

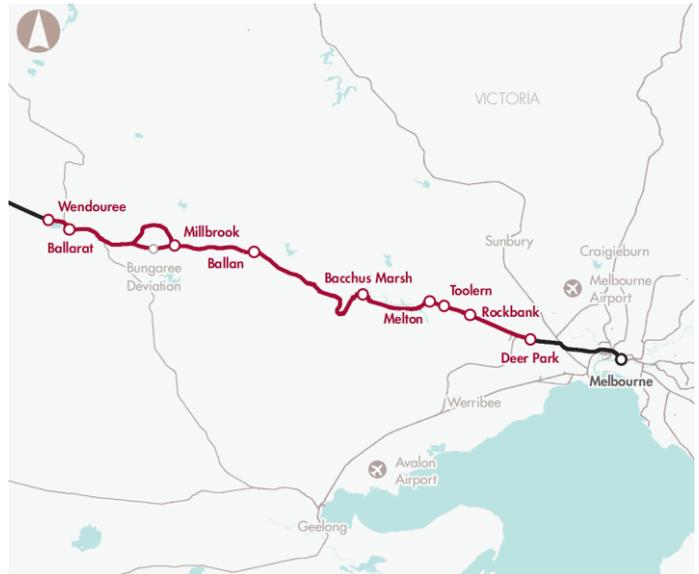
Project Evaluation Summary

Ballarat Line Upgrade

Proponent Victorian Government
Evaluation date 30 August 2018

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1. Summary

Infrastructure Australia has added the **Ballarat Line Upgrade** project to the Infrastructure Priority List as a **Priority Project**.

The Ballarat Line is an important regional public transport link for Melbourne’s outer west, with annual boardings increasing from 3.4 million in 2014/5, to 4.3 million in 2016/17. It provides access between the Melbourne CBD and growing population centres, such as Bacchus Marsh, Melton and Ballarat. Demand on the Melton/Bacchus Marsh section of the Ballarat Line exceeds capacity at peak times, causing passenger crowding and affecting service punctuality and reliability.

Victoria in Future (2016) predicts strong population growth in local government areas to the east, north and west of Melbourne. To the west, in the Ballarat Line corridor, the population of the Melton local government area is expected to grow at 4% between 2011 and 2031 – the highest average annual growth rate in Greater Melbourne.

The Australian Infrastructure Audit (2015) projected that demand on the Melton/Sunshine section of the Ballarat Line would grow to around three times the current capacity by 2031. Road traffic is also projected to grow strongly, with daily trips to and from the Melton/Bacchus Marsh area forecast to increase from 14,300 trips per day in 2011 to 87,700 trips per day in 2031.

The Ballarat Line Upgrade project responds to the demand growth and will improve reliability by duplicating tracks and enhancing rail systems, adding passing loops and upgrading stations. The works would allow an increase in service frequency, and provide passengers with more reliable and less crowded trips. It would also reduce congestion on the road network by encouraging some travellers to use public transport instead of driving.

The proponent’s stated benefit-cost ratio (BCR) for the project is 1.1, with a net present value (NPV) of \$60 million (using a 7% real discount rate and a P90 equivalent capital cost estimate).

Infrastructure Australia identified several issues in the economic analysis underpinning the business case, including the overestimation of road decongestion, health benefits and additional fare revenue. Infrastructure Australia also noted the omission of potential benefits from road maintenance cost savings, improved reliability of rail services, and improved amenity for passengers using new trains and upgraded stations.

Overall, Infrastructure Australia considers that, on balance, the project will deliver marginal net economic benefits to Australia. The economic and strategic case for the project is the strongest for works to the east of Melton, where growth is expected to be higher.

2. Strategic context

In Melbourne's outer west, the populations of Melton, Moorabool and Ballarat grew respectively by 5%, 3% and 2% each year from 2012 to 2017. Meanwhile, Australian Bureau of Statistics' data show that, in 2016, Melbourne's CBD accounted for approximately 20% of employment in Greater Melbourne. This has led to more demand for commuter services on the Ballarat Line, which runs through this corridor. V/Line reported that annual rail trips on the Ballarat Line have increased from approximately 1.5 million in 2005/06, to 3.4 million in 2014/15 – an annual growth rate of 9.5%. Peak journey time indicators reported by V/Line suggest much of this growth is attributable to the Melton/Deer Park section of the Ballarat Line.

This trend is expected to continue with the Victorian Government forecasting the population of Melton to increase from 112,600 in 2011 to 266,000 in 2031 – an annual growth rate of 4.4%. This population growth is driven in part by the expansion of Melbourne's Urban Growth Boundaries. Further west, the population of the Moorabool and Ballarat local government areas are forecast to grow at annual rates of 1.8% and 2.4% respectively.

Future congestion in the rail corridor between Melton and Sunshine was identified in the Australian Infrastructure Audit (2015), and the Melton Rail Line Upgrade Priority Initiative has already been included on the Infrastructure Priority List. While the Ballarat Line Upgrade project will enhance rail capacity between Melton and Sunshine, the Victorian Government is also considering electrification and quadruplication of the line east of Melton.

3. Problem description

V/Line's May 2018 patronage data shows that four morning peak services originating from Bacchus Marsh/Melton and travelling to the Melbourne CBD reached 100% seated capacity by Melton or Deer Park. The three services originating further west from Ararat and Wendouree had 94%, 89% and 66% of seats occupied. In the evening peak, five of the six services departing Melbourne between 5pm and 6pm on the Ballarat Line reached 100% seated capacity by Footscray or Sunshine, while the other service reached 90%.

The average timetabled peak journey times from Wendouree, Bacchus Marsh and Melton are 119 minutes, 49 minutes and 38 minutes respectively. Average punctuality on the Ballarat Line has decreased from pre-2015 levels of near 95%. The decline was exacerbated by the opening of the Regional Rail Link in June 2015 to accommodate increased patronage on the Geelong Line, as Ballarat Line services now share the Regional Rail Link track east of Deer Park West with Geelong Line services. Between January and July 2018, V/Line reported punctuality of between 77% and 86% on the Ballarat Line.

The proponent states that increased service capacity and improved punctuality on the Ballarat Line cannot be achieved without additional track capacity. There is currently no spare track capacity to add more services to meet peak demand, and spare weekend capacity will be eroded over time. Without investment to increase capacity on the Ballarat Line, demand will increasingly exceed capacity.

Road demand is also forecast to increase along the M8 Motorway corridor with the Australian Infrastructure Audit (2015) predicting that daily car trips to and from the Melton/Bacchus Marsh area will increase from 14,300 in 2011 to 87,700, over the period 2011 to 2031 – an annual growth rate of 9.5%. This is the highest percentage growth of car trips for any Melbourne statistical area in the same period. Improvements to rail infrastructure on the Ballarat Line, and particularly to Melton, can encourage people to take the train and reduce road congestion.

4. Project overview

The proponent's objectives for the Ballarat Line Upgrade project are to:

- increase the number of peak services from Ballarat to Melbourne to accommodate current unmet demand and cater for growing patronage caused by forecast population growth on the Ballarat Line
- increase the on-time running performance of services on the Ballarat Line from the current levels and deliver travel time savings on some services
- increase consistency and reliability of services by addressing existing network constraints and providing a foundation for further capacity expansion in the future.

The project includes upgrades between Wendouree and Deer Park on the Ballarat Line, including track duplication, construction of new rail track and passing loops, enhanced stabling facilities, and station upgrades.

The proponent revised the project scope after completing the business case to reflect the findings of supplementary rail operations analysis, analysis of noise impacts on the local community and to meet legislative requirements. The proponent has advised that the revised project scope does not affect the benefits of the project, but increases the total project cost slightly. Infrastructure Australia's evaluation has considered the revised scope, which includes the following:

- Melton to Deer Park West duplication: a new track on the northern side of the existing line between Deer Park West Junction and Melton
- Ballan passing loop: a 5-kilometre long passing loop near Ballan
- Spredaeagle passing loop: a passing loop between Bungaree East and Bungaree West Junctions on the Bungaree Deviation, making it possible to close the existing Bungaree loop and remove five level crossings
- Bacchus Marsh duplication: duplication of the rail line between Bacchus Marsh and Maddingly stabling facility
- Maddingly Stabling upgrade: removing stabling at Bacchus Marsh and replacing with stabling at Maddingly
- Bacchus Marsh Station upgrade: construction of a second platform and enhanced pedestrian access facilities
- Ballan Station upgrade: construction of a second platform and enhanced pedestrian access facilities
- Rockbank Station upgrade: construction of a second platform, enhanced pedestrian access facilities and a new car park on the southern side of the station
- Wendouree Station upgrade: construction of a second platform and enhanced pedestrian access facilities
- Rolling stock: allocation of 12 VLocity carriages (of 27 carriages being procured as part of the Regional Rail Upgrade Program) to provide additional service capacity on the Ballarat Line. Only the costs of the 12 carriages have been included in the cost-benefit analysis.

A new station will also be constructed at Toolern under a separate funding arrangement by the Victorian Government using Growth Areas Infrastructure Contributions. This is not part of the business case submitted for the Ballarat Line Upgrade. Therefore, the costs and benefits of this station have not been included in the Ballarat Line Upgrade business case or cost-benefit analysis.

5. Options identification and assessment

The proponent completed a systematic options identification and assessment process, which considered capital and non-capital solutions to determine the preferred solution of strategic rail infrastructure upgrades focusing on improving the condition of the existing rail network to increase rail capacity and performance.

The business case considered a thorough long-list of possible solutions, including demand management, better use of existing assets, and investing in alternative transport modes. However, the 'rail infrastructure improvements' option was selected as the recommended strategic option using only qualitative analysis. Infrastructure Australia's Assessment Framework recommends the use of quantitative analysis to shortlist options, with at least two project options (plus a base case) being considered in the detailed economic appraisal. For instance, an alternative option could have focused on infrastructure works near Melton/Bacchus Marsh and Deer Park where the strongest population and trip growth is forecast to occur.

6. Economic evaluation

The proponent's stated BCR for the project is 1.1 with a NPV of \$60 million, using a 7% real discount rate and a P90 equivalent capital cost estimate. The proponent did not estimate any wider economic benefits for the project, and they are not expected to be material.

The Victorian Government's metropolitan and regional transport modelling tools, the Victorian Integrated Transport Model (VITM) and Victorian Patronage Elasticity Model (VPEM), were used to estimate the base case and project case demand forecasts. VITM was used to model the metropolitan part of the regional train network (Melton and Wyndham Vale), while VPEM was used to model the regional rail corridors.

The use of these two models is consistent with their respective strengths and capabilities. However, using a single multi-modal model to forecast demand changes within the entire study area would have been a more transparent method of deriving economic model inputs and estimating road user and environmental externality benefits.

The VITM model used Victoria's Reference Case of projects, which includes existing and planned projects, some of which are yet to be funded. While the Reference Case approach is useful for the purposes of integrated long-term transport planning, it is unconventional for economic evaluations and could understate the BCR if the unfunded projects assumed in the base case do not proceed. The underlying population and employment growth rates used in the models are consistent with the Victorian Government's planning policies.

Benefits and Costs breakdown (excluding wider economic benefits)

Proponent's Stated Benefits and Costs	Present Value (\$m, 2015) @ 7% real discount rate	% of total
Public transport user benefits		
Reduced crowding	\$16	3%
Reduced wait time	\$67	11%
Service reliability	\$8	1%
New user benefits	\$20	3%
Fare resource cost correction	\$112	18%
Road user benefits		
Road decongestion	\$178	29%
Resource cost correction for vehicle operating cost savings – cars	\$43	7%
Resource cost correction for parking	\$23	4%
Other (environmental externalities, accident cost savings, health benefits)	\$132	21%
Residual value of assets	\$23	4%
Total Benefits¹	\$622 (A)	100%
Capital costs (P90 equivalent) ^{2,3}	\$437	78%
Operating and maintenance costs	\$124	22%
Total Costs¹	\$561 (B)	100%
Net Benefits - Net Present Value (NPV)⁴	\$60 (C)	n/a
Benefit–Cost Ratio (BCR)⁵	1.1 (D)	n/a

Sources: Proponent cost-benefit analysis and business case

(1) Totals may not sum due to rounding.

(2) For the purpose of the cost-benefit analysis, the capital costs include the relevant proportion of rolling stock costs to reflect the allocation of new VLocity carriages procured in the Regional Rail Upgrade Program. They are not included in the capital cost of the project (see next page).

(3) The capital cost has been determined during procurement and are by the proponent to be equivalent to a P90 estimate.

(4) The net present value (C) is calculated as the present value of total benefits less the present value of total costs (A – B).

(5) The benefit–cost ratio (D) is calculated as the present value of total benefits divided by the present value of total costs (A ÷ B).

Capital costs and funding

Total capital cost (nominal, undiscounted)	\$517 million (P90 equivalent)
Proponent's proposed Australian Government funding contribution (nominal, undiscounted)	\$467 million
Other funding (nominal, undiscounted)	The remainder would be funded by the Victorian Government

Note: The project capital cost differs from the capital costs in the cost-benefit analysis, which includes rolling stock opportunity costs.

The economic appraisal was originally developed to measure the benefits and costs of a broader Regional Rail Upgrade Program, of which the Ballarat Line Upgrade is a component. The proponent subsequently prepared a revised cost-benefit analysis to consider only the costs and benefits of the Ballarat Line Upgrade project, which resulted in several discrepancies between the business case and the economic appraisal.

At a high-level, the economic appraisal shows that only 36% of the total project benefits are for public transport users. This proportion appears low, given that the primary objectives of the project are to improve the punctuality, reliability and capacity of rail services.

Infrastructure Australia identified several issues in the economic analysis underpinning the business case, including the overestimation and omission (under-estimation) of several benefit categories. The most significant issue is the overestimation of road decongestion benefits, which are \$178 million (or 29%) of the project benefits. The economic appraisal used optimistic assumptions for the value of avoided vehicle kilometres driven and the extent of future road congestion in regional parts of the study area.

Further, the economic analysis artificially constrained the number of passengers who could travel on severely crowded trains, which potentially understates rail user benefits and overstates road user benefits.

Other minor issues include the use of optimistic parameters for estimating health benefits and the estimation of residual values using a 3% discount rate. Infrastructure Australia also noted that V/Line introduced a new Ballarat Line timetable with additional services after completing the business case, suggesting that the base case for the project may have been slightly underestimated.

Infrastructure Australia also identified a number of factors that could positively impact on the economic viability of the project, including:

- **Rail performance:** the business case appears to significantly underestimate potential rail punctuality and reliability improvements, as the project should allow the rail network to recover from unplanned incidents sooner and reduce passenger delays. The infrastructure investments should also benefit the Geelong/Bendigo Lines, which interface with the Ballarat Line near Deer Park West and Sunshine respectively. The proponent has been unable to provide accurate attribution on the cause of delays due to data collection limitations.
- **Appraisal period:** the business case considers a 30-year operational period in the appraisal, whereas a 50-year period would better reflect the longer asset life of rail infrastructure, including station buildings.
- **Road maintenance:** notwithstanding the previous discussion of impacts on the road network, it would be reasonable to allow for reduced road maintenance costs if fewer people travel by car as a result of the project.
- **Amenity and safety:** upgrading stations and providing new rolling stock will improve passenger experience and safety.

Overall, Infrastructure Australia considers that the project will deliver marginal net economic benefits to Australia. The economic and strategic case for the project is the strongest for works to the east of Melton, where travel demand growth is expected to be higher.

7. Deliverability

The Ballarat Line Upgrade will be delivered by Rail Projects Victoria (formerly known as Melbourne Metro Rail Authority (MMRA)), on behalf of the Victorian Government. The project has been procured and will be delivered by a construction contractor consortium in partnership with V/Line, a government-owned corporation that operates the regional passenger train and coach services.

Rail Projects Victoria's recommended procurement approach is a single-package, alliance-delivery model with accelerated competitive pricing. The approach to the procurement options analysis was informed by the Victorian Department of Treasury and Finance's High Value High Risk (HVHR) Project Assurance Framework and National Public-Private Partnership (PPP) Guidelines (Procurement Options Analysis).

The business case noted that an independent peer review of the original project scope found that the original capital costs may have been underestimated by approximately 3%. However, the Ballarat Line Upgrade is now in the delivery phase and the proponent has confirmed that competitive tendering has validated the cost estimate and that the project is operating within the funding envelope prescribed in the business case.

A limited benefits realisation plan has been developed for the project. The benefits realisation plan does not link closely to the benefits measured in the cost-benefit analysis. For example, a total of three benefits have been identified as part of the benefits realisation planning: service punctuality, number of services and service frequency. These benefits led to four key performance indicators, which did not include reducing road congestion, which accounted for \$178 million (29%) of project benefits, or increased patronage, which would lead to additional fare revenue accounting for 18% of project benefits. These two measures alone account for almost one-half of total benefits.

The business case does not provide a plan for a future post-completion review. Infrastructure Australia encourages the proponent to undertake and publish a post-completion review to assess the extent to which expected project benefits and costs have been realised. This will help to inform future projects and should assess project costs and outcomes for customers, against the expectations set out in the business case.