Australian Government | Infrastructure Australia

BUSINESS CASE EVALUATION SUMMARY

Singleton Bypass (New England Highway)

PURPOSE OF EVALUATION
Committed and funded proposal

EVALUATION OUTCOME
Funded proposal (not eligible for the Infrastructure Priority List)

ASSESSMENT FRAMEWORK STAGE

1 DEFINING PROBLEMS AND OPPORTUNITIES | 2 IDENTIFYING AND ANALYSING OPTIONS | **3 DEVELOPING A BUSINESS CASE** | PROJECT DELIVERY | 4 POST COMPLETION REVIEW

LOCATION
Singleton, NSW

GEOGRAPHY
Smaller cities and regional centres

SECTOR
Transport

OUTCOME CATEGORY
Regional connectivity

PROPONENT
NSW Government

INDICATIVE DELIVERY TIMEFRAME
Construction start: 2023
Completion by: 2027

EVALUATION DATE
8 September 2022

CAPITAL COST
Pending[1]

FUNDING COMMITTED (P90)

Australian Government:
$560 million, November 2020

NSW Government:
$140 million, November 2020

Review summary

Infrastructure Australia has evaluated the business case for **Singleton Bypass** in accordance with our 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. As the project is fully funded, it is not eligible for inclusion on the *Infrastructure Priority List*.[2]

The Singleton Bypass project has a total budget envelope of $700 million, with $560 million committed by the Australian Government and the remaining $140 million by the NSW Government. As the committed funding is in excess of the P90 cost estimate, the proponent expects funding to be released up to the estimated capital cost, with appropriate governance mechanisms implemented for releasing funding as required.

[1] This Evaluation Summary currently excludes the capital cost (nominal, undiscounted) to maintain confidentiality during the current active procurement process. The capital cost will be added once procurement is complete.
[2] The Infrastructure Priority List only identifies those proposals which are seeking investment.

The New England Highway forms part of the inland Sydney to Brisbane National Land Transport Network and is a major freight and commuter route between Newcastle and the Upper Hunter. The highway currently passes through the Singleton town centre, with one lane in either direction and a speed limit of 50 kilometres per hour. Up to 28,000 vehicles travel along the highway through Singleton each day, up to 15% of which are heavy vehicles (4,200). Road users currently experience congestion and delays along the route, amplified by heavy vehicle movements, with growing risk of safety incidents and declining amenity. The *New England Highway upgrade* was added to the *Infrastructure Priority List* in February 2016, and recognises the route through Singleton as a constraint on the safe and efficient movement of heavy vehicles on the highway.

The Singleton Bypass project seeks to improve travel reliability on the New England Highway through Singleton, particularly for road freight supporting the Upper Hunter and the north west New England region. It is expected to improve road safety for through and local traffic, improve the amenity of Singleton for the community by removing freight traffic, and support future traffic growth along the highway associated with planned land use in the Upper Hunter area. The project demonstrates alignment with various local, state and national government objectives, and is identified in the *Draft New England Highway Corridor Strategy*.

The proponent's business case states that the net present value (NPV) of the project is estimated to be $318.0 million with a benefit-cost ratio (BCR) of 1.85.[3] [4] While the cost estimate appears robust, the project's contingency allowance may be low given the project's complexity and in the context of current industry-wide market capacity pressures. An allowance of $10 million has been included to meet required biodiversity offset obligations. However, noting the significant flood risk in Singleton, greater resilience measures may be required that are not currently costed. We consider the economic appraisal to provide a thorough assessment of the economic merits of the project and, despite some limitations and risks to the scale of benefits, the project is expected to deliver a net economic benefit to society.

While the proponent has considerable experience delivering similar projects, external market conditions and capacity pressures may impact the ease of delivering this project in line with the proposed time, cost and scope, in the short-medium term. The proponent should continue to monitor these risks and potential impacts on project delivery.

Project description

The Singleton Bypass project involves building a new section of highway west of Singleton across the floodplain, starting near Newington Lane and re-joining the New England Highway north of McDougalls Hill. The key components of the project include:

- around eight kilometres of new highway (the bypass) with a single lane in each direction
- connection with the New England Highway at the southern end of the project, including a southbound entry ramp and northbound exit ramp (the southern connection). The northbound exit ramp would connect to the New England Highway via a new roundabout intersection at Maison Dieu Road
- 600-metre-long bridge over the floodplain at the southern connection
- 1.84-kilometre-long bridge over the Main North railway line, Doughboy Hollow and Hunter River floodplain, Army Camp Road, Putty Road and the northbound entry and exit ramps at the Putty Road connection (bridge over the floodplain).
- connection at Putty Road consisting of a southbound entry ramp, southbound exit ramp, northbound entry ramp and northbound exit ramp (the Putty Road connection)
- 205 metre bridge over the Hunter River
- 1.7-kilometre northbound climbing lane between Gowrie Gates and the northern connection.

Further information about the project can be found here: https://roads-waterways.transport.nsw.gov.au/projects/new-england-highway/singleton-bypass/index.html.

[3] Using a 7% real discount rate and a P50 capital cost estimate.

[4] Economic appraisal results have been updated following submission of the business case for evaluation, due to updates to cost estimates, which have resulted in a slight reduction of the BCR. Results presented here reflect those contained in the business case.

Review themes

Strategic Fit	The case for action, contribution to the achievement of stated goals, and fit with the community.
Case for change	The problem identified in the business case relates to the *New England Highway upgrade* proposal, which was added to the *Infrastructure Priority List* in 2016. The highway currently passes through the Singleton town centre, with up to 28,000 vehicles travelling along the highway each day, of which up to 15% are heavy vehicles. Road users travelling on the New England Highway through Singleton currently experience congestion and delays which are amplified by heavy vehicle movements, and there is growing risk of safety incidents and declining amenity.
Alignment	The project is identified within the *Draft New England Highway Corridor Strategy* and contributes to national, state and local government objectives, including the *2021 Australian Infrastructure Plan* Recommendation 4.2 *Connecting regional and remote Australia*. However, the *Draft New England Highway Corridor Strategy* has not been finalised and will be superseded by Transport for NSW (TfNSW) *Regional Plan 2041 for the Hunter*, expected to be released in late 2022. The proponent has advised that the Draft Plan will be publicly exhibited before finalisation to provide opportunity for local communities and key stakeholders to review content and provide comment ahead of finalisation. While consultation is planned, it is occurring at the end of the planning process so is unlikely to materially influence the project scope. This presents a risk that major infrastructure projects on the corridor are being progressed without a finalised, endorsed corridor strategy that appropriately considers program interdependencies and staging.
Network and system integration	The project integrates with the existing New England Highway and presents an efficient solution to the problems and objectives identified, as shown through the traffic and economic analysis. There are several interdependent projects on the New England Highway. However, none of these is required to realise the benefits of the project: • Muswellbrook Bypass – delivery funding committed • New England Highway upgrade, Belford to Golden Highway – under construction • New England Highway upgrade, Golden Highway to Singleton – identified as short-term priority in the *Draft New England Highway Corridor Strategy* (unfunded) • Singleton to Muswellbrook capacity program – identified as short-term priority in the *Draft New England Highway Corridor Strategy* (planning funding committed). The Singleton Bypass improves the flood resilience of the New England Highway. In the business case, the proponent identified the opportunity for the inland New England Highway to provide a flood-resilient alternative route to the coastal Pacific Highway for road freight between Sydney and Brisbane. However, without suitable analysis, the level of redundancy provided by the New England Highway cannot be confirmed. Therefore, there is an opportunity for the proponent to review the New England Highway corridor to determine the level of flood resilience (and how much this is improved with the Singleton Bypass) and identify any other constraints to providing a flood-resilient alternative route to the Pacific Highway.
Solution justification	The proponent has carried out multiple investigations over a significant period of time to investigate the need and development of the project. The preferred route was selected during the Strategic Business Case phase based on a combination of it having the strongest economic merit and comparative performance in relevant technical studies, including traffic and flood performance. While the two options considered in the Final Business Case represent only minor technical variations, the earlier options analysis indicates that this is the most appropriate route, with other routes unlikely to deliver a better value for money solution. Although the decision to include off-ramps at Putty Road may not have strong economic merit, it represents meaningful consideration of stakeholder views during project development.

Stakeholder endorsement	The project has strong support from community and business stakeholders and has demonstrated meaningful consideration of stakeholder views during design development. We note that there is an endorsement risk due to stakeholder desire for a dual carriageway bypass (rather than single lanes as proposed). However, the proponent's analysis indicates that additional lanes are not required within the 20-year modelling horizon.
Societal Impact	**The social, economic and environmental value of the project, as demonstrated by evidence-based analysis.**
Quality of life	The project will primarily improve travel reliability and reduce travel times for vehicles that currently travel through Singleton, including coal mining industry traffic, commuters and heavy vehicles. It is also expected to improve road safety as traffic will be diverted out of Singleton town centre to the bypass, reducing fatality and serious injury crash rates in the project area. Amenity within the Singleton town centre is expected to improve due to the absence of heavy vehicles, resulting in reduced engine noise and exhaust emissions, as well as safer conditions for motorists and pedestrians. A total of 37 properties will be either fully or partially acquired to enable the project to be delivered. The proponent has advised that nine properties have been acquired to date, with an additional 28 properties planned for acquisition in the second half of 2022. TfNSW is currently preparing tender documentation which includes the Scope of Work and Technical Criteria (SWTC) to guide the design development of the project. The SWTC will outline how placemaking opportunities for the incorporation of Aboriginal and non-Aboriginal heritage is included within urban design and landscaping outcomes (for instance, First Nations signage and artwork).
Productivity	The project aims to increase road capacity to meet the projected future traffic demand, which would result in substantial benefits for freight vehicles by allowing higher PBS[5] levels to operate on the corridor, leading to increased productivity, reduced travel times, reduced vehicle operating costs, and improved competitiveness. The proponent's business case notes that the project will support economic growth by employing local workers during planning, design and construction phases (including local and regional contractors or local council crew) in the surrounding region. The project will contribute to future economic growth by expanding opportunities for the production of goods and connecting communities to economic opportunities (such as employment) which in return will enhance liveability and population growth in Singleton and nearby communities. However, as the bypass will result in a reduced number of vehicles passing through Singleton, there will likely be a corresponding negative impact on business trade.
Environment	As the bypass will increase the overall vehicle kilometres travelled across the network, there will be increased emissions (negative environmental externalities) from vehicles. The business case reports that a referral to the Commonwealth under the Environment Protection and Biodiversity Conservation (EPBC) Act was not required as biodiversity impacts are mitigated through an existing strategic assessment. However, the project will significantly impact Central Hunter Valley eucalypt forest and woodland listed as critically endangered under the EPBC Act. TfNSW reports that they will seek to reduce these impacts and consult with the Department of Climate Change, Energy, Environment and Water. An allowance of $10 million has been included in the cost estimate to meet expected biodiversity offset obligations. The project's Review of Environmental Factors identified several adverse environmental impacts, including impacts to heritage sites (both Aboriginal and non-Aboriginal), air and noise emissions, biodiversity and reduced visual amenity for some residents and road users.

[5] Performance-Based Standards. The basic principle of PBS is to match the right vehicle to the right freight task.

Sustainability	There has been extensive engagement with local stakeholders to consider aspects of social and economic sustainability. However, it is unclear to what extent the project has been designed and will be implemented to align with the proponent's environmental sustainability strategies and initiatives.
Resilience	Singleton town centre is significantly exposed to flood risk and is effectively cut off during a 1 in 7-year flooding event. While not the objective of the project, the bypass will marginally improve the communities' resilience to flooding events. The proposed southern connection will allow an evacuation route from the town centre to the bypass in a 1 in 20-year flood event. However, ramps to the main bypass carriageway north will be completely flooded and will not be able to be used as an additional flood evacuation route. Noting the likelihood of increased extreme weather events, there is an opportunity to further mitigate residual flood risks for the community by using permeable surfaces where possible.
Deliverability	**The capability to deliver the project successfully, with risks being identified and sufficiently mitigated.**
Ease of implementation	While the project has some complex technical elements including several bridges, a 1.8 kilometre viaduct and significant areas of cut and fill earthworks, the proponent has considerable experience delivering similar projects. However, external market conditions and industry-wide capacity pressures may impact the ease of delivering this project in line with the proposed time, cost and scope, in the short-medium term. Noting these pressures and the scale of land acquisition[6] and procurement to support delivery, there is a risk the project will not be delivered to the proposed timeframe. The proponent should continue to monitor these risks and potential impacts on project delivery.
Capability & capacity	Risks related to market capacity have been considered through packaging, scoping and procurement methods to ensure sufficient market appetite and efficient delivery of the project. A market interaction process was completed as part of the procurement strategy, where a range of Tier 1 and Tier 2 contractors provided feedback which was incorporated into the final procurement approach. As a result, packaging was developed with consideration given to the scale of works to suit relevant contractors, the impact of concurrent projects within the NSW pipeline, and contractor expertise required for each package. The level of engagement with contractors and consideration of their feedback in the procurement strategy provides some confidence in the market's capability and capacity to deliver the project.
Project governance	The procurement strategy has been developed based on TfNSW analysis and the market interaction process. A Design and Construct model with a single package is proposed, but with early works packages completed through minor works contracts or performed by the proponent. A wide range of early works have been considered, including utility adjustments (including a heritage pump station), site clearing, establishment of ancillary sites, cutting at McDougalls Hill, and Aboriginal artefact salvage. However, the scope of the early works packages appears to have some uncertainty due to delays in land acquisition. This uncertainty must be addressed to commence early works and provide certainty of the contract scope for tenderers. Alternative funding options, such as value capture and user pays, have not been considered, which is consistent with NSW Government policy for regional roads.
Risk	A comprehensive risk register was included in the business case. This has been used to estimate probabilistic cost contingency estimates with the appropriate level of statistical significance (that is, P50 and P90). Risks that remain significant following mitigation strategies include potential community opposition to the two-lane bypass design (which is sufficient for the forecast traffic demand) chosen over a four-lane design which was preferred by the community, changes to reduce

[6] The proponent has advised that a total of nine properties have been acquired to date, with an additional 28 properties planned for acquisition in the second half of 2022.

	cost in viaduct design, tender appetite and capacity, stakeholder risk related to Registered Aboriginal Parties, and additional specialist studies, major flood event and potential contaminated material. In particular, we note there is minimal contingency allowed for removal and treatment of potential contaminated materials. The proponent has advised that the project cost estimates and contingency allowance have increased since the business case was finalised to account for the risk of 'higher than anticipated escalation' (including property escalation). While this will help to mitigate some cost pressures, contingency may still be low for a project of this scale in the context of industry-wide market capacity pressures. The proponent has considered additional opportunities to reduce costs, including the use of cut material from the northern section as fill for the other sections, which has contributed to the selection of the single tendering package.
Lessons learnt	The business case does not highlight any learnings from similar projects. However, we note that the proponent has delivered a large number of projects across NSW with similar complexities and challenges. The business case includes a Benefits Realisation Management Plan which sets out the proposed process for realising benefits, including measurement, tracking, management and risk mitigation. It also includes a high-level cost management plan. Promisingly, the project includes funding for an Infrastructure NSW Gate 6 Benefit Realisation review which will include updated traffic modelling, calculation of BCR and post-completion review work.

Economic appraisal results (preferred option)

The proponent's business case states that the NPV of the project is estimated to be $318.0 million with a BCR of 1.85.[7,8]

The base case is presented as a do minimum option, assuming no bypass is constructed and the continuation of maintenance costs for the New England Highway. However, as no detailed description of the base case is provided, there is limited transparency regarding what works, and upgrades are included in the base case versus the project case. Depending on the assumptions made and inclusions in the base case, this could have a positive or negative impact on the BCR.

The economic appraisal appears to follow NSW Government guidelines and we consider it to provide a robust assessment of the economic merits of the project. Despite some limitations, the project is expected to deliver a net benefit to society.

	Discount rate:	4%	7% (central)	10%
Core evaluation results[1]	**BCR:**	2.95	1.85	1.24
	NPV ($m):	$792.8	$318.0	$82.5
Key benefits measured:	The economic appraisal demonstrates that the project's primary benefits relate to travel time savings (89% of the total), with other key benefits relating to vehicle operating cost savings and reduction in crash costs. Key intangible costs and benefits identified in the business case include: • costs resulting from construction disruption (low expected impact) • reduced benefits from COVID-19/working from home (low expected impact) • flow-on network benefits • contribution to the local economy • reduced operations and maintenance costs compared to the existing highway • amenity benefits. While the intangible benefits and costs have the potential to improve or worsen economic and social outcomes for the Singleton township, it is not clear if or how these			

[7] Using a 7% real discount rate and a P50 cost estimate.

[8] Economic appraisal results have been updated following submission of the business case for evaluation, due to updates to cost estimates, which have resulted in a slight reduction of the BCR. Results presented here reflect those contained in the business case.

	have influenced the selection of the preferred option.
Key observations and issues	The Singleton area experienced growth in traffic volumes of 2.6% per annum between 2015 and 2018, higher than the NSW average of 1.5% over the 10-year period to 2017. The higher growth is largely attributable to the mining sector, with 17 active coal mines in the Local Government Area. The proponent has estimated annual average growth rates for trips through both Singleton and the bypass, by vehicle type (cars/light vehicles and heavy vehicles). Growth rates appear to be appropriate and are in line with the NSW average for light vehicles, and slightly higher for heavy vehicles. Given the uncertainty related to coal mining and future demand, sensitivity analysis should have been undertaken to understand the impacts of lower heavy vehicle traffic growth on the BCR; however, this was not included in the business case. Noting that around 20% of travel time savings benefits relate to heavy vehicles, the benefits are still robust to a slowdown in mining activity. The traffic demand modelling estimates that in the opening year (2026), around 65% of traffic will use the bypass, with the remaining 35% continuing to travel through Singleton. The proponent has indicated that there is no intention to restrict heavy vehicles from travelling through Singleton and requiring them to travel on the bypass. This is largely driven by the need for these vehicles to access large industrial estates within the MacDougalls Hill area (west of Singleton Heights) that services the surrounding mines. This may place downside risk on the amenity and placemaking benefits of the project (although these were not modelled in the cost-benefit analysis). Our review has identified potential downside risks to the BCR, including: • Peak to daily expansion factor – travel time savings have been calculated using a traffic model for AM and PM peak periods, and then factored to a daily amount using a peak to daily expansion factor (an expansion factor of 1.00 implies that there are no travel time savings outside of peak periods). The expansion factor used was 2.03, calculated from traffic counts. By using traffic counts, it implies that average trip time is the same across peak and off-peak periods, and that the same travel time savings are achieved across periods; however, this is highly unlikely. As travel time savings account for around 89% of total project benefits, this parameter poses a large risk to the BCR as benefits are likely overstated. • Heavy vehicle proportions – the economic model applies an assumption (in line with TfNSW guidelines) that heavy vehicles account for 12.8% of total traffic through Singleton; however, this varies from proportions used in the traffic model. Applying the same proportions across the traffic and economic models would ensure that the 'demand curve' is not broken. As this parameter value also informs the value of travel time savings benefits (and Value of Time for heavy vehicles is around double that of light vehicles), adjusting this parameter in the economic model to align with that in the traffic model would decrease the BCR. • 2046 model stability – the traffic model contains forecasts for 2026, 2036 and 2046. Travel times through the project area in 2046 are forecast to be double that in 2026 (around 29 minutes compared to 13 minutes). Like many traffic models, a limitation exists whereby the model does not account for realistic changes in behaviour. For instance, in reality many motorists would change the time of their trips to avoid traffic, hence, the level of congestion and travel time in the model is likely overstated. To overcome this limitation, it is common practice to have two forecast years in the traffic model, with one being close to the opening year and the second 10 years later, with travel time savings benefits flatlined thereafter. If applied to the modelling, this would have negative impacts on the BCR. Regardless of these limitations, the results of the CBA are robust to a range of sensitivity tests undertaken by the proponent, including testing the sensitivity of traffic growth (assuming 0% growth and 50% of the proposed growth).

(1) Costs reported in this table are based on P50 cost estimates, $2021/22.

Project development

The proponent has undertaken a range of investigations to assess the need for the project, with the following two problems being identified:

1. local network cannot meet traffic demand from commuters, the mining industry and heavy vehicles during AM and PM peaks, leading to increased travel times and delays for road users.
2. high heavy vehicle volumes, which are often oversize and/or over-mass vehicles, and activities associated with mining, put pressure on local roads and existing infrastructure, leading to poor safety and amenity outcomes.

Response options were initially identified in the 2013 *Singleton Bypass Preliminary Feasibility Assessment Report*. This study considered 15 potential route options within four broad corridors. These options were subsequently refined and filtered to three options using a multi-criteria analysis (MCA) and relevant technical studies in the 2015 *Preliminary Environmental Investigation*.

An economic appraisal of the base case and three options was prepared for the Strategic Business Case in 2017. The preferred route was selected using a value management workshop which consisted of a MCA based on criteria informed by relevant technical studies. The preferred route was selected on the basis that it had the best traffic and flood performance, less property severance and improved access for residents through an interchange close to the town centre. The 2021 Final Business Case considered two variations of the preferred route, both with and without south-facing ramps at Putty Road, as initial traffic modelling suggested that the northbound off-ramp and southbound off-ramp at the Putty Road interchange were unlikely to have a material impact on traffic access and volumes. While these options represent only minor technical variations, the earlier options analysis indicates that this is the most appropriate route, with other routes unlikely to deliver a better value for money solution.

In April 2021, the NSW Government announced its commitment to increasing the scope to include ramps at Putty Road and a revised southern interchange. The proponent reports that this is well supported by the local community.

Overall, the project appears to present an efficient solution to the problems and objectives identified, as identified through the traffic modelling and economic analysis. While the proponent has not undertaken specific COVID-19 sensitivity testing, we recognise that, due to the location and nature of local industry, population growth and working from home, traffic volumes are unlikely to be affected by changes resulting from COVID-19 in the long term.

Project engagement history

EARLY-STAGE PROPOSAL	POTENTIAL INVESTMENT OPTIONS	FUNDED PROPOSAL REVIEW
Not submitted for Infrastructure Priority List consideration at Stage 1	Recommended for the Infrastructure Priority List at Stage 2 as part of *New England Highway upgrade* program: February 2016	Submitted to Infrastructure Australia as a funded project

Detailed economic appraisal results

The following table presents a breakdown of the benefits and costs stated in the business case.

Benefits and costs breakdown

Proponent's stated benefits and costs	Present value ($m,2021/22)			% of total for 7% results
Discount rate (real)	**4%**	**7%**	**10%**	
Total costs[1,2]	**$406.1**	**370.4**	**$341.3**	**100%**
Benefits				
Vehicle operating cost savings	$62.4	$39.4	$26.3	5.7%
Travel time savings	$1,063.1	$613.2	$377.9	89.1%
Crash costs savings	$51.5	$31.6	$20.6	4.6%
Externality cost savings	-$18.3	-$10.6	-$6.6	-1.5%
Residual value of assets	$40.2	$14.8	$5.6	2.2%
Total benefits[1]	**$1,198.9**	**$688.4**	**$423.8**	**100%**
Net present value (NPV)[3]	**$792.8**	**$318.0**	**$82.5**	**n/a**
Benefit-cost ratio (BCR)[4]	**2.95**	**1.85**	**1.24**	**n/a**

Source: Proponent's business case

(1) Totals may not sum due to rounding.

(2) Costs reported in this table are based on P50 cost estimates.

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

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