		84.6%
Safety Benefits	$2.5		0.4%
Reduced environmental externalities	$9.0		1.3%
Residual value	$6.6		1.0%
Total Benefits[1]	**$655.7**	(A)	**100%**
Capital costs (P50)	$189.3		97.8%
Operating costs	$4.3		2.2%
Total Costs[1]	**$193.7**	(B)	**100%**
Net benefits - net present value (NPV)[2]	**$462.0**	(C)	n/a
Benefit-cost ratio (BCR)[3]	**3.4**	(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).

The following table presents a breakdown of the proponent's reported capital costs and funding.

Capital costs and funding	
Total capital cost	$275 Million (P90, nominal, undiscounted)
Australian Government funding contribution	$220 million (80% of total project costs)
Other funding	$55 million Western Australia Government

8. Deliverability

The proposed delivery method is a design and construct contract with Main Roads Western Australia maintaining overall accountability and delivery of the project. The proponent has past experience with similar projects and has capacity for delivery. The proponent notes that a large part of the Bindoon Bypass project will be constructed off the existing road network and, given the location, the project has a relatively low construction risk.

The proponent also developed a preliminary risk register which identifies and quantifies project risks and preliminary mitigation strategies. The risk assessment register included, but was not limited to, economic, environmental, design, social, and construction factors relevant to the project. Overall, the risk assessment and mitigation approach is appropriate and consistent with this stage of project development. Further ongoing planning and risk assessment will be necessary during the project initiation and development phase to further update and detail the risk register. This includes detailing priority actions to mitigate identified risks.

The proponent has developed a benefits realisation plan which identifies key project performance indicators, measures and timelines. If the project proceeds, Infrastructure Australia encourages the proponent to undertake and publish a Post Completion Review of the project to assess the extent to which the expected benefits and costs have been realised. This will help to inform future projects and should assess project benefits and outcomes against pre-construction forecasts.

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