

COOMA AND MONARO PROGRESS ASSOCIATION

CONCEPT PLAN FOR CANBERRA TO EDEN RAILWAY

PART 3A – FINANCIAL COST / BENEFIT ANALYSIS



EXECUTIVE SUMMARY

This document presents the estimated financial performance of the proposed Canberra–Eden Railway. It should be read in conjunction with Parts 1 and 2 of the Concept Plan (Project Concept and Preliminary Estimate of Construction Costs).

Although the freight operation is predicted to return a healthy operating profit, in order to be attractive to a private-sector partner, public funding in the order of 50% of up-front capital costs will be required. Additionally, the passenger operation will attract strong ridership but is not likely to be profitable in its own right – it will require a subsidy in the order of 30% of revenue in order to operate on a revenue-neutral basis at competitive fares.

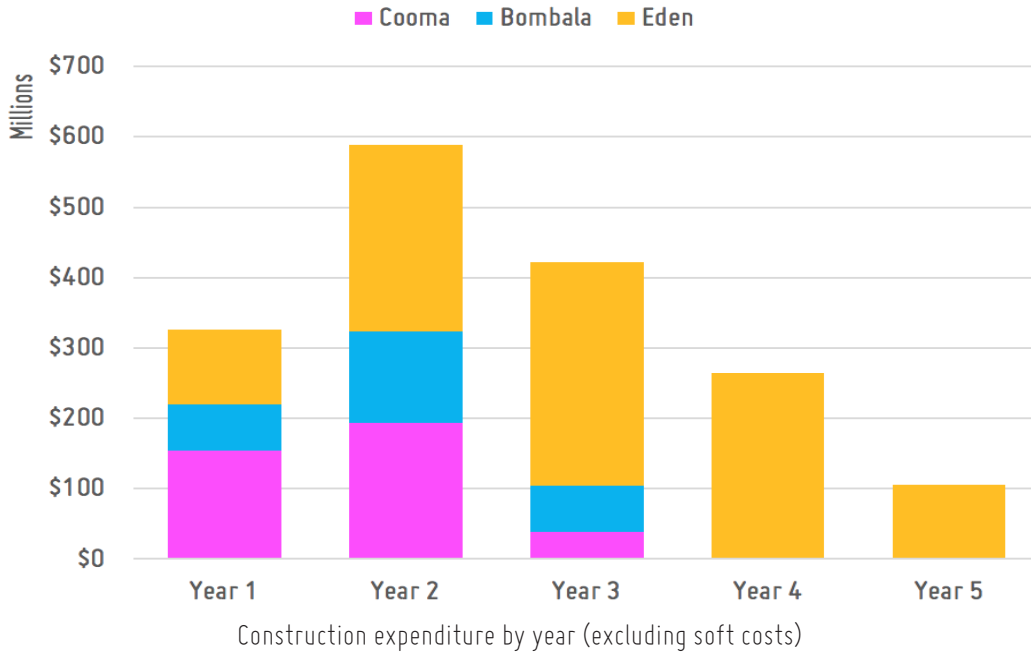
This two-pronged approach is critical – while the freight operation is profitable in its own right, it cannot offset the large up-front construction expense. Conversely, a high level of passenger service can return strong revenues from value-capture developments, but once the available sites are fully developed, the passenger service itself is unlikely to cover costs, leaving the railway vulnerable to bankruptcy. Both freight and passengers are essential – passengers and value-capture to enable recovery of the initial investment, and freight to enable long-term profitability of the railway.

This document is arranged in the following sections, summarised below:

- **Construction Timeline** – Construction of Canberra–Cooma and Cooma–Bombala sections completed within 2 years 4 months, Bombala–Eden section completed within 5 years. Fully operational by 2026 assuming a 2021 start date.
- **Passenger Demand** – Daily passenger demand to be 3,473 trips per day by 2026, growing at 10% per annum due to strong residential development in Monaro region townships. 9 daily return services between Canberra and Cooma, and 4 return services between Canberra and Eden, will meet this demand.
- **Value Capture** – Residential property developments at station precincts along the railway line will be released at an initial rate of 1,000 dwelling rights per year spread across eight townships, enabling significant early income to offset construction costs. Each development precinct will comprise between 4–8 individual sites, with approximately 10,000 dwellings built over 20 years.
- **Freight Demand** – The railway's freight task in 2026 is expected to be 5.3 million net-tons per annum, or 1.34 billion net-ton-kilometres. The mainstay of this task will be agricultural products (mainly grains and cotton from the Riverina and Central West of New South Wales), and forestry products (the majority to Eden for export, but some northbound to mills at Tumut, Tumbarumba and Wagga Wagga). The remainder comprises quarry products and intermodal freight diverted from intercapital routes to the uncongested low-cost port at Eden.
- **Operating Costs** – Total below-rail operating costs for the railway provider (track maintenance, control and management) are estimated at \$25,540/track-km-annum, or \$7.99 million per annum for the 313-km Canberra–Eden line. Above-rail costs for train operators are estimated at \$18.30 per thousand Gross-Ton-Kilometres, a per-kilometre saving of about 25% over the existing NSW North Coast route.
- **Access Charges and Passenger Fares** – The effective access charge has been set at \$24 per thousand net-ton-km, approximately 80% above the prevailing charge on the North Coast route. This price point is competitive based on higher efficiencies, lower distance to port, lower port charges, fewer mode changes, and congestion avoidance. Additionally, the total freight cost is still far lower than for road freight (approx. 43% lower cost per net-ton-km). Passenger operations are expected to run at a farebox recovery ratio of 60–70%
- **Financial Appraisal** – Under a Build–Own–Operate model with 50% public ownership, ongoing cost-recovery subsidy to the passenger operation, and transfer after 30 years, the payback period for the railway consortium is estimated at 19 years, at a 4.41% internal rate of return.

CONSTRUCTION TIMELINE

Estimates for the duration of construction assume a comparable productivity to Inland Rail – we have selected several of the Queensland sections as analogous to Canberra–Eden Rail. For expenditure timeline, we have assumed a typical sinusoidal ramp-up / ramp down of expenditure over the course of each section of the project. Soft costs (preliminaries & general, and client costs) are distributed equally across 5 years of construction. Additionally, no contingency has been allowed for; it has been assumed that total direct construction costs will equal the base estimate of \$1.71 billion from Part 2 of this Concept Plan.



CANBERRA-COOMA

This section is comparable to the Inglewood–Oakley section of Inland Rail – they are of similar distance, similar mix of upgraded track and new sections, 2.3 million m³ of earthworks vs. 2.2 million m³, 1,077m of bridges vs. 1,110m (excluding Tuggeranong Viaduct). We will assume Canberra–Cooma shall take the same time, 120 weeks (2 years 4 months).

COOMA-BOMBALA

Comparable to Toowoomba Range Tunnel to Grandchester – Cooma–Bombala is slightly longer, but has a similar rate of earthworks per kilometre, and fewer bridges than the Inland Rail analogue. We shall assume Cooma–Bombala shall also take 120 weeks (2 years 4 months).

BOMBALA-EDEN

The Bombala–Eden section most closely resembles the Grandchester–Kagaru section, although it is not directly comparable due to the much higher volume of earthworks for the Eden section (16 million m³ compared to 3.7 million m³ – over 4 times the volume). The primary reason Grandchester–Kagaru is estimated to take almost 3 years is the 1250m of tunnel in the section – a similar length to Bombala–Eden. However it is not the tunnels that are the limiting factor on this section – it is the earthworks. A comparable contemporary project is the Woolgoolga to Ballina section of the Pacific Highway duplication, at 14.2 million m³ over 155km and taking 5 years to complete.¹ We will adopt 5 years as the goal for completion of Bombala–Eden.

In order to finish overall within 5 years, earthworks would have to be complete within, say, 4 years, making the required rate of earthworks 4 million m³ per year. Of this, approximately half is cut and half is fill, so that makes 2 million m³ required to be excavated, crushed and placed as fill per year. According to the Inland Rail construction program, the minimum contract productivity for earthworks is 250m³ per hour (about 500,000m³ per shift–year).

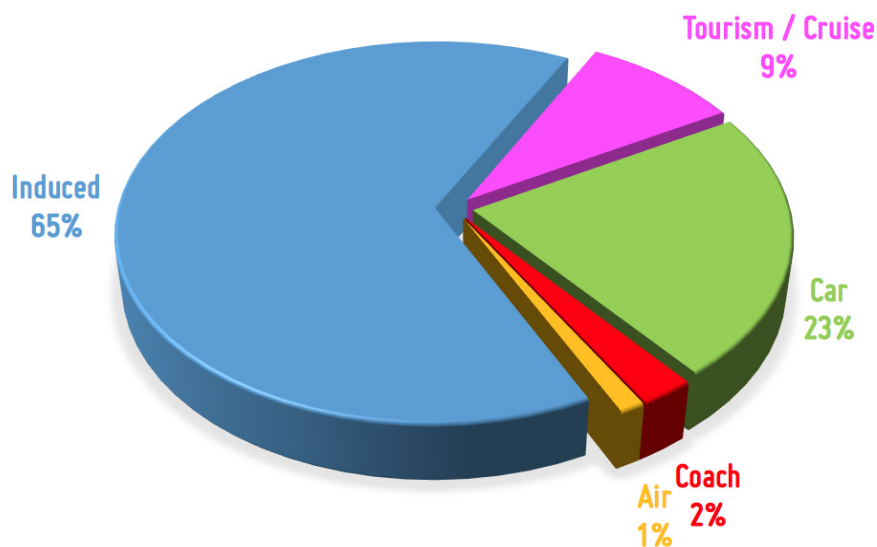
Therefore the required rate of excavation could be achieved by four teams working normal hours. Faster completion could be achieved with additional teams, or running two shifts per day for at least part of the project.

PASSENGER DEMAND

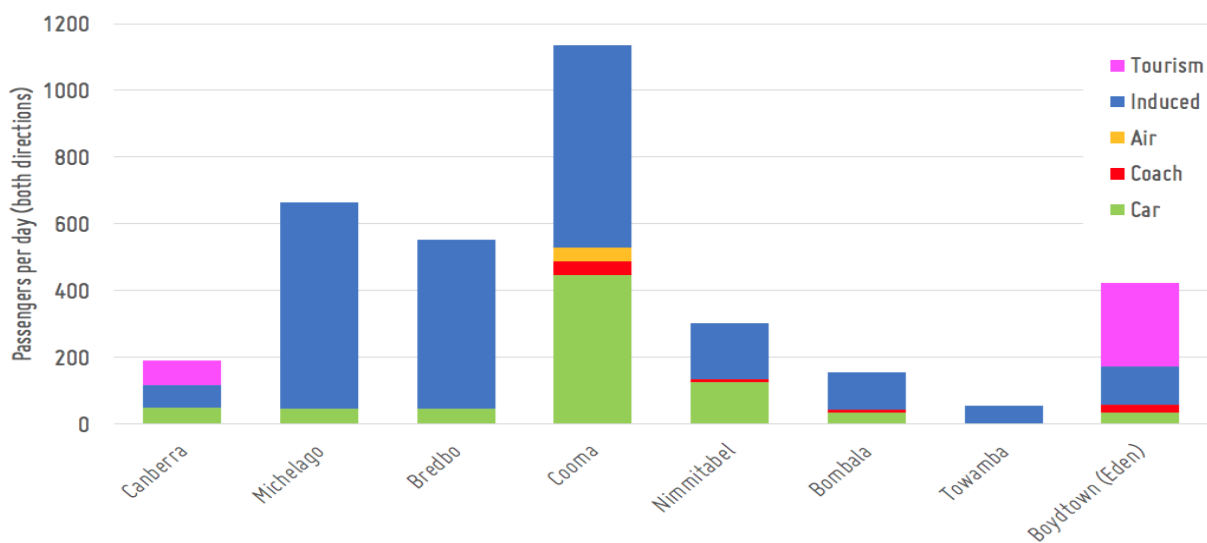
Within 3 years of the line becoming operational, passenger demand is expected to be 3,473 trips per day (1.27 million passengers per annum). Initial growth will be a linear 10% of year-3 demand for the next 10 years (127,000 pax/annum each year), and 2.5% thereafter. This reflects strong population growth in Monaro and Far South Coast townships during the value-capture development program, with growth subsequently reverting to the long-term average rate of population increase.

The demand split is 2,353pax/day (68%) on the Canberra-Cooma line, and 1,130 pax/day (32%) on the Canberra-Eden line. Such a demand could be met by three trainsets of 4 cars / 200 seats, running a timetable of 9 daily return services between Canberra and Cooma, and 4 daily return services between Canberra and Eden. These services would respectively have an average capacity factor 65% and 70% (calculated as passengers per day / seats per day). Services on the Cooma section would be more frequent in the morning and evening in order to cater to significant commuter demand for the major employment centre of Canberra.

While comprising a modest proportion of existing private car traffic, the overwhelming majority of expected patronage will be from induced demand, itself mainly due to significant property development at station precincts along the line. Each source of demand will be analysed in turn.



Passenger demand by source at 3rd year of operation.



Passenger demand by station at 3rd year of operation

PASSENGER DEMAND – by source

CAR

Existing traffic is shown by the five traffic counters on the Monaro Highway between Canberra and Bombala.² Another counter on Mt Darragh Road west of Pambula represents the major traffic route between the Bega/Eden region and Southern Monaro.

In the absence of a numberplate survey, we cannot know how many of these vehicle movements are originating or terminating in the railway catchment – a reasonable estimate might be 75% throughout. Additionally, some of the cars are undoubtedly travelling through multiple counters on a single trip – we will assume 50% of the cars in the Nimmitabel and Mt Darragh counters are unique vehicles, and 30% of those at Bombala. Most of the cars at Bunyan and Bredbo are likely to also be represented at Cooma; we will assume 10% unique vehicles for these counters.

Location	Number of Cars (Daily)	Unique Vehicles	Number Pax @ 1.6 occupancy	Estimated Rail Ridership
Bredbo	3,807	381	457	46
Bunyan	3,845	384	461	46
Cooma	4,131	4,131	4,957	496
Nimmitabel	2,112	1,056	1,267	127
Bombala	961	288	346	35
Mt Darragh (Eden)	1,710	855	342	34

What proportion of these trips could be expected to switch mode to rail?

The introduction of medium-speed V/Line services to regional Victoria between 2006 and 2009 resulted in a substantial increase in mode-share for commuter rail services.³ Averaged over four regional LGAs (Ballarat, Geelong, Bendigo and LaTrobe), rail's share of commutes to the Melbourne CBD increased from 16% (in 1996) to 29% (in 2011). The biggest increase, and the highest proportion overall, was observed in Ballarat, where it increased from 15% to 44% over the same period. Similarly, the 2013 High Speed Rail study estimated that, on the Sydney–Canberra leg, approximately 18–20% of the existing private automobile traffic would shift mode to the fast rail service.

The mode capture achievable by the Canberra–Eden railway would be dependent on the characteristics of the Canberra terminal station. Both Sydney and Melbourne have a very concentrated CBD employment market, well located terminal stations, and good onward connections to the city public transport network. Canberra by comparison has several employment nodes, notably Civic, Parliament, Russell, Woden and Belconnen. The present station site in Kingston is not particularly proximate to any of these, however it could be made so with a suitable extension of the light rail network such as is currently in planning. Alternatively (or concurrently), the main rail terminus could be relocated to a more central location, say, Canberra Airport, Russell or Civic.

Given the examples above, and the likely configuration of a near-term ACT light rail network, a 10% capture of existing automobile traffic is a reasonable expectation. This would result in an estimated 783 passengers per day (about two-thirds of them between Canberra and Cooma).

COACH

NSW Trainlink runs a regularly scheduled coach service in each direction between Canberra and Eden via Nimmitabel (daily), and between Canberra and Bombala via Jindabyne (3 times weekly). Assuming a typical 40-seater coach, that makes a capacity of 800 seats per week, or 114 per day. Assuming a reasonable capacity factor of 75%, current coach ridership would be 85 people per day. It is assumed that the rail service would supplant the coach service, therefore the capture of this market will be 100%.

There are additionally a handful of charter or community bus services that offer occasional or on-demand service; these do not constitute a significant number of seats and will be ignored in the demand estimation.

PASSENGER DEMAND – by source

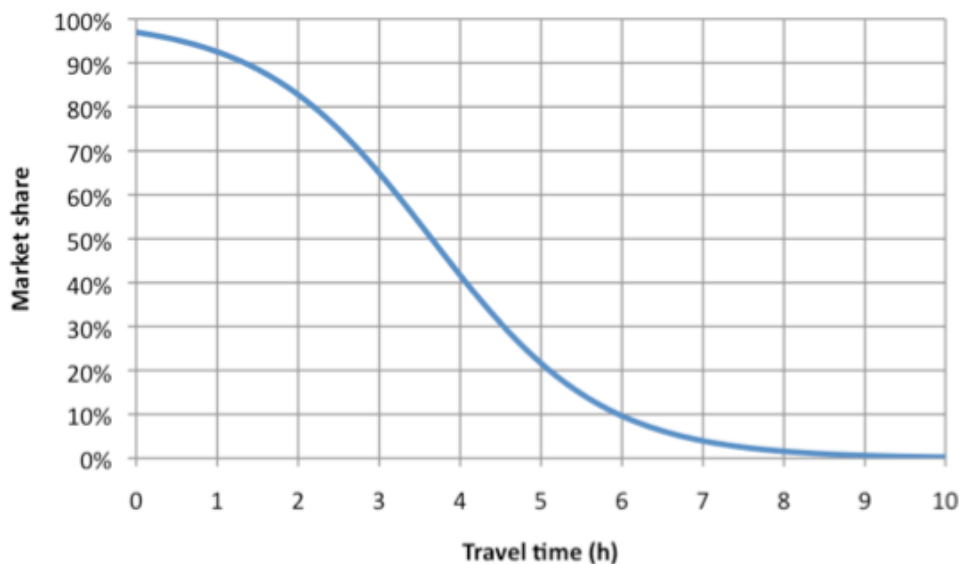
AIR

Regional Express operates a regularly scheduled airline service between Sydney and Snowy Mountains Airport, located just outside Cooma at Coolringdon. The 34-seat Saab 340B aircraft performs 5 return services per week, with extra services offered during the ski season.⁴

- Oct–May: 340 seats per week
- June: 612 seats per week
- Jul/Aug/Sep: 816 seats per week

This averages out annually at 471 seats per week (about 67 per day). Applying a reasonable capacity factor of 75% to the core services, and 90% to the ski-season services, results in an annualised average demand of 55 passengers per day.

A competitive Sydney–Cooma “ski express” train service would have a travel time of about 5 hours, assuming no change to the existing Sydney–Canberra service, or perhaps as low as 2.5 hours if the Sydney–Canberra corridor were upgraded to allow unrestricted medium-speed running (160–200km/h). A model of rail modeshare by Peter Jorritsma⁵ predicts a percentage market capture from air, based on the point-to-point travel time for the rail service. According to this model, the mode capture would be between 20% (with no improvement to the existing Sydney–Canberra service) to as high as 75% (with upgrade to medium-speed). In any case, the absolute mode capture from air will be small, between 10–40 passengers per day.



Jorritsma model of fast rail market capture. In practice the market share for travel times under about 1.5 hours is 100%, as the air service is discontinued.

INDUCED DEMAND

So-called “induced demand” refers to trips that are not captured from any existing mode, but that are facilitated by the railway itself and did not exist prior to the railway’s availability. This will be largely a result of new residential developments in the station precincts of the townships along the line, which will be highly desirable for commuters.

Canberra’s population growth rate is presently equal-highest in the nation, rising by approximately 9,000 people per annum. If a modest 5% of these new arrivals were to choose to live in one of the townships on the railway line, rather than in Canberra itself, this would represent 450 new commuters every year, adding 900 trips per weekday to the total. Assuming 240 working days per year, this averages out to an increase of about 600 trips per day, each year. We shall assume that incidental, non-commute related trips shall add an additional 25% to induced demand, bringing total induced demand to approx. 2,250 passengers per day by the third year of operation.

PASSENGER DEMAND – by source

The extent of induced demand driven by residential development is dependent upon the scale of development permitted in the townships along the line. Such developments should be a mixture of medium density development near station precincts, of a scale similar to contemporary developments at Kingston, Molonglo and Gungahlin in Canberra, as well as low-density detached housing of the type already existing in the townships.

If the rate of population growth assumed above were to remain constant, induced demand could be expected to continue to grow linearly at approximately 10% per annum for an additional 20 years as new residents move into the available stock of development sites. Such a development strategy could be achieved without drastically changing the typical settlement density or the boundaries of the existing townships, and could therefore be achieved while remaining sympathetic to the existing character of each township.

TOURISM / CRUISE

The \$44 million upgrade of the wharf at Snug Cove is expected to be completed in 2019.⁶ It will allow cruise ships up to 325 metres in length to dock, whereas presently most large cruise ships must anchor in the bay and ferry passengers to shore. The wharf upgrade is expected to significantly increase both the number of visitations, and the percentage of passengers who disembark to explore the town and region.

In 2016/17, Eden was visited by 14 cruise ships and 20,000 passengers (up from eight ships the previous year), with 91% disembarking and 26% participating in an official shore excursion.⁷ The wharf upgrade will increase Snug Cove's cruise ship capacity to 40-60 vessels per year, enabling a greater share of the 350-400 cruise ships that visit Sydney annually to make a call at Eden. A day-trip to Canberra is already among the excursion options offered by cruise companies, as is a train journey from Canberra to Sydney.

If we assume a near-term increase in visitation to 30 ships per season (typically spread out over the peak months from October to April), and an increased average passenger capacity to 3,000 per ship, Eden would see an average of 3,462 passengers per week during the tourism season (not including crew). If a conservative 15% of these passengers were to do a day-trip to the nation's capital by rail, that would entail 520 return-passengers per week during the tourism season (1,040 trips in total, 2-3 return trainloads), or half that number averaged over the year — about 75 trips per day. Therefore while cruise ship demand might be good for the publicity of the line, even at optimistic estimates it is unlikely to prove a substantial source of overall passenger demand.

Tourism from Canberra to Eden however represents a much higher potential patronage. Canberra-Eden rail would establish Eden not only as Canberra's port, but also its seaside resort of choice. There is presently significant seasonal traffic between Canberra and its nearby seaside townships of Batemans Bay, Ulladulla and others. The average annual traffic volume on the King's Highway is about 5,500 vehicles per day, but peak weekly volumes during holiday periods can be double or triple the annual average, with the summer average overall being approximately 50% higher than the annual average.^{8,9}

This suggests a contestable summer travel market of perhaps 2,500 vpd, which additionally would likely have substantially higher vehicle occupancy than the national average of 1.6. Even assuming a conservative occupancy of 2, it's potentially 5,000 passengers per day.² If Eden Rail were to achieve 10% share of this market, it would mean 500 passengers per day during the summer period, and perhaps twice or three times that number at peak times such as school holidays. While average summer demand could be met by a single trainset running two return trips per day, peak summer demand would require at least one further trainset to be added to the daily schedule (perhaps diverted from the Canberra-Cooma service on weekends, when commuter demand is lower).

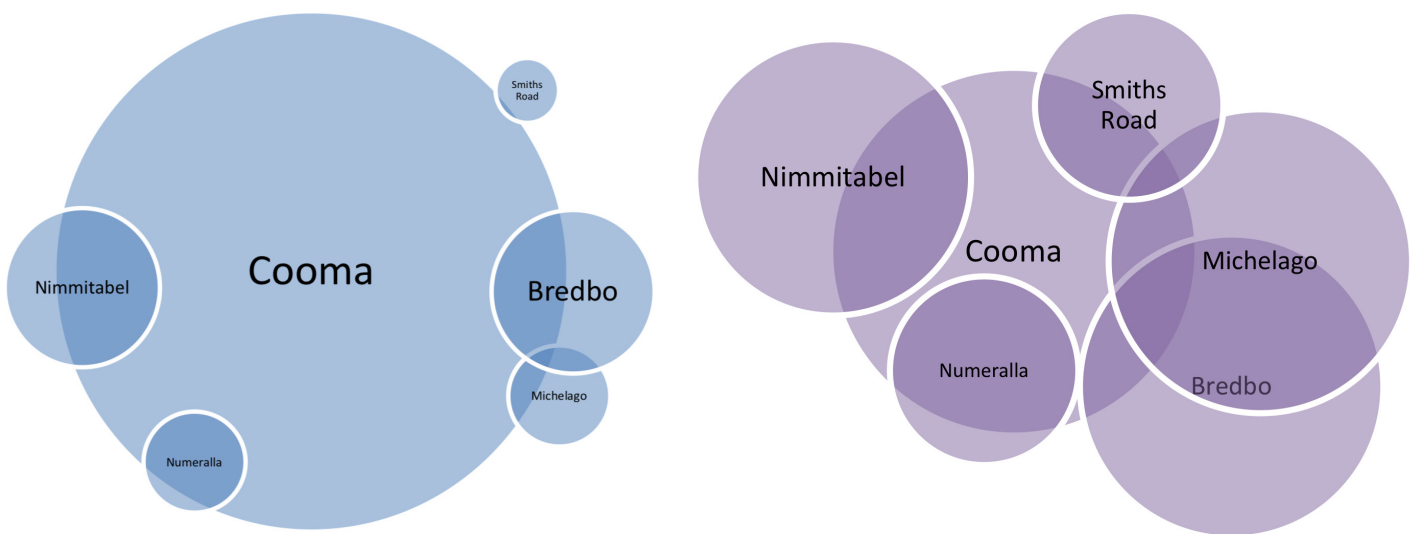
Averaged out over the year, this summer tourism market would be 250 vehicles per day. Although technically this represents a mode shift away from private car, we will account for it under tourism as it also represents a change of destination for those cars.

The total annualised demand for tourism and cruise ships is therefore conservatively estimated at 325 passengers per day.

VALUE CAPTURE

The advent of a fast passenger railway will make the townships along the line newly desirable locations to live, especially for commuters. This presents a significant opportunity for value-capture financing – enabling the proponent of a major infrastructure project to keep a portion of the external benefits generated by that project, in this case, the uplift in property prices caused by the improved transport to the major employment market of Canberra.

It is proposed that state and local planning authorities collaborate to enable medium-density housing estates at station precincts and other suitable sites, with the development rights awarded exclusively to the railway proponent. The revenue so generated will be a significant component of the financial rationale for the project. This vision is compatible with the development goals of the region; while Cooma is presently the overwhelmingly dominant township of the region, a 2015 discussion paper by Cooma-Monaro Shire Council investigated options for changing the development balance to achieve greater population in the minor townships.¹⁰



Existing hierarchy and relationship of Monaro region townships (left) compared to a possible future scenario where the other main townships have been more greatly developed (right). The relative scale suggests a long-term objective for Michelago, Bredbo and Nimmitabel to each reach a population of approximately 4,000 people. (Cooma Monaro Shire Council 2015)

Typical medium-density developments contain around 100–200 dwellings per hectare, at a plot ratio of 1–2 (visualise 3 to 6 story apartment or terrace house blocks).¹¹ Given the available area of suitable precincts in each of the townships along the line, it is plausible that as many as 10,000 such dwellings could be constructed in eight townships. This number of dwellings would entail in the order of 30 to 60 individual development sites, with each township comprising perhaps 4–8 sites. A similar number of dwellings could additionally be built at lower density (detached housing) by infilling under-developed land within the existing township boundaries, although this kind of development would be difficult or impossible to reserve as the sole right of the railway proponent.

In addition to development sites at exurban township stations, the ACT Government should award the railway proponent the right to develop the Kingston Station site in Eastern Canberra (perhaps 2,000 additional dwellings). Such an agreement would significantly increase the value capture revenue available to the railway proponent. Additionally, it would be the only site not dependent directly on the railway for its value, and could therefore be developed early in order to quickly reduce debt levels. The ACT government would succeed in revitalizing the heart of a rapidly gentrifying part of inner-eastern Canberra, without sacrificing its existing status as the capital's rail hub.

VALUE CAPTURE

OPTION 1 – SALE OF DEVELOPMENT SITES

One way to pursue value capture is to sell development sites rezoned as R5-residential to external developers, similar to the current land release strategy of the ACT Land Development Agency. This would have the advantage of greater certainty over the amount of revenue, earlier achievement of that revenue, and reduced risk for the railway consortium. Additionally, this strategy does not require the railway consortium to have in-house residential construction expertise, and is therefore the preferred option.

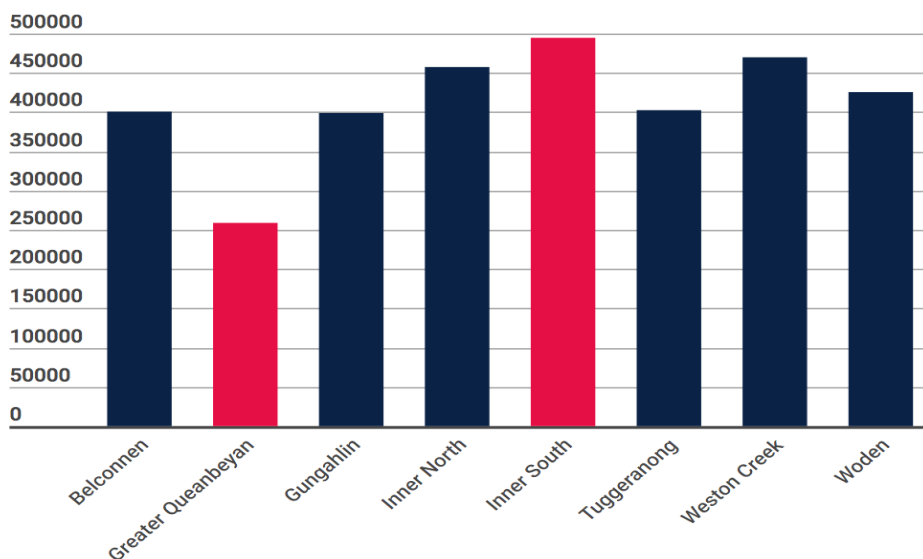
There is a wealth of recent sales data for medium-density development sites in Canberra and the surrounding region; \$75,000 per dwelling approval would be at the lower end of the range of expected returns, according to recent sales experience. If the pace of development were staged to match the expected pace of population growth, we might see sales of the rights to build perhaps 500–1,000 dwellings per year, which would represent a maintainable value capture income of up to \$75 million per year for 15–20 years. Greater income could be earned in the crucial early years by increasing the rate of sales to establish a solid base of commuting population, and focusing on the most desirable sites. This would represent a nominal income in the order of \$1 billion over the course of the project, offsetting a significant proportion of the up-front capital costs.

OPTION 2 – DIRECT DEVELOPMENT

The second option is to develop the housing precincts directly, and then either sell or rent the finished dwellings. This would have the advantage of higher potential return, but the downside of additional expense and delay before that return is achieved, and increased uncertainty. It is analysed here for comparison to the preferred option.

Low- to mid-rise multi-story residential construction in Australia costs approximately \$2,200 per square metre Gross Floor Area, so at a typical GFA:NFA ratio of 1.5 and an area per 2-bedroom apartment of 70m², this suggests a construction cost of around \$230,000 per dwelling.^{12, 13, 14} Additional development costs for roads, services and utilities could be expected to add several thousand extra per dwelling, so say \$250,000 per dwelling for total development cost.

Therefore in order to be preferable to the strategy of selling the sites to external developers, the eventual sale price would have to exceed \$325,000 per apartment. With the median unit price in the ACT being \$411,000 as at March 2018, and premiums being paid for new, high-quality, village style developments such as Weston Creek, this seems a plausible goal.^{15, 16} Applying a discount for increased distance from the city centre, \$300,000 to \$350,000 is a reasonable expectation for the median unit price in the township developments.



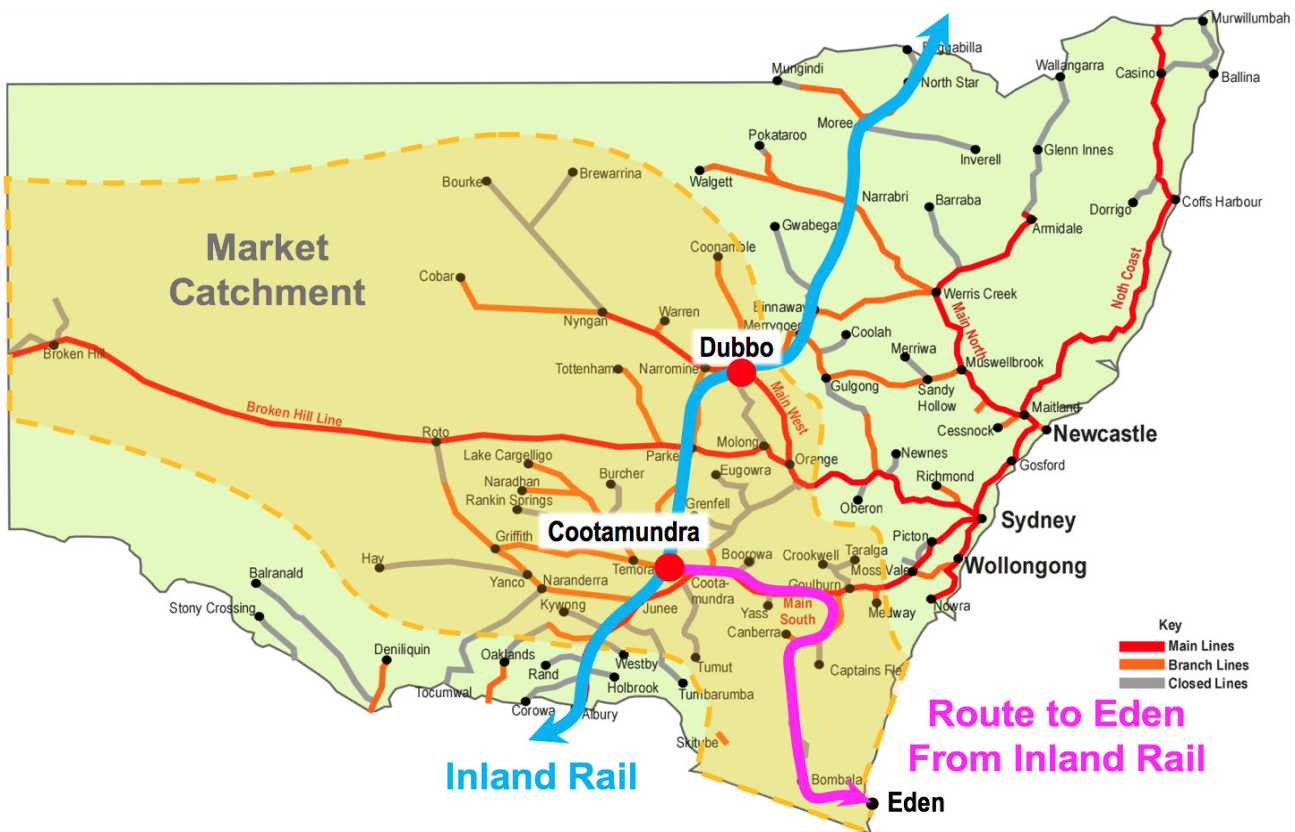
Median unit price by ACT region, March 2018 (Image: Allhomes.com.au)

FREIGHT DEMAND

Freight estimates have been based on the numbers in the Inland Rail Business Case.¹⁷ Inland Rail is forecast to divert a significant quantity of agricultural and containerized freight to Port Kembla and the Port of Newcastle, as well as a substantial proportion of existing intercapital and intermodal freight between Adelaide–Brisbane and Perth–Brisbane (as well as its primary purpose of Melbourne–Brisbane).

The development of the Port of Eden, and its connection to the national standard gauge rail network, would change this calculus. Eden would at a stroke become the most proximate port for many freight customers, with additional advantages of being relatively uncongested, offering a direct rail-to-port link, and not traversing busy metropolitan corridors.

The zone of likely market catchment is determined on the basis of equal cost to reach competitor ports. On a purely distance-based metric, the boundaries of the catchment area are roughly at Cootamundra in the south (500km to both Eden and Melbourne) and Dubbo in the north (800km to both Eden and Brisbane). In practice the effective market catchment will be somewhat larger than this, due to the lower cost of the Port of Eden as well as operational advantages in avoiding congested urban corridors.

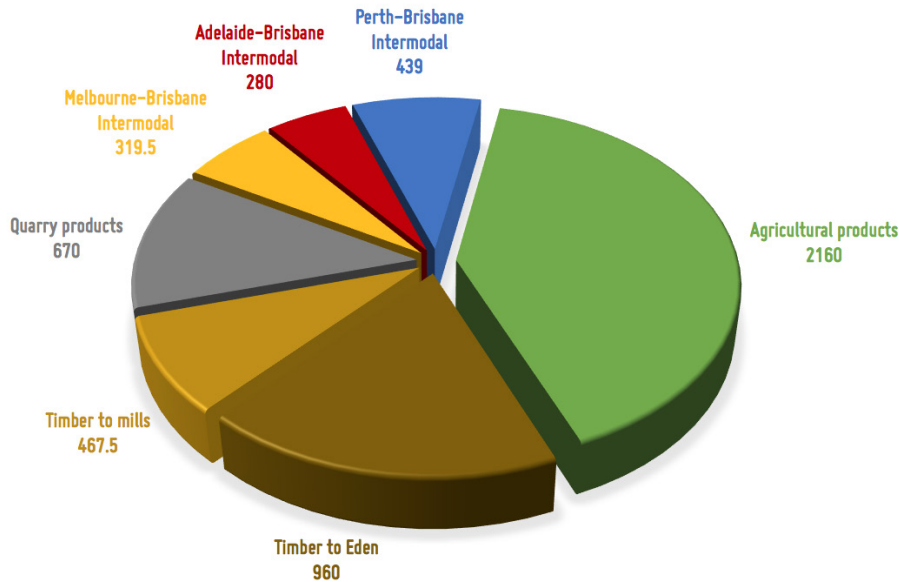


Likely market catchment for Canberra–Eden Railway.

Base image: https://en.wikipedia.org/wiki/Rail_transport_in_New_South_Wales

FREIGHT DEMAND

The total freight task of Canberra–Eden rail when fully operational in 2026 is estimated at 5,296,000 net tons per annum (1.342 billion net-ton-kms per annum), which equates to approximately 7–8 trains per day (assuming a Reference Train of 700m length carrying 2,000 net tons bulk) with linear growth of 5% per annum commensurate with that expected for Inland Rail, and the Australian freight task generally, which is expected to double over the next 20 years.¹⁸



Canberra–Eden freight task, thousand net-tons per annum

- Melbourne–Brisbane Intermodal** — Eden could be expected to capture a small proportion of this market due to offering a low-cost port at a distance 600km closer to Melbourne by rail than Brisbane. We will estimate a conservative 10% of this market will divert to Eden (320,000 tons per annum in 2024–25)
- Intercontinental Intermodal** — Inland rail expects to capture significant volumes of Adelaide–Brisbane and Perth–Brisbane freight, which is presently routed via the coastal corridor through Sydney. Eden would become a highly competitive export port for this freight; we will estimate 50% of this freight would divert to Eden (719,000 tpa in 2024–25)
- Agricultural Products** — The Port of Eden will be the most proximate port for a significant proportion of New South Wales, and is expected to capture a majority of the agricultural produce within this catchment zone. Further north, the distance advantage is eroded and market capture will be lower. The Inland Rail Business Case classifies this freight by destination port (volumes from 2014–15). The weighted average market capture of Inland Rail is therefore 32% of agricultural products; in 2024–25, this would represent 2,160,000 tons per annum.
 - Port Kembla (3.0 million tons, 2.9 on rail) — Produce sourced from Western, Central, Riverina and Southern districts of NSW. Eden expected to capture 66% of this market.
 - Port of Newcastle (1.8 million tons, 1.2 on rail) — Produce sourced from Western, Central and New England districts. Eden expected to capture 10% of this market.
 - Port of Brisbane (2.1 million tons, 0.4 on rail) — Produce sourced from New England, Darling Downs and Toowoomba districts. Eden will not capture any of this Market.
- Coal** — Inland Rail expects significant tonnages of coal to be transported from the Surat and Clarence–Moreton basins. It is not expected that Eden will capture any of the coal market due to the mine sites being located outside the distance-competitive envelope.

FREIGHT DEMAND

- **Victoria** — Inland Rail does not expect to capture any of the Victorian Market (save for Melbourne–Brisbane intercapital freight); all Victorian freight is expected to continue to use the ports of Melbourne, Hastings, Geelong and Portland. There is however some (future) potential to capture a proportion of the 250,000 tons per annum of freight routed direct from Gippsland to Sydney via the Monaro Highway, especially if a cross-border rail link were completed.
- **Fuel** — Automotive fuel consumption in the South–Eastern Region was 184,000 tons in 2006.¹⁹ Accounting for population growth it would be well over 200,000 tons by 2018. With wholesale fuel depots located in both Cooma and Bega, there is some potential for future investment in rail delivery if the population of the region were to increase substantially, however this is a longer term prospect.
- **Timber** — there are a number of timber operators in the potential market catchment, including Bombala (660,000 tpa), Tumut (3,100,000 tpa), Tumbarumba (855,000 tpa) and Wagga Wagga (60,000 tpa).¹⁹ Additionally the Port of Eden presently handles about 1,200,000 tpa. The likely market capture is 1mtpa to Eden (over a shorter distance, approx. 100km), and perhaps 500,000tpa northbound (this would significantly increase were the Tumut Branch from Cootamundra to be reopened). Secondary timber products (structural timber, cardboard and paper) are not in the potential market catchment.
- **Quarry Products** — There are several extant and former quarry sites for coarse and fine aggregates in the region, at Middlingbank, Nimmitabel, Rock Flat, and Holts Flat. While the quantities are not presently significant, the advent of the railway would enable product to reach the large Sydney market at low cost. There is also potential to capture existing freight flows between the major quarries at Berrima and the concrete batching plants at Bega, Pambula and Jindabyne. Quarry product flows within the region were estimated at 13.4mtpa in 2006 and growing at 2% per annum.¹⁹ If even a small proportion of this flow were to switch to rail, or production in Southern Monaro induced to expand, it could represent a significant market. We will conservatively estimate 5% of the 2006 flows to be captured, ie 670,000tpa.
- **Horticulture** — Cooma is a significant producer of carrots and broccoli, producing about 2,000 tons annually of each (the broccoli production in fact represents well over half the NSW total).²⁰ However these volumes are too small to appreciably affect total demand of the railway.
- **Seafood** — Although Eden is home to a substantial fishing fleet, the daily volumes are small and variable — between 10 to 35 tons per day depending on the size of the catch (no more than 10,000tpa).²⁰ In the absence of a major expansion of the Eden fleet, seafood is unlikely to be a significant source of freight.
- **Dairy** — The Southern NSW Dairy Region produced 490 million litres of milk in 2008/09 (about 500,000tpa),²⁰ however geographic considerations make it unlikely that a substantial share of this would divert to rail. There is some potential for the southernmost dairies to divert to rail, as the road route up the escarpment is highly inefficient, however the volumes would be insignificant. The large export market for processed dairy products such as cheeses is also unlikely to use the railway — it would simply export directly from Eden or continue to use existing supply chains.
- **High-value Air Freight** — The potential for export of high value, time-sensitive products from Canberra Airport is relatively high, however total volumes will be low in the context of the total rail freight task. The entire Australian air freight market, domestic and international, is just over 1mtpa – any plausible share of this routed via Eden Rail would be insignificant. The benefits of this freight class will accrue mostly to the airport operator.

FREIGHT OPERATING COSTS

Operating costs for freight are based on the Inland Rail Business Case,¹⁷ using data for the 10 million gross-ton per annum scenario:

- Below-Rail Costs (Operations planning, train control, transit management, power supply, management overhead and track maintenance) — Accrue to railway provider
 - Operating Costs \$4,390 per km-annum
 - Management and Overhead \$1,310 per km-annum
 - Major Periodic Maintenance \$11,840 per km-annum
 - Reactive Maintenance \$8,000 per km-annum

TOTAL BELOW-RAIL **\$25,540 per km-annum**
\$7.994 million per annum for Canberra-Eden (313km)

- Above-Rail Costs (train crew, fuel, rollingstock maintenance, depreciation, overhead and administration) — Accrue to train operator
 - North Coast Route \$24.2 per thousand net-ton-km (000ntk)
 - **Inland Rail** **\$18.3 /000ntk** (adopted; other figures are for comparison)
 - Agricultural \$32.2 /000ntk
 - Road \$84.0 /000ntk

DIFFERENTIAL PORT COSTS

Eden is a low cost port compared to Botany, Kembla or Melbourne. Canberra-Eden rail will enable freight operators to take advantage of these differential costs:

Port	Intermodal Wharfage			Bulk Wharfage		
	Cost per TEU	Difference	Eden Saving	Cost per NT	Difference	Eden Saving
Eden	\$57.00	0	0%	\$1.41	0	0%
Botany	\$123.10	\$66.10	54%	\$2.58	\$1.17	45%
Kembla	\$65.85	\$8.85	13%	\$2.33	\$0.92	39%
Newcastle	\$112.96	\$55.96	50%	\$1.84	\$0.43	23%
Melbourne	\$109.31	\$52.31	48%	\$2.82	\$1.41	50%
Brisbane	\$85.05	\$28.05	33%	\$4.23	\$2.82	67%

With a typical TEU carrying 10 net tons, and total carriage costs on Canberra-Eden Rail being approximately \$38 per thousand net ton kilometres (access charge plus above-rail operating costs), this implies a slight range advantage of 30-50km for bulk freight, but a significant advantage for intermodal freight of 150-200km. Eden's generally lower costs for navigation, pilotage and berth occupancy would improve this further.

PASSENGER OPERATING COSTS AND FARES

There are four extant regional passenger rail operations in Australia (excluding Great Southern Railways); their present operating costs are listed below. Data for the Sydney Trains network has also been included for comparison.

- **Sydney Trains metropolitan network** ²¹
 - Direct train operations \$16.00/train-km
 - Rollingstock maintenance \$1.37/car-km
 - Ticketing costs \$1.05/passenger trip

- **NSW Trainlink regional network** ²²
 - Total net operating cost \$8.76/revenue car-km
 \$21.46/passenger
 - Capacity factor 51.9% (revenue-km/seat-km)

- **V/Line** ²³
 - Operating costs: \$11.38/car-km (typical consist of 3 cars)
 - Train maintenance: \$2.31/train-km (VLocity cars)
 - Farebox recovery ratio: 20.24%
 - Subsidy per passenger: \$21.66

- **TransWA Prospector, Australind and AvonLink** ²⁴
 - Average cost \$0.47/passenger-km
 - Average pax/train 65.7 (passenger-km ÷ service-km)
 - Implied cost per car-km \$10.30 (typical consist of 3 cars)

- **Queensland Rail** ²⁵
 - Operational cost \$25.38/revenue train-km (South-East Queensland above-rail)

Assuming the Canberra-Eden railway were to reflect Australian experience, and with efficiencies applied for new rollingstock and larger average train size, a reasonable estimate for operating cost might be \$7.5 per car-km, or \$30 per train-km for a 4-car trainset. This translates to a cost-recovery fare of about \$0.33 per passenger-km. Although this is somewhat higher than typical cost-recovery fares per passenger-kilometre on high-speed railways around the world (examples below),²⁶ it is reasonable given the lower economies of scale of Canberra-Eden rail, and has been adopted.

- Shinkansen \$US 0.217/pax-km (\$AU 0.289) (international HSR cost-recovery fares for comparison)
- RENFE (Spain) € 0.104/pax-km (\$AU 0.160)
- Deutsche Bahn € 0.108/pax-km (\$AU 0.166)
- SNCF (France) € 0.112/pax-km (\$AU 0.172)

A cost-recovery fare of \$0.33/pax-km would be about \$37 one-way between Canberra and Cooma, or \$102 between Canberra and Eden (about three times the existing fare of the NSW Trainlink coach service). Full cost-recovery fares are likely to be prohibitive for most regular commuter users, however a fare level higher than the existing coach service would be justified due to the much improved travel time and service quality offered. Pending a detailed demand analysis, a fare level of \$0.20/pax-km would appear reasonable (this would correspond to a one-way fare of \$22 to Cooma and \$63 to Eden).

At this fare level, the passenger service would make an operating loss of around \$15 million per year, or \$12 per passenger. Applying a passenger subsidy of this magnitude in order to allow the passenger rail operation to recover costs would be at the mid-range of typical regional and suburban rail subsidies in Australia.

ACCESS CHARGES

Access charges are typically a two-part tariff: first, a “flag-fall” per train-kilometre (charged per train movement regardless of the gross tonnage) and a usage charge per thousand gross-ton-kilometres (GTK). A 2006 study by Ernst & Young imputed a typical rate per NTK as a multiple of approximately 2.2 times the rate per GTK (equivalently, this implies the typical gross tonnage is 2.2 times the net tonnage carried).²⁷

For the purposes of estimating access revenue, we will assume the Canberra-Eden “Reference Train” to be a 700m long, 50 wagon consist, carrying 2,000 net tons bulk (4,400 gross tons). While substantially smaller than the Inland Rail reference train of 1,800m length, and the maximum train length on the notional Eden corridor of 1,200m, it is more in line with the typical existing freight train size on the Sydney-Canberra and Sydney-Wagga corridors, and would achieve better performance on the steep sections of the Eden corridor.

Existing access charges for the ARTC network (as at July 2018) are as follows:

	Acacia Ridge-Islington (Brisbane-Newcastle; North Coast route)	Cootamundra-Parkes (existing inland)	Sydney Trains Network (SSFL)	Truck (for comparison)
Flagfall \$/Train-km	\$2.085	\$1.671	\$8.964	N/A
Usage \$/000 GTK	\$3.830	\$4.218	\$5.787	N/A
Effective charge \$/000 NTK	\$13.013	\$12.956	\$32.45	\$84.00

The 2015 Inland Rail report assumes that access charges are set at the same level as the existing coastal route, in order to maximise volume diversion from both the existing rail service and road freight. The 2006 Ernst & Young report however opined that such an approach was unrealistic, as this would entail a lower price per NTK for a shorter route. Instead, that report implied that the access charge should be set to maximise revenue, rather than volume.

Ernst & Young modelled that maximum revenue would be achieved at an access charge of 22%–86% higher than on the existing North Coast route, with the lower number assuming no operational efficiencies with respect to the existing coastal route, and the higher number assuming 20% efficiency gains. As Inland Rail is expected to deliver operational efficiencies of 25% (which we will assume can also be achieved on Canberra-Eden Rail), and also taking into account reduced distances to port and differential port costs, an access charge toward the top end of this range could be justified. Even at a premium of 150% above the coastal route (approximately the charge on the South Sydney Freight Line), the effective access charge plus operating costs is still over 30% lower than for road freight.

This study will adopt an effective access charge of \$24/000ntk, being the tariff premium recommended by Ernst & Young, given the operational efficiencies of the route. At this tariff, the reference train would be charged \$15,024 per one-way journey between Canberra and Eden.

PASSENGER RAIL

The present ARTC access charge for express passenger services on the coastal corridor is \$2.258/train-km flagfall plus \$3.781 per 1,000 GTK usage charge. Assuming Canberra-Eden rail were to adopt an access price structure 80% higher than this level (commensurate with the premium assumed for freight), and at a typical mass of 250 gross-tons for a 4-car, 200 passenger trainset, that makes a typical access charge of \$5.77 per train-km.

However, under the proposed contract structure of Build-Own-Operate, the railway provider would themselves operate the passenger rail service, receiving fares and a per-passenger subsidy in lieu of access charges. This is preferable as it ensures certainty over the ongoing level of service offered by the passenger operation, which in turn supports the value-capture funding model.

FINANCIAL APPRAISAL

The Net Present Cost of building and operating the railway for 30 years without subsidy is \$2.095 billion at a discount rate of 4% (including financing costs of 4% per annum). Cash flow analysis of various access charge and freight volume scenarios indicates that there is no reasonable prospect that the railway would achieve profitability, far less recover its costs, without some level of public subsidy.

This is not unexpected — most railways worldwide require subsidy in order to recover their capital costs, with the external benefits generated by the railway justifying such public expenditure. These benefits will be investigated in Part 3B of the Concept Plan and include:

- Reduced congestion (road, rail, port)
- Delayed or eliminated need to upgrade other major ports and railways
- Reduced energy intensity of transportation
- Improved access to affordable housing
- Facilitation of transport mode optionality
- Facilitation of desired urban and regional development objectives
- Potential for future expansion of network

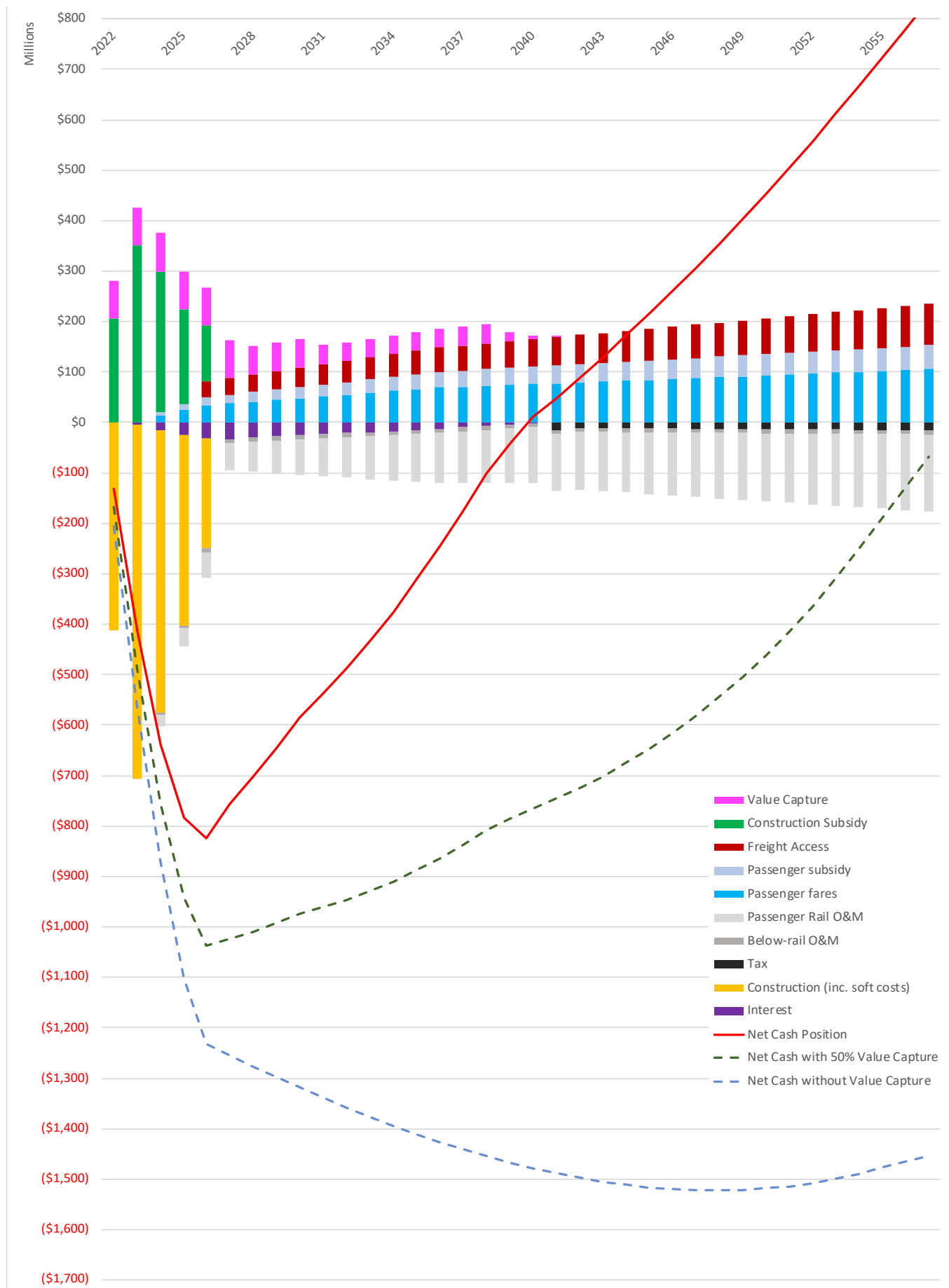
PROJECT FINANCING – CORE SCENARIO

In order to make the proposal attractive to private sector capital, it is proposed that the project be financed under a Build–Own–Operate model, with an ongoing contract sum included to cover the subsidy to the passenger rail operation. Such an arrangement would ensure a specified level of passenger service were delivered during the contract period, which is critical to ensure the success of the residential developments. Core features of the proposed scenario are:

- Total public expenditure of \$1.33 billion, comprising:
 - 50% of up–front capital costs and project management; government to be 50% shareholder
 - Net Present Cost to government of \$996 million over 5 years
 - Passenger subsidy of \$0.09 per passenger–km
 - Averages \$12.24 per passenger–trip, or \$16 million per year in third year of operation (2026)
 - Net Present Cost to government of \$367 million over 30 years
- Payback Period: 19 years
- Internal Rate of Return: 4.41%
- Net Present Value: \$44,733,000 (at 4% discount rate)
- Full ownership of the railway transferred to government in 2056, 30 years after becoming fully operational

Of particular note is the importance of value capture to the overall viability of the project. The dashed lines on the cash flow projection on facing page show two alternative value capture scenarios. Where value capture income is 50% of the base scenario, payback period is doubled from 19 years to 38 years, beyond the proposed duration of the build–own–operate contract. Where no value capture is achieved at all, the project does not even achieve operational profitability until the third decade of operation. This highlights the importance of using the substantial early income from residential development to quickly recoup construction expenses and avoid escalating interest payments.

CASH FLOW PROJECTION (constant dollars)



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