

Napoleon Road Upgrade



PURPOSE OF EVALUATION
Proposal seeking funding



EVALUATION OUTCOME

Not recommended for the Infrastructure Priority List at this time

**ASSESSMENT
FRAMEWORK
STAGE**



LOCATION

Melbourne, Victoria

GEOGRAPHY

Fast-growing cities

SECTOR

Transport

OUTCOME CATEGORY

Efficient urban transport networks

PROPONENT

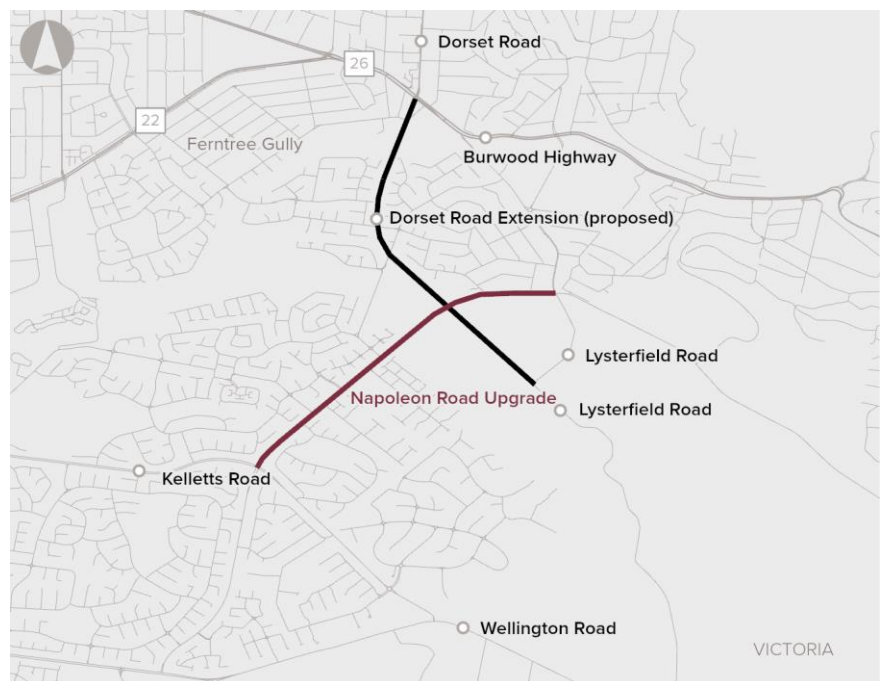
Victorian Government on behalf of the Australian Government

INDICATIVE DELIVERY TIMEFRAME

Construction start: Q1 2024
Completion by: Q2 2026

EVALUATION DATE

8 September 2022



CAPITAL COST

\$233.3 million (P50, outturn)
\$272.9 million (P90, outturn)

FUNDING COMMITTED/SOUGHT (P90)



Review summary

Infrastructure Australia has evaluated the business case for the **Napoleon Road Upgrade** 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 a result of our assessment, Napoleon Road Upgrade has not been added to the *Infrastructure Priority List* as an Investment-ready proposal.

Napoleon Road is a two-lane, single-carriageway road, located in the outer eastern suburbs of Melbourne, within the Knox municipality. It serves as a key north-south connection between the heavily populated suburbs of Ferntree Gully, Lysterfield, and Rowville. Napoleon Road is operating beyond its theoretical design capacity, contributing to

long and unreliable journeys. Additionally, existing road conditions are substandard¹, increasing the risk of crashes. Forecast population growth, as well as poor public transport options and limited active transport facilities, are expected to exacerbate pressure on road infrastructure and worsen congestion and safety issues.

In response to the identified problems, the options analysis considered combinations of infrastructure and non-infrastructure interventions and found upgrading Napoleon Road to be the top-ranking option, although we consider a broader range of non-infrastructure options could have been considered. Additionally, an option to adopt a more integrated approach together with the Dorset Road Extension, which is being planned to intersect with Napoleon Road, was not considered in the options assessment process.

The business case considered three proposal options, with the preferred option seeking to duplicate a 2.7 km section of Napoleon Road between Kelletts Road and Lysterfield Road and improve public transport and active transport facilities. This preferred option has a Benefit Cost Ratio (BCR) of 0.82 and a Net Present Value (NPV) of -\$38.5 million², which was the lowest BCR of the options considered. This option was selected because it provides better safety and journey experience outcomes compared to the other options. However, another option, which has a reduced scope, delivers a similar level of benefits for lower costs (i.e., has a higher BCR) and has lower levels of risk related to environmental impacts.

The economic appraisal does not account for impacts to interfacing road projects within the Knox municipality. In particular, Dorset Road is proposed to be extended so that it will directly intersect with Napoleon Road. The Dorset Road Extension and Napoleon Road Upgrade are proposed to be delivered over the same period. A preliminary economic analysis assessing the combination of these two proposals indicates that Napoleon Road Upgrade can be delivered with a reduced scope, saving \$37 million, while delivering a similar scale of benefits. The business case notes an integrated delivery would support improved stakeholder engagement and a streamlined land acquisition process.

The preferred option for Napoleon Road Upgrade does not appear to be the best value response to the identified problem, particularly when considering the proximity and interdependencies with Dorset Road Extension. We recommend that the proposal be considered as part of an integrated program, and that further work is undertaken to quantitatively assess the performance of options. This would provide confidence that costs are minimised, and benefits are maximised across the two proposals, supporting better value for society.

Proposal description

The proposal seeks to upgrade Napoleon Road to address issues associated with congestion, service expected population growth, and improve road safety. Specifically, the preferred option for the proposal includes:

- duplication of 2.7km of Napoleon Road between Kelletts Road and Glenfern/Lysterfield Road
- upgrades to existing intersections at Kelletts Road and Glenfern/Lysterfield Road
- new intersections at Lakesfield Drive and Sovereign Crest Boulevard
- bus priority infrastructure at the new intersections
- replacement of the bridge across Monbulk Creek
- shared use paths on both sides for cyclists and pedestrians.

Further information on the proposal is available on the proposal website – [Napoleon Road Upgrade](#).

¹ Factors contributing to poor conditions on Napoleon Road include, poor road geometry, lack of sealed shoulders, unprotected roadside hazards, and poor pavement conditions.

² Based on a 7% real social discount rate, P50 capital cost estimate and evaluated over a 30-year period.

Review themes

Strategic Fit The case for action, contribution to the achievement of stated goals, and fit with the community.

Case for change Growth in traffic volumes and deteriorating road conditions are impacting travel time, reliability and road safety on Napoleon Road and surrounding areas. Poor public transport options limit travel choice and contributes to reliance on private vehicles and congestion. Population growth, and the associated increase in traffic volumes, is identified as one of the key drivers of the proposal, with the Knox municipality expected to grow by 20% over the next 16 years. While the growth rate is relatively low when compared to expected growth of 46% across Greater Melbourne over the same period³, Napoleon Road is already operating beyond its design capacity of 900 vehicles/hour, with volumes of up to 1,525 vehicles/hour in the PM peak. Continued growth is expected to exacerbate pressure on road infrastructure and worsen bottlenecks on key links along the arterial road.

Alignment The proposal aligns with state strategies such as *Victoria's Infrastructure Strategy 2021-2051*, *Victoria's Climate Change Strategy, Plan Melbourne 2017-2050*, and the *State Planning and Policy Framework*. The proposal also aligns to the Victoria Department of Transport's *2019-2023 Strategic Plan*, and Victoria's *Road Safety Strategy & Action Plan*, although the proposal is not specifically mentioned in these strategies. The proposal is aligned with plans of the Knox Local Government. Napoleon Road is specifically identified as a strategic cycling corridor in the *Victorian Cycling Strategy 2018-2028*. Upgrades to Napoleon Road are identified as an opportunity to address a critical gap in the cycling network. The proposal aims to address the challenge of legacy infrastructure being under increasing strain identified in the [2019 Australian Infrastructure Audit](#). It also supports the recommendation to maximise the overall benefits of transport investments by aligning transport programs with place-based objectives in the [2021 Australian Infrastructure Plan](#).

Network and system integration There are a number of proposals for road upgrades in the Knox municipality that interface with Napoleon Road Upgrade, including:

- *Dorset Road Extension* – proposes an extension of Dorset Road that will directly intersect with Napoleon Road. There are strong interdependencies in terms of network functionality, proposal timing and land acquisition. Construction of the Dorset Road Extension prior to upgrading Napoleon Road is likely to exacerbate capacity and transport efficiency issues along the corridor.
- *Lysterfield Road Widening* – proposes to widen Lysterfield Road, which intersects with Napoleon Road at the northern end. While this proposal is not currently a priority, it will exacerbate already limited north-south connectivity by redirecting traffic towards Napoleon Road and Dorset Road, which could impact benefit realisation of upgrading Napoleon Road.
- *Wellington Road Upgrade* – proposes to upgrade Wellington Road, a key east-west arterial road, located to the south of Napoleon Road. While outside the Napoleon Road Upgrade scope, these upgrades are likely to impact traffic volumes in the local network.

The service need and problem definitions for each proposal are closely interlinked and the ability of each proposal to achieve the desired outcomes would be compromised if the others do not progress. The business case investigates the scenario where both Napoleon Road Upgrade and Dorset Road Extension are delivered concurrently. If Dorset Road Extension proceeds⁴, the business case identifies that the Napoleon Road Upgrade could proceed with a shorter length, which is estimated to reduce cost by \$37 million and still deliver similar benefits. Due to the high level of complexity, proximity and interdependencies between Napoleon Road Upgrade and Dorset Road Extension, we recommend that further analysis is undertaken to determine whether the proposals should be delivered as an integrated program. This would

³ Victorian in Future (VIF2019) estimates.

⁴ Assuming Dorset Road is extended to Lysterfield Road.

provide confidence that costs are minimised, and benefits are maximised across proposals.

Solution justification

The options analysis considered a range of potential responses, including supporting a mode shift, upgrades to other roads in the area, and safety improvements. Upgrading Napoleon Road was progressed as the top-ranking response option. However, options involving an integrated approach with interfacing road upgrade proposals should have been considered at this stage of the options analysis. The method for ranking the response options was not well articulated, with insufficient justification provided as to why the option for mode shift was assumed to take longer than the option involving capital upgrades to Napoleon Road.

Based on the highest-ranking response option to upgrade Napoleon Road, three project options were developed, which varied by scale of proposed works. The option of duplicating Napoleon Road to four lanes up to the intersection with the proposed Dorset Road Extension⁵ delivered the highest BCR (0.92).

A Multi Criteria Analysis (MCA) was then completed and the option involving duplicating beyond Dorset Road to Lysterfield Road was selected as the preferred option, despite having a lower BCR (0.82). The rationale for selecting this as the preferred option was that it was considered to best address the identified problems, deliver on the benefits and provide better safety outcomes.

The business case also separately investigated additional options for the scenario where both Napoleon Road Upgrade and Dorset Road Extension are delivered concurrently. In this scenario, an option with a reduced scope (duplicating Napoleon Road to the intersection with the proposed Dorset Road Extension) was identified as the preferred option.⁶ Based on our assessment, further evidence is needed to confirm that the most economically efficient option has been selected.

Stakeholder endorsement

The proponent has undertaken stakeholder and community engagement at various stages of planning. The business case reports that feedback from engagement has helped inform the design of proposed options and that opportunities for stakeholders to provide feedback on the preferred option are planned.

The proposal is broadly supported by most stakeholder groups. However, there has been limited engagement to date with landowners that will be impacted by acquisitions, or with businesses affected by changes to road access.

It has also been identified that the proposal will impact areas that have a moderate potential to contain Aboriginal cultural heritage. In addition to regular project briefings with stakeholders, the proponent commits to undertake consultation for registration of cultural sites as required, and develop a Cultural Heritage Management Plan.

Societal Impact **The social, economic and environmental value of the proposal, as demonstrated by evidence-based analysis.**

Quality of life

The proposal is expected to provide very marginal quality of life improvements for the local community. The economic appraisal has quantified lower incidence of accidents (1.9% of the total benefits), and amenity and placemaking benefits (0.1% of total benefits). There is expected to be a negative impact on visual amenity and urban cooling benefits through the removal of some mature trees, although these impacts were not quantified in the economic appraisal.

Other benefits of the proposal that have been qualitatively described include health benefits related to the provision of active transport links, as well as improved access to health, education, and other services in the Knox area, which will enable growth. The preferred option is expected to provide greater levels of these benefits relative to other assessed options. There is no evidence of significant disadvantage in the area (Australian Bureau of Statistics, Socio-Economic Indices for Areas) that would be addressed by improving connectivity to these services.

Productivity

The proposal is expected to facilitate greater productivity and access to economic opportunities by improving travel times, with travel time savings representing 72% of total benefits. The economic appraisal estimates time savings for business-purpose trips as well as

⁵ This option also includes delivering improved public and active transport facilities and rebuilding the Monbulk bridge

⁶ Assuming that the option with the most extensive scope of Dorset Road Extension is adopted

light and heavy commercial vehicles accessing industrial precincts in the area. The proposal is also expected to deliver improved travel time reliability and intersection performance, which has been qualitatively reported.

An initial qualitative assessment of the economic impact of options indicates that the preferred option will have a strong positive impact on improving access to businesses, employment, education, and services. An option with a reduced scope (duplicating Napoleon Road to the intersection with the proposed Dorset Road Extension), however, is also assessed as having an equally strong impact.

Given that the scope of the proposal is a relatively small, local-level upgrade to the road network, time savings are not expected to extend beyond the proposal area, and there are unlikely to be material Wider Economic Benefits (WEBs).

Environment	<p>The impacts of the proposal on ecology, land use, noise levels and amenity were analysed using the outputs of environmental studies. This found that the preferred option will involve the removal of 1.31 hectares of native vegetation (including 0.745 hectares of endangered vegetation), which is suitable habitat for multiple threatened fauna species. The preferred option has the most significant impact of all the options as it has the largest scope.</p> <p>Design requirements and mitigation measures for environmental risks have been identified. No environmental aspects were assessed as having a residual risk rating of higher than medium for the proposed option. Planning and environmental approval pathways, as well as further investigations for detailed designs of the proposal have been clearly identified.</p> <p>Costs associated with environmental management as well as biodiversity offsets have been appropriately captured within the capital costs of the proposal.</p>
Sustainability	<p>Relative to the development of a new alternative road, the upgrade of Napoleon Road optimises the use of existing assets and is a more sustainable option.</p> <p>The scope of the preferred option includes improvements to walking and cycling facilities along both sides of Napoleon Road. It also includes improvements to bus facilities and delivery of bus priority lanes. These upgrades will support sustainable forms of transport.</p> <p>The economic appraisal, however, outlines that the proposal will increase vehicle kilometres travelled due to increased capacity and reduced congestion on Napoleon Road. This results in greater levels of environmental externalities with an economic impact of -\$3.1 million.⁷</p> <p>The proposal's Value Creation and Capture Plan identifies the opportunity for greater reuse of materials (for example, reclaimed asphalt pavement, crushed concrete and crushed glass fines) as a mechanism for value creation. However, an assessment of alternative options for sustainable design has not been completed so it is not clear whether these will be costed and incorporated into the final design.</p>
Resilience	<p>The proposal is expected to improve the resilience of the transport network in the Knox Municipality, which is currently impacted by limited north-south arterial connectivity. Potentially significant benefits of increased transport network resilience include enabling road users to circumvent incidents from crashes or other events, although these have not been quantified.</p> <p>The existing level of Napoleon Road requires raising through the Monbulk Creek flood plain to accommodate major flood levels. Detailed flood modelling is yet to be completed to determine the appropriate road level requirement. The results of this may require changes to the design and increase the costs of the proposal.</p>
Deliverability	<p>The capability to deliver the proposal successfully, with risks being identified and sufficiently mitigated.</p>
Ease of implementation	<p>A detailed delivery schedule has been developed, informed by preliminary investigations. This includes up to 18 months for pre-construction activities relating to detailed studies, stakeholder engagement and land acquisition, and external approvals. Key risks for the schedule have been identified and mitigation activities developed.</p> <p>The timing of delivery coincides exactly with the delivery of the proposed Dorset Road Extension. Separate business cases have been developed for the two proposals, but an</p>

⁷ Externalities include air pollution, greenhouse gas emissions, noise, soil and water pollution, biodiversity loss, nature and landscape impacts and urban barrier effects.

integrated delivery is recommended. Integrated delivery could support improved stakeholder engagement and a streamlined land acquisition process for directly affected landowners of both proposals.

Capability & capacity

Major Road Projects Victoria (MRPV) has experience delivering projects similar in scope and complexity to the Napoleon Road Upgrade and is expected to have the required level of skill and expertise to deliver the proposal.

The business case acknowledges resourcing capability and capacity constraints in the current heightened market, which is in line with Infrastructure Australia's [2021 Infrastructure Market Capacity Report's](#) forecast. These industry-wide capacity pressures need to be managed to mitigate impacts to the proposal's delivery time, scope and costs. The business case identifies a risk related to market response but does not appear to include any specific mitigations or provide analysis of how the sequencing of this proposal would align with other competing projects and programs in the market.

Additionally, an escalation rate of 3.7% (FY24 onwards)⁸ has been applied to capital cost estimates, which we consider to be low in the current infrastructure market. No sensitivity testing has been undertaken to understand the impacts of higher escalation costs (reflecting tighter market conditions) on the proposal.

Project governance

The delivery agency for the proposal would be MRPV, which has extensive experience in delivering road projects and an established governance framework.

A number of procurement models were considered, with the recommended model following MRPV's Program Delivery Approach (PDA), a standardised approach to procurement for MRPV. The PDA includes a panel of contracts and a two-stage incentivised cost model. This model was selected based on a thorough assessment of several options and the risks associated with delivery. The business case, however, outlines that 'packages should be re-reviewed for appropriateness if both [Dorset Road Extension and Napoleon Road Upgrade] are funded'.

Risk

A risk management strategy is in place to support delivery of the proposal, in addition to a comprehensive risk register detailing potential risks and proposed mitigation measures across a range of risk categories. The register assesses the likelihood of risks impacting various aspects of the proposal, such as schedule and budget, as well as environment and cultural heritage outcomes. This has been used to estimate probabilistic cost contingency estimates with the appropriate level of confidence (i.e., P50 and P90).

There is only one risk with both a pre and post mitigation rating of high. This relates to the proposal not meeting stakeholder expectations, particularly affected landowners and businesses. The Communications and Stakeholder Engagement Plan provides details on components of this risk and details engagement activities to mitigate should the proposal proceed.

Lessons learnt

The business case specifically identifies lessons from previous projects that are relevant to the proposal. These include early engagement with local councils regarding planning permits, separating utilities works from the main contract, and installation of CCTV cameras at key intersections for operational issues.

These learnings have been reflected in the timing of pre-construction activities (including planning approvals) in the delivery schedule, as well as with the packaging approach for early works (separate package for utility relocation).

The business case includes a high-level post completion review strategy, outlining a number of performance measures related to scope, timeliness and cost. It also defines key performance indicators (KPIs) for benefit categories that will be realised by the proposal. Benefit KPIs align broadly with the benefits quantified as part of the economic appraisal, and those defined as the objectives of the proposal. However, the proposal would benefit from additional evidence regarding benefit owners, monitoring and reporting, and key handover points.

⁸ In line with guidance from the Major Transport Infrastructure Authority.

Economic appraisal results (preferred option)

The economic appraisal was conducted on the three proposal options (Options 2, 3 and 4). The preferred option (Option 4) has a BCR of 0.82 and an NPV of -\$38.5 million.⁹ This is the lowest BCR of the three options considered.

The headline economic appraisal results for the preferred option are summarised in the table below. More detailed results for the preferred option are presented on page 9.

Economic Appraisal Results

	Discount rate:	4%	7% (central)	10%
Core evaluation results¹	BCR:	1.23	0.82	0.57
	NPV (\$m):	\$56.0	-\$38.5	-\$83.0
Key benefits measured:	<p>Key benefits measured:</p> <ul style="list-style-type: none"> vehicle travel time savings vehicle operating cost savings crash cost savings placemaking benefits environmental externalities. <p>Vehicle travel time savings (72.6% of benefits) are the largest benefit followed by vehicle operating cost savings (27.1%). Benefits associated with safety and placemaking made up approximately 1.9% of total benefits and environmental externalities are negative (a disbenefit) as the proposal results in an increase in the kilometres travelled for all vehicle types.</p>			
Key observations and issues	<p>Transport demand modelling was undertaken using the outputs from local scale (microsimulation) traffic modelling (SIDRA). The modelling focuses only on signalised intersections within the proposal area. Due to the isolated nature of SIDRA analysis, the model does not take into account:</p> <ul style="list-style-type: none"> network impacts to demand from interfacing proposals – the potential impacts to traffic volumes as a result of the Dorset Road Extension, Lysterfield Road Widening and Wellington Road Upgrade impacts of COVID-19 – the COVID-19 pandemic has disrupted travel patterns and created a degree of uncertainty linked to the data inputs. It is unclear if any new traffic data was collected since COVID-19 and used to inform the modelling. <p>Additionally, we note a number of assumptions used to quantify and monetise impacts across all options could overstate benefits:</p> <ul style="list-style-type: none"> average speed in non-peak periods – this has been assumed to be the average of speeds in the peak periods, when it is more likely to be faster due to lower congestion at non-peak times vehicle occupancy rates – noting that they are based on Australian Transport Assessment and Planning (ATAP) parameter values, these estimates are high when compared to occupancy rates assumed in other jurisdictions. Proportion of business-related travel – the business case assumes that 10% of total travel is business related, with 90% being private. The appraisal notes that this is a conservative assumption that is lower than the Victorian average that 18% of travel is business related (based on the ABS Survey of Motor Vehicle use)¹⁰, and consistent with assumptions held in the state-wide mandated traffic model. However, the business case assumptions are not directly comparable to the ABS estimates referenced as they are based on travel distances whereas the ABS data is based on travel times. This suggests that travel benefits could be overstated in the economic appraisal, potentially overstating the BCR as a result. 			

⁹ Using a 7% real discount rate, P50 capital cost estimates, and evaluated over a 30-year period.

¹⁰ <https://www.abs.gov.au/statistics/industry/tourism-and-transport/survey-motor-vehicle-use-australia/latest-release#tonne-kilometres-travelled>

Proposal development

A multi-step process was undertaken to identify options to respond to the problems impacting Napoleon Road:

1. Firstly, a range of 'strategic interventions' were identified, including improvements to public and active transport services; increasing the capacity of Napoleon Road; upgrading alternative road corridors or building a new road; and road safety improvements. In total, nine strategic interventions were considered.
2. Using the strategic interventions, a number of 'response options' were developed. These options consisted of one or a combination of the strategic interventions (e.g., a combination of upgraded transport services and new active transport facilities to support a mode shift on Napoleon Road). Including a base case, five response options were considered.

Response options were then ranked through a consideration of the degree to which they deliver proposal objectives, their level of risk, and the number of proposal interdependencies. Additional factors considered included cost and the timeframe for delivery. The selected response option (Efficiency and safety improvements along Napoleon Road) was selected as the top-ranking response option.

3. Based on the highest-ranking response option, to upgrade Napoleon Road, three proposal options and a base case were developed. The proposal options varied by scale of proposed works and included:
 - Addressing targeted bottlenecks along Napoleon Road through signal changes, turn lane improvements and some capacity upgrades (Option 2) (BCR of 0.89, NPV of -\$23.7 million).^{11 12}
 - Duplicating Napoleon Road to four lanes up to the intersection with the proposed Dorset Road Extension, build new active transport facilities and replace the existing Monbulk Creek Bridge (Option 3) (BCR of 0.92, NPV of -\$15.1 million).¹²
 - Duplicating beyond Dorset Road Extension to Lysterfield Road and replace the existing Monbulk Creek Bridge (Option 4) (BCR of 0.82, NPV of -\$38.5 million).¹³
4. These options were assessed in detail through a CBA, risk analysis, environmental impact assessment and social impact analysis.
5. The options were then assessed through MCA, which considered the strategic alignment of options and their delivery against objectives, as well as a number of other criteria. Option 4 (Duplicate Napoleon Road to four lanes between Kelletts Road and Lysterfield Road) was selected as the preferred option.

In addition, the business case also considers:

- Four options where upgrades to Napoleon Road have been combined with proposed upgrades to Dorset Road. A separate MCA process was undertaken for these options, although only considering qualitative measures. Only two of these options have been assessed in the CBA.
- Two additional 'scalable options' have been developed. These have been costed but not assessed.

While having the lowest BCR, the preferred option was selected as it supports improved safety outcomes and further enhances regional and local connectivity, two criteria of the MCA. We consider that options involving an integrated approach with interfacing road upgrade proposals should have been considered at the strategic interventions stage and assessed in further detail with the other proposal options. This would support an assessment against options that involve upgrades to Napoleon Road only and support selection of the most economically efficient option.

Proposal engagement history



¹¹ Based on a 7% real social discount rate, P50 capital cost estimate, and evaluated over a 30-year period.

¹² It is noted that CBA modelling results for Option 2 are overstated given that the economic appraisal of this option incorporates scope beyond that which is defined in the option scope in the business case.

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
	4%	7%	10%	
Discount rate (real)	4%	7%	10%	
Costs				
Total capital costs (P50)	\$230.9	\$212.0	\$195.2	98.5%
Operating costs	\$5.9	\$3.3	\$2.0	1.5%
Total costs^{1,2}	\$236.7	\$215.3	\$197.2	100%
Benefits				
Vehicle travel time savings	\$211.6	\$128.4	\$83.3	72.6%
Vehicle operating cost savings	\$80.7	\$48.0	\$30.6	27.1%
Crash cost savings	\$5.4	\$3.4	\$2.3	1.9%
Placemaking benefits	\$0.2	\$0.1	\$0.1	0.1%
Environmental externalities	-\$5.2	-\$3.1	-\$2.0	-1.8%
Total benefits¹	\$292.7	\$176.8	\$114.2	100%
Net present value (NPV)³	\$56.0	-\$38.5	-\$83.0	
Benefit-cost ratio (BCR)⁴	1.24	0.82	0.58	

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.