

## Infrastructure Australia

### Project Business Case Evaluation

<b>Project name</b>	Adelaide – Tarcoola Rail Upgrade Acceleration
<b>Rating</b>	Priority Project
<b>Date of IA Board rating</b>	7 September 2016

<b>Location</b>	South Australia
<b>Proponent</b>	Australian Rail Track Corporation (ARTC)
<b>Project timeframe</b>	Anticipated start date: 2016-17 Anticipated end date: 2018-19

#### Evaluation Summary

Rail dominates freight movements between Perth and the eastern seaboard of Australia, with approximately 80% of the land-based freight market serviced by the interstate railway network. Rail freight volume is projected to increase by two-thirds by 2030, placing additional pressure on the east-west railway corridor. At the national level, the *Australian Infrastructure Audit 2015* (the Audit) projected the economic contribution of rail freight services to grow from \$5.4 billion in 2011 to \$9.5 billion by 2031. Without adequate investment, interstate freight travel time and reliability will deteriorate as a result of congestion, poor alignment, and asset age and, in turn, this will reduce national productivity.

Upgrading rail infrastructure along the Melbourne-Adelaide-Perth corridor is currently listed as a priority initiative in the Infrastructure Priority List (IPL). The initiative proposes upgrades along the corridor to accommodate higher axle loads, via enhanced network capacity and speed, and improved train management systems.

The project represents an acceleration of phase one of the 25-year long, phased re-railing program outlined in Australian Rail and Track Corporation's (ARTC) Asset Management Plan. The project would bring forward the upgrade of 600 kilometres of track from 23 Tonne Axle Load (TAL) capabilities, to 25 TAL, to the next three years. This would support the operation of double-stacked trains at speeds of up to 115 kilometres per hour between Adelaide and Tarcoola (located north-west of Port Augusta).

The proponent's stated benefit-cost ratio (BCR) of the project is 1.1, exclusive of wider economic benefits (WEBs), using a 7% real discount rate and single point cost estimate using historical costs. The stated net present value (NPV) for the project is \$34.6 million. The reported project cost is \$252 million (outturn, 2016) which includes the cost of steel purchase, preparation and delivery, and installation between 2016-17 and 2018-19. Key project benefits include avoided future re-railing, avoided tamping, reduced transit delays associated with broken rail, and increased producer surplus for both above- and below-rail operators.

Based on sensitivity analyses conducted by the proponent, Infrastructure Australia is confident that the project would achieve a BCR above 1. The results of the cost-benefit analysis show that the acceleration of the re-railing project would generate higher net economic benefits than the original re-railing project. Furthermore, there is strategic merit in bringing forward the progressive upgrading of the east-west rail freight infrastructure to achieve full 25 TAL capability across the interstate network sooner.

## 1. Strategic Context

The interstate freight rail network in South Australia comprises links between Melbourne, Adelaide, Perth, Sydney and Darwin and was identified in the Audit as a key part of the National Land Transport Network. Upgrading rail infrastructure along the east-west Melbourne-Adelaide-Perth corridor is currently listed as a priority initiative in the IPL.

In 2013-14, the rail corridor between Tottenham (Melbourne) and Tarcoola (South Australia) alone carried approximately 55 million gross tonnes of freight. The Commonwealth Department of Infrastructure and Regional Development projects rail freight to increase by two-thirds by 2030, placing additional pressure on the east-west railway corridor. The 2014 South Australian Department of Planning, Transport and Infrastructure (DPTI) report on Regional Mining and Infrastructure Planning identified capacity constraints between Tarcoola and Port Augusta on the Adelaide to Kalgoorlie corridor as a major impediment to future growth in bulk minerals exports from the north of South Australia. Given this, as well as the high rate of rail breaks, this section has been considered as the most critical for rollout and acceleration of track upgrades.

The track handles 80% of the land-based east-west inter-capital freight market and is also utilised by regional mineral and agricultural producers in South Australia. ARTC estimates that the Adelaide-Tarcoola rail line carries 92% of freight between Adelaide and Perth (i.e. east-west corridor), and 90% of freight between Adelaide and Darwin (i.e. north-south corridor). The significant volume of freight accessing the corridor reflects the national significance of this section and its impact on national productivity.

As rail ages through use, it becomes progressively fatigued, which manifests as an increase in rail flaws and/or rail breaks. As axle loads become higher and trains become longer and more frequent, the rate of fatigue increases. On average, the ARTC network has generally seen an increase in rail breaks over the past five years. The section between Adelaide and Tarcoola has experienced a particularly notable increase. While in many cases trains can continue to operate across a rail break at a reduced speed, more serious breaks result in significant disruption, particularly in remote areas. There is the additional risk of serious derailment, although this is more likely to occur on curves than on tangent track.

Upgrading the Adelaide-Tarcoola segment of the east-west freight rail network represents the original phase one of the staged re-railing program listed in ARTC's Asset Management Plan. In ARTC's plan, phase two of the program involves upgrading 310 kilometres of the Adelaide to Melbourne rail tracks between 2029 and 2036, and a further 1,190 kilometres of the Tarcoola to Kalgoorlie line to be upgraded during phase three between 2032 and 2042.

Once all three stages are complete, the works would improve the productivity of existing infrastructure by enabling an increase in the maximum axle loading from 23 tonnes to 25 tonnes, improving operating performance. This would further build on investments made by ARTC in upgrading the network to support 25 tonne axle loads, which is consistent with the Australian Government's long-term goal for the national rail freight network. The upgrade will also address deterioration and improve failure rates on these sections.

While options for a reduced program of works may be developed, the expected benefits would be significantly reduced if the network, as a whole, is not increased to the same standard. The investment would facilitate opportunities to procure an efficient land transport solution to current and future port developments in regional South Australia and Victoria.

## 2. Problem Description

As rail approaches the end of its life, the cumulative effects of load repetition, volume carried and high axle loads progressively increase track fatigue and failure rates. This necessitates temporary speed limits to be imposed, in turn restricting rail freight transport productivity.

Parts of the current east-west rail corridor are over 100 years old and are constrained by a number of broad factors. These include:

- track capacity being constrained by the existing rail quality
- lack of clearance for double-stack container loading due to constraints along the Melbourne – Adelaide corridor
- the additional pressure on the rail and track structure owing to the high axle loads from operating bulk mineral services (particularly on the Adelaide to Kalgoorlie line).

The proponent considers the Adelaide-Tarcoola section the highest priority for the next stage of replacing 47kg rail on the network with 60kg rail, given the majority of the rail infrastructure is estimated to be between 45 and 60 years old.

Over the past five years, the Adelaide to Crystal Brook, and Port Augusta to Tarcoola sub-sections have repeatedly experienced rail breakage rates of up to three times the target rate. Interstate activity is forecast to grow steadily over coming years and pressure on the Crystal Brook to Tarcoola section is expected to be amplified due to the overlap of all three transcontinental corridors at that point. Rail breakage rates which are higher than the target rate adversely impact on freight reliability and transit times, and can increase the cost of rail freight transport. A reduction in the competitiveness of freight rail transport could, in turn, lead to a fall in national productivity.

Moreover, the project corridor is expected to become capacity constrained over the next 10-15 years. Without sufficient augmentation, the existing rail infrastructure is unlikely to be able to accommodate the projected growth in freight volumes along the east-west interstate rail network.

### **3. Project Overview**

The project seeks to accelerate rail replacement and upgrading of approximately 600 kilometres of track between Adelaide (Islington and Outer Harbour) and Tarcoola, including any necessary bridge strengthening to permit higher axle loads. The project aims to address ageing and deteriorating tracks that have high rail breakage rates and medium-term capacity constraints anticipated in line with projected growth in freight rail volumes along the east-west corridor. The upgrade would increase the rail track weight from 47kg per metre to 60kg per metre, and enable axle loadings to increase from 23 tonnes to 25 tonnes. The project is part of a program of three interconnected re-railing projects involving the upgrade of 2,100 kilometres of track on the Melbourne to Perth (via Adelaide) interstate line, increasing rail size and improving axle loads across the section.

The completion of this project would:

- achieve 25 Tonne Axle Load (TAL) capabilities at 80 kilometres per hour between the Port of Adelaide, the interstate freight terminal at Islington and Outer Harbour in Adelaide and Tarcoola
- improve reliability by decreasing faults and reducing rail breaks along the Adelaide to Tarcoola section. Other maintenance benefits are also expected as a result of the project, such as the replacement of rail pads which improve overall track performance and integrity.

The proposed accelerated re-railing work will be delivered between 2016-17 and 2018-19. Without the accelerated program, this upgrade would not occur for approximately 20 years (between 2036 and 2040).

The acceleration of the re-railing program is one of several enabling programs for achieving a 25 TAL network which would significantly enhance the rail productivity between Melbourne and Perth. Other key enabling projects in ARTC's capital program include the deployments of an advanced train management system (ATMS), the construction of crossing loops and the potential for a direct connection to the Whyalla Line.

### **4. Options Identification and Assessment**

The track between Adelaide and Tarcoola is currently laid with 47kg rail. Rail lines on the interstate network are predominantly three sizes; 47kg, 53kg and 60kg rail weight per metre. The majority of 47kg rail track is between 45-60 years old and is gradually being phased out with all new re-railing undertaken in 60 kg rail. While it is possible to manufacture 47kg and 53kg rail, the benefits of 60kg rail in terms of track strength and rail life significantly outweigh any cost saving. For this reason, 60kg rail has been considered to be the most appropriate long-term rail size for the interstate network.

The proponent has considered three options in their submission:

- The "do minimum" base case option where the proponent upgrades rail infrastructure in accordance with their existing asset management plan. Incremental upgrades would occur over a 25-year period, with the bulk of 60kg rail installed between 2036 and 2040. Under this base case option, the section from Adelaide to Parkes via Crystal Brook would remain at 23 TAL
- Option 1 involves rail tracks to be upgraded from Adelaide (Islington and Outer Harbour) to Tarcoola, as part of an accelerated railway modernisation program at an estimated cost of \$252 million (outturn, 2016 prices). This represents the proposed option
- Option 2 which considers the upgrade of the full east-west rail alignment (i.e. Melbourne-Adelaide-Kalgoorlie) and comprises acceleration of rail replacement and upgrade works at an estimated cost of \$882 million (outturn, 2016 prices). This would involve bringing forward works scheduled across the east-west corridor over the next 25 years

to commence in 2016-17. The program of works would be phased in over three stages and would be delivered over eight years.

Based on a high-level analysis comparing Option 1 and Option 2, the proponent considered Option 1 to be the preferred alternative since the economic case for Option 2, which has a project cost more than three times higher than that of Option 1, is much more difficult to make.

## 5. Economic Evaluation

The proponent's stated benefit-cost ratio (BCR) of the project is 1.1 using a 7% real discount rate and single point historically-based estimates, exclusive of wider economic benefits (WEBs). The reported project cost is \$252 million (outturn, 2016) which includes the cost of steel purchase, preparation and delivery, and installation between 2016-17 and 2018-19.

A key source of economic benefit is the avoided costs of future re-railing and tamping along the project corridor, totalling approximately \$123.6 million in present value at 7% discount rate. The proponent has also included below- and above- rail economic producer surplus in the calculation of project benefits. These values have been included on the basis that, without the project going ahead at this time, steel production at Arrium would probably cease, which would in turn result in forgone producer surplus for both ARTC and haulage companies due to the reduction in steel freight demand along the corridor.

A number of potential risks to achieving the stated BCR exist, particularly relating to the approach used to estimate avoided loss of producer surplus under the 'do minimum' base case. Potential escalation of project costs, or reduction in the volume of freight transport along the project corridor, as a result of decreased production output at key mines in the region, could adversely impact on the economic case for the project.

However, based on sensitivity analyses conducted by the proponent, Infrastructure Australia is confident that the benefits of the project would achieve a BCR above 1. The results of the cost-benefit analysis also show that the acceleration of the re-railing project would generate higher net economic benefits than the original re-railing project.

Moreover, recognising the project corridor has experienced particularly high rail breakage rates in recent years, and that it constitutes an important segment of the interstate network which supports over 90% of freight movements in the transcontinental north-south and east-west corridors, Infrastructure Australia believes this project has strategic merit.

### Major cost items

The major cost items are as follows (PV at 7% real discount rate):

- Capital costs (\$231 million).

The proposed project does not accrue any incremental operating costs over and above the base case. Therefore, the total project costs are estimated to be \$231 million.

Of the above, the major capital cost elements (outturn, 2016) are:

Rail Purchase	\$80 million
Preparation and delivery	\$40 million
Installation	\$132 million
<b>Total</b>	<b>\$252 million</b>

Total capital cost (nominal, undiscounted)	\$252 million (outturn, 2016)
Proponent's proposed Australian Government funding contribution	\$252 million
Other funding (source / amount / cash flow) (undiscounted)	None

## Major sources of benefit

The major sources of project benefits are as follows (PV at 7% real discount rate):

- avoided future costs of re-railing / renewals - \$108.2 million
- avoided future costs of tamping - \$15.4 million
- increased economic producer surplus in terms of increased steel freight traffic for above- and below-rail operators - \$135 million.

Unquantified benefits include the potential increase in economic producer surplus from increased non-steel freight for both above- and below-rail operators.

Total project benefits are estimated to be \$265.9 million in present value terms using a 7% real discount rate.

The stated NPV for the project is \$34.6 million.

## Deliverability

Infrastructure Australia is confident that the project would be successfully delivered for the following reasons:

- Re-railing projects are part of ARTC's core business
- ARTC's capital cost estimates are based on actual (historical) outturn costs. Furthermore, re-railing costs are fairly predictable due to the defined scope of works/activity
- ARTC has a long history of on-time and on-budget delivery of similar projects
- Project management and delivery would use ARTC's standard internal procedures.
- Any risks identified will be managed using ARTC practice and its risk register will be subject to a review by a control board.

Infrastructure Australia recommends the proponent undertake a post-completion review after the project has commenced operation, to assess whether the project benefits have been realised.

The proposed project timeframe for completing the accelerated upgrades is 2016-17 to 2018-19.