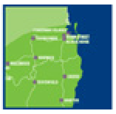
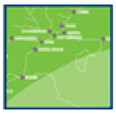





Contents

1 Introduction

The North-South Rail Corridor Study (the Study) was commissioned by the Department of Transport and Regional Services (DOTARS) and undertaken by a Study Team comprising of Ernst & Young, Hyder Consulting and ACIL Tasman. The Study included extensive consultations and provision of data and information from rail operators, the freight industry and key customers, supplemented by contributions from regional and other stakeholders. GIS database systems and mapping tools were used extensively in the development of concept plans.

The Study assessed the current freight and passenger markets, projected demand (total and rail's share), rail route options, other transport infrastructure requirements and environmental issues and used these to examine economic and financial impacts. The complete Terms of Reference for the Study are provided at annexure 1: ***Terms of Reference***.

2 Market Assessment

Freight in the Corridor consists mainly of coal, other minerals, grain, other agricultural products, manufactured products and steel. The biggest flows involve coal transport in New South Wales, but the movement is mainly across the corridor rather than along it and is of secondary importance to the freight movements along the Corridor.

Other products move between the capital cities or between intermediate points on the main Melbourne-Sydney and Sydney-Brisbane corridor. Relatively little freight moves between the inland points in the Corridor.

Almost half (47%) of the inter-capital freight is on the Melbourne-Sydney route; 32% is Sydney-Brisbane and 21% Melbourne-Brisbane. About 5% is express, while another 60%-70% is less urgent but is sensitive to reliability of service and to availability of capacity when needed (e.g. manufactured products). The remaining 25%-35% is more price sensitive (e.g. manufacturing inputs).

Air freight offers speed and reliability, but at a high price. Road freight offers shorter door-to-door transit times than rail or sea freight, high reliability (about 95%-98% of freight arrivals are within 15 minutes of schedule), and high flexibility and availability to meet customer's preferred dispatch and receive times. Road prices are typically higher than the terminal-to-terminal (or linehaul) component of rail or sea freight. Sea freight offers slower but reliable services with lower frequency than other modes, and lower prices.

Rail's large capacity offers logistical advantages for bulk movements such as coal, other minerals and grain, but relatively slow door-to-door transit times for other freight because of infrastructure constraints and local pickup and delivery. Intercapital reliability is poor with fewer than 50% of trains arriving on time and availability is uncompetitive with trucks – customers often prefer evening departures but trains have to leave during the day to meet customers' demands of early morning arrival times (because of slower transit times). Relative door-to-door road and rail prices vary depending on the length of the route and whether or not it is part of a domestic or export/import supply chain. Road is often slightly cheaper than rail for short-haul domestic transits but rail becomes cheaper than road when routes extend beyond 1,000km. Rail tends to be less expensive than road for export and land bridging freight tasks.

Modal shares on various routes reflect the relative strengths of the different transport modes for the carriage of different freight types. Sea freight is used for certain bulk commodities such as petroleum and cement. Rail freight is used extensively to get bulk commodities to ports, and for bulk products such as steel. Road transport currently dominates the market for freight that is either express or sensitive to reliability and availability; typically manufactured goods. Air freight or trucks are used for express items.

Outside bulk commodities, rail's share of freight markets in the Corridor has been declining for decades because of improving road and truck design, congestion on the tracks, and the time and cost of local pickup and delivery. Rail market shares are currently around 9% between Melbourne and Sydney (and most of that is Tasmanian freight), around 11% between Sydney and Brisbane, and around 30% between Melbourne and Brisbane. The Melbourne Brisbane rail mode share has grown recently and is higher than the others because of the longer distance – trucks cannot offer an overnight/next morning service, and pickup and delivery time and costs have lower relative importance.

In order to compete, rail operators have had to offer linehaul freight rates well below those of trucks, thus squeezing their margins, in order to make up for its inferior service.

Longer distance passenger rail services in the Corridor have low frequency and patronage has been stable at relatively low load factors (in an era of good road networks and low-cost airlines); they are relatively insignificant in the context of North South rail corridor options.

Sydney suburban rail patronage has been increasing, but patronage on longer distance commuting services from the Central Highlands (Mittagong) and the Central Coast (Gosford) has been unchanged.

The major impact of passenger services on rail freight through the Sydney area is the limitations of curfews in peak passenger times, which prohibit freight operations for 3-4 hours in the morning and evening peak periods. Narrow windows for freight train paths between commuter trains also inhibit freight operations through Sydney's northern suburbs (Cowan Bank/Hawkesbury River).

3 Demand Analysis

The Study developed a model of the anticipated future freight demand in the Corridor (irrespective of mode) by origin, destination and commodity. The split between different transport modes was then calculated to produce an estimate of rail freight demand. Adjustments were made for freight inducted or diverted by new rail options. Rail passenger demand was estimated separately.

The Study assessed the total freight between the main cities in the Corridor (Brisbane, Sydney and Melbourne) and intermediate points, freight to or from points along possible inland rail routes, and freight moving between points in the Corridor and elsewhere in Australia.

Much of the Corridor is used to transport commodities used for manufacturing (for example, steel or crude paper products) or final consumption goods (for example, cars and retail products). The demand for these commodities and goods depends on the level of consumer demand and hence GDP. The freight task has historically been growing at 1.3-1.5 times the rate of GDP growth, but is expected to taper off due in part to increasing imports.

Grain, coal and other mineral traffic are not determined by GDP but by production capability, freight capacity and international demand. ABARE and CSIRO commodity forecasts were used as the basis of the forecast demand for these freight flows.

Regional freight consists largely of agricultural and mineral products and is expected to grow steadily. An inland rail route would also divert some grain, agricultural and manufactured freight from other routes, and allow expansion of coal freight in southern Queensland.

Research undertaken during the Study indicates that the total freight flows in most markets within the Corrridor is likely to double over the next 25 years.

Apart from bulk commodities and long-haul routes, rail's share of the freight market has been declining for many decades. Road freight is often more expensive but offers quicker and more reliable door-to-door delivery than rail freight. However, the rail infrastructure route options developed in this Study would improve the relative performance of rail transport services and result in an increase in rail's share of the freight market.

The Study Team extensively surveyed freight firms and customers, and combined this with economic techniques to estimate future modal shares. The main factors driving mode choice were:

- **Door-to-door price** – rail freight prices are relatively price competitive but increased by local pickup and delivery costs. Fuel prices, labour costs and infrastructure charges will affect future relative prices.
- **Transit time, availability of service on demand, and reliability** (these are interrelated) – rail performance on these scores is relatively poor in the Corridor, but would improve with the identified new and upgrade route options. Reliability is forecast to improve from 45% to around 70% to 90% depending on the route, and availability from 45% to nearly 90%.

Customers indicated that they would use rail services far more often if the rail service improved (and remained at a comparable price) between Melbourne and Brisbane. Customers and freight forwarders were less optimistic about rail's mode share increasing on short-haul inter-capital routes in the Corridor.

The rail share of the Melbourne-Brisbane freight market is currently around 30% but could be expected to more than double with improved service levels. There will also be increases on shorter routes (Sydney-Brisbane and Sydney-Melbourne), though the increases will be less (from 9% to 18% and from 11% to 22% respectively).

It should be noted that the relative size of the markets is such that Melbourne-Sydney is expected to remain the largest market (25.3m tonnes by 2029) with Sydney-Brisbane the next largest (18.2m tonnes by 2029) and then Brisbane-Melbourne (11.5m tonnes by 2029).

The combination of increasing total freight and an increasing rail mode share translates into significant increases in future rail tonnages between the main origins and destinations. Rail freight to and from most regional areas will remain modest, other than bulk commodities.

Rail passenger services compete with freight trains for infrastructure capacity, especially as they are usually given priority. In the Sydney area, freight trains may not operate during the suburban peak periods due to the curfew arrangement. The restrictions have a severe impact on freight services. Much of the reliability issues associated with the Melbourne-Brisbane services relate to network constraints in the Sydney area. Conflicts between freight trains and passenger trains in the Sydney metropolitan network are caused by narrow windows for train paths and freight train curfews. Limited passing lanes and crossing loops also impact on the line haul sections.

After examining recent historical passenger growth trends, the Study concluded that passenger services are unlikely to create any additional concerns for rail freight services within the Study period. However, the present issues will remain unless infrastructure capacity is increased.

4 Infrastructure Assessment

The Study assessed the infrastructure capability and train operations requirements that will be necessary to support the business demand and forecast for rail freight through the Corridor. The main issues relate to:

- **Intermodal terminals -** The development of route options for the Corridor requires supporting infrastructure such as terminal facilities to ensure that potential benefits can be realised. In particular, the forecast increases in freight demand indicate that capacity constraints at existing terminal facilities will need to be addressed in the foreseeable future. The Study investigated the existing terminal infrastructure, the timing and location of future capacity constraints and the options being developed to address those constraints. The Study concluded that the existing intermodal terminals in the three capital cities and in particular in Sydney, are constrained by space limitations, preventing the terminals from providing for longer trains without loading inefficiencies.

  As the management of terminals, including operations and upgrading terminal capacity, is currently under the control of private train operators and freight forwarders, the provision of terminal infrastructure would need to be financed by the private sector and the costs of this infrastructure may be substantial. Available land and proper transport planning will be important to ensure that future increases in intermodal capacity necessary to support the development of the Corridor are achievable in the period 2009-2014;

- **Port operations** - The amount of import/export freight that can be carried by rail will depend on the efficiency of access to, and the capacity of rail transfer at the ports. Research indicates that the majority of freight arriving at the ports is distributed within the metropolitan areas of the capital cities and is not a significant issue for end to end freight movements in the Corridor. However, the linkages to the ports are important considerations for potential increases in regional freight that will benefit from improved rail services and rail access between the intermodal terminals and the ports need to be maintained at a high standard to ensure efficiency of freight operations at both the ports and the intermodal terminals. The Study investigated the rail facilities at each of the major port facilities in Melbourne, Sydney and Brisbane and the relevance to rail freight movements along the Corridor;

- **Road Connections -** The Study analysis suggests that there are no significant road/rail connections that would impact on the viability of rail freight movement along the Corridor, beyond already approved terminal and port related projects in Melbourne and Brisbane, aside from the need for additional and efficient intermodal capacity. In Sydney, connecting roadworks may be required, depending on the location of new or enhanced intermodal terminal facilities, to handle forecast increased demand;

- **Train operations -** the relative efficiency of train operations is largely driven by transit time, reliability and availability. Transit time can be defined as the overall time from the origin terminal to the destination terminal including pick-up and delivery (PUD) components. The end to end rail transit time is the component that can be improved through consideration of new route options and horizontal or vertical realignment of existing track. However, the actual transit time also includes additional delays from operational constraints imposed by single line track systems and associated safe working requirements. The existing curfew arrangements within Sydney impact on transit time but have a greater impact on reliability and availability. The Study determined that the key operational design considerations for the Study should include provision for 1,800 metre long trains and 30 tonne axle loads;

- **Committed rail infrastructure projects -** the state of the rail network at the base year is a key consideration in the comparison of alternate route options for the Study. The ARTC has commenced a major upgrade of the existing Coastal Route with a significant investment committed over the next three years. The 2009 base network adopted for the Study assumes that all current and committed programs will be complete by that date based on discussion with ARTC and publicly available information on the ARTC website. The Study identifies further improvements that are required to address remaining network deficiencies. The committed program of works relevant to the Study includes the $1.4 billion ARTC program of improvements to the existing Coastal Route, and additional $270 million Australian Government funding towards the concrete sleepering of the existing Melbourne-Sydney-Brisbane route and various planned works across the remainder of the network;

- **Major rail network constraints** - there are several major infrastructure constraints that impact on the ability of rail to provide an optimal service along the existing Coastal Route. The Study examined the major infrastructure constraints including those in northern Sydney, the Hawkesbury region including Cowan Bank and the Toowoomba Range. The Study concluded that each of these issues required a large investment to provide a suitable standard of infrastructure for a modern rail freight network. Major infrastructure solutions were included in the route options to assess the viability in comparison to other options;
- **Design criteria and costing approach** - Any new construction should be designed in accordance with appropriate design criteria to produce a network suitable for the nature and scale of freight activities anticipated. Similarly any existing track deficiencies will need to be addressed to ensure that the proposed network provides a complete and appropriate network. The Study adopted suitable design criteria generally based on standard industry practice and an approach for costing of each component based on relevant data sources to ensure a thorough and consistent approach across all route options.

5 Route Options Assessment

The Study Area comprises an elliptically-shaped area roughly defined by the standard gauge rail line along the New South Wales coast, and a broad arc from Melbourne, through central Victoria, (west of Shepparton) through western New South Wales to Toowoomba and Brisbane. This area embraces all sections of the existing rail network in Victoria, New South Wales and Queensland that currently form, or could potentially form part of a freight route between Melbourne and Brisbane.

For the purpose of analysing alternative route options for the entire Melbourne-Brisbane corridor, four broad route alignments or "Sub-Corridors" were developed to ensure that the Study considered the range of construction project options across the entire Study Area as follows:

- **Sub-Corridor A – Far Western Sub-Corridor** – this Sub-Corridor links Junee to Brisbane via Parkes, Dubbo and/or Narromine, Coonamble, Burren Junction, Narrabri and/or Moree, North Star, Goondiwindi, Warwick and/or Toowoomba;
- **Sub-Corridor B – Central Inland Sub-Corridor** – this Sub-Corridor links Junee to Brisbane via any inland route that includes the Werris Creek – Armidale-Tenterfield rail links;
- **Sub-Corridor C – Coastal Sub-Corridor** – This follows the existing Coastal Route between Junee and Brisbane; and
- **Sub-Corridor D – Hybrid Sub-Corridor** – This combines elements of the inland route options and the Coastal route, linking Junee to Brisbane via Muswellbrook and Maitland.

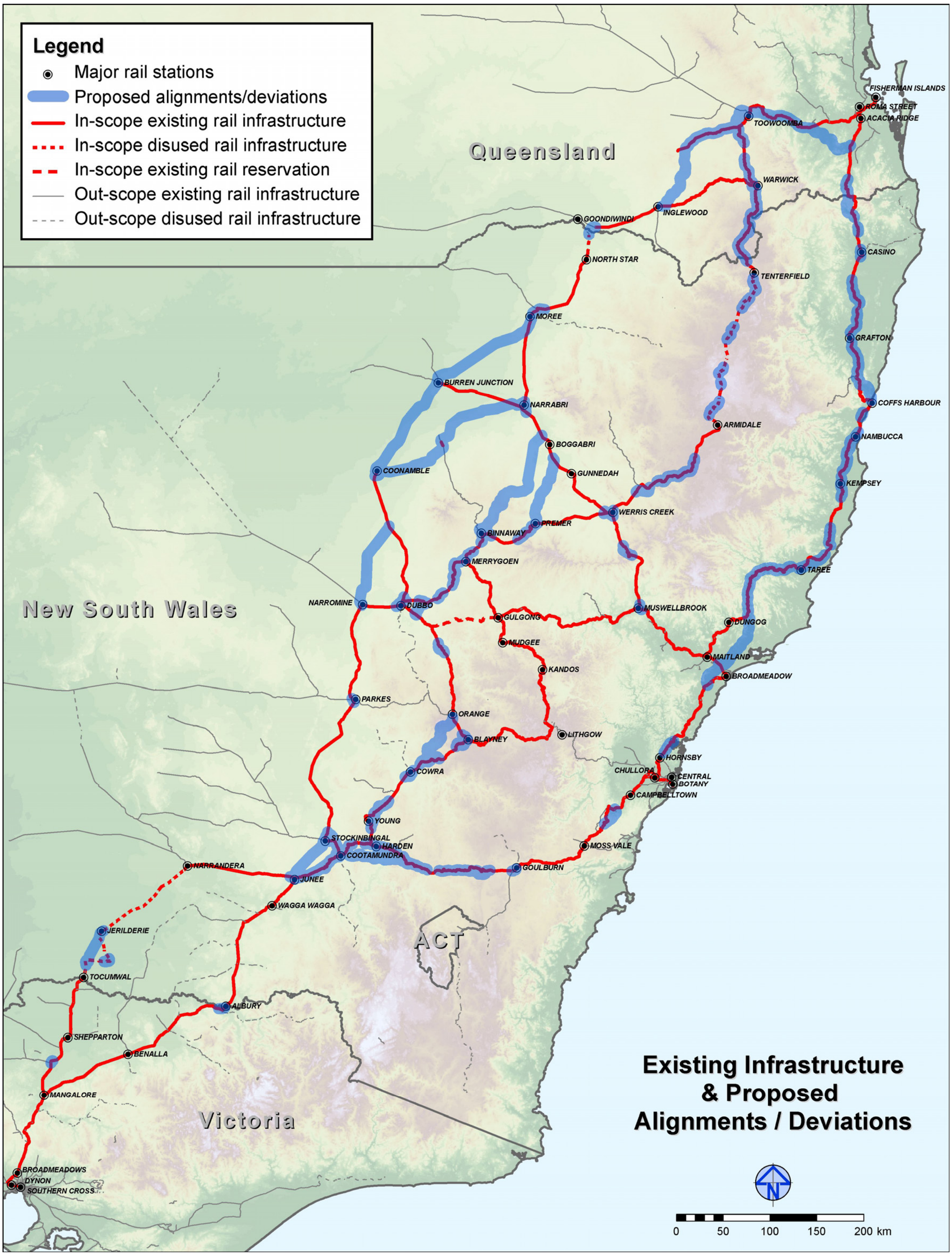
All potential new or upgraded route options along each Sub-Corridor have been analysed to determine the combination that produces the best outcome for that Sub-Corridor. The optimisation modelling process determines the optimal outcome (ie. project combination, demand level, and budget capital cost) for specific scenarios covering combinations of capital expenditure, freight demands, access prices and economic parameters.

Each of the Sub-Corridors has been combined with two alternative routes between Melbourne and Junee – via Shepparton or via Albury. In combination a total of eight distinct alternatives have been analysed and compared throughout the route selection process.

A similar approach has been adopted for the development and assessment of each of the four Sub-Corridors. This process ensures that all potential upgrade options were retained throughout the analysis process and that all inland regions of New South Wales and Victoria were provided with an optimised outcome that services that region. In addition, a common set of assumptions that represent the situation necessary to achieve a practical network has been applied to the assessment of each Sub-Corridor. In this way consideration of alternative new routes or upgrade options on existing routes were compared on an equivalent basis.

For each of the route segments identified through the above process, the CAD design software and topographic data from the Study GIS was used to design one or more alternative rail alignments. Figure 1 shows all the route options analysed through the optimisation process for the four Sub-Corridors. The concept designs for each of the route options were developed in accordance with the adopted design criteria to a level that enables the options to be assessed using the train operations model and to enable costing of the alternatives on a comparable basis.

Figure 1 - Route Options for the Corridor



Concept designs have been developed for each identified project along the Sub-Corridors in accordance with the infrastructure criteria to enable indicative costing of each option. To identify the projects with the biggest impact on transit time at least overall cost the Study Team determined the cost per minute in transit time saved for each project.

The methodology has been developed to provide a systematic and analytically rigorous approach to the task of selecting the "best" infrastructure solution for each Sub-Corridor subject to the set constraints and the optimisation criteria. The method does not attempt to find a single recommended route option for the Corridor, but rather, to find that combination of infrastructure that best provides for a market demand, operational or financial/economic objective for each of the eight different Sub-Corridors.

The route selection method (for each Sub-Corridor) involved an iterative procedure that includes:

- Development of a set of route options for each Sub-Corridor and an initial estimate of the transport price.
- The Rail Operations Model, from which travel time estimates were produced.
- The Operating Cost model produced the operating cost estimates used to prepare another estimate of the transport price given the above-track operating costs, the access price, and a margin corresponding to a commercial return.
- The Demand Model was used to iterate the price and demand equilibrium.
- When the demand-price equilibrium was achieved, the capital costs, operating and maintenance costs and the operator revenues were used to produce the equivalent present values, and economic indicators.
- The economic indicators provided further input to the optimisation procedure, which then selected another route option based on a search for the "best" option to achieve the target optimisation criteria.
- The process was repeated until the "optimal" combination of design standards for each route segment, across the entire route, was found.

Each of the Sub-Corridors is then assessed using three different scenarios:

- **Nominal capital cost of around $1.5 billion** representing the minimal capital spend required to achieve a route comparison across all four Sub-Corridors;
- **Nominal capital cost of around $3 billion** representing a targeted capital spend across all four Sub-corridors; and
- **Unconstrained nominal capital cost:** this scenario also represents the result that achieves the minimum transit time.

The results for each of the Sub-Corridors can be summarised as follows:

- **Far Western Sub-Corridor** – Only becomes a real option in terms of servicing the Melbourne-Brisbane rail corridor under the minimum transit time outcome at a capital cost of $3.1 - $3.6 billion generating negative NPVs;
- **Central Inland Sub-Corridor** – Not as effective in terms of reducing transit time and generating revenue as other sub-corridors, although total capital cost, at $8 - $8.5 billion is less than for the full Coastal upgrade. This option also generates negative NPVs;

- **Coastal Sub-Corridor** – At lowest capital cost spends, performs better than other sub-corridors given it is an extension of existing upgrading programs. However, to seriously improve transit times this requires major ($10.2 - $10.7 billion) investment and generates the worst NPVs, not surprisingly, as a consequence;
- **Hybrid Sub-Corridor** – Weakest transit time performance of the sub-corridors and also poor revenue result if high investment, of $6.3 - $6.8 billion, is undertaken. This option also generates negative NPVs.

5.1 Far Western Sub-Corridor

Feature	Description
Overview	The Far Western Sub-Corridor links Melbourne to Brisbane via Parkes, Dubbo and/or Narromine, Coonamble, Burren Junction, Narrabri and/or Moree, North Star, Goondiwindi, Warwick and/or Toowoomba. The Study team has identified 42 possible routes options through the Sub-Corridor. The total distance along the Sub-Corridor is between 1,657 km and 1,926 km depending upon the route adopted.
Market Demand	In addition to carrying Melbourne-Brisbane freight, the Far Western Sub-Corridor has the potential to derive additional revenue from Southern Queensland freight travelling to the western States and from Perth to the east coast. A rail freight line through the Far Western Sub-Corridor can also be expected to result in some diversion of the freight that moves between regional areas and ports. Specific freight diversions include: • approximately 27 per cent of grain freight from northern NSW is estimated to divert to the Port of Brisbane from Newcastle, easing congestion along the Hunter Valley Line; • a higher proportion of cotton from areas north of Narrabri, estimated at approximately 50% of containerised cotton shipments, is expected to be diverted to the Port of Brisbane from Port Botany; • if exploited in commercially viable quantities, coal from the Ashford area near Inverell could be expected to flow on the northern part of the inland route to the Port of Brisbane; • coal and grain exports from the area around and west of Toowoomba, including coal projections of the order of eight million tonnes per annum of coal from the Surat Basin would be expected to divert to a superior inland route; • up to 300,000 to 400,000 tonnes of the 750,000 tonnes of grain grown in southern NSW which is not well serviced by rail could won from road if the rail line linked Narrandera to Tocumwal; • up to 400,000 tones of rice grown in the Murrumbidgee Irrigation Area would potentially divert from Melbourne to Port Botany if the rail line linked Narrandera to Tocumwal as the rail journey would be shortened; • chilled meat from southern NSW which is almost exclusively moved by road would potentially divert to rail. The extent of the freight diversions will depend upon the willingness of Ports to accept additional freight, shipping patterns and relative access charges along the two routes. The results indicate that significant new freight growth is only likely for commodities that are suited to transport by rail that are not currently capable of being serviced by rail due to their geographic remoteness, such as grain and minerals.
Operating Efficiency	The Far Western Sub-Corridor provides the shortest transit distance from north to south at approximately 1,657 km to 1,926 km (depending on the specific route). The Sub-Corridor also avoids the impact of Sydney rail traffic congestion as it does not pass through the Sydney metropolitan area. The fastest possible transit time along the Sub-Corridor is 20.4 hours via Albury or 21.3 hours via Shepparton at a projected capital cost of $3.1 billion ($ nominal) and $3.6 billion ($ nominal) respectively. These transit times are below the threshold transit time of 27 hours that has been identified as the door to door delivery time from Melbourne to Brisbane necessary to promote effective competition with road, but are not sufficient to enable overnight transport of freight from Melbourne to Sydney. Many of the routes through the Sub-Corridor will support trains of greater than 1,800 metres in length as well as the double stacking of trains if routed via Shepparton. If the route is via Albury, double stacking will not be feasible south of Junee due to the number of bridges along the route and the Bunbury Street tunnel.

Feature	Description
Infrastructure Requirements	The corridor requires significant investment in new infrastructure. Depending on the route and capital spend constraint, key additional projects involve: • The Inglewood – Calvert route option incorporates the Gowrie – Grandchester route option. The Gowrie – Grandchester improvement would provide a direct connection from Gowrie, near Toowoomba, to Grandchester via a series of tunnels and viaducts bypassing low speed curves and steep grades associated with the Toowoomba Range (alignment provided by QR). A connection from the proposed alignment from Inglewood - Toowoomba Line via Milmerran would complete a direct alignment for the Far Western Sub-Corridor. • A significant amount of greenfield route construction that would involve considerable land acquisition and construction costs to establish a complete route. • The high cost of obtaining an acceptable route through the Toowoomba ranges is a major inhibitor to the Sub-Corridor. Modelling suggests that it is possible to achieve a transit time of less than 27 hours without the Toowoomba range rail deviation, albeit with a line subject to significant speed restrictions in key sections that will adversely influence its operational viability and competitiveness. • It has been assumed that radio based in-cab safeworking systems will be introduced by ARTC. The infrastructure improvements include the track detection systems required for safe operation of these systems.
Environmental Constraints	The Far Western Sub-Corridor is the least developed and has generally low amounts of major limitations. However, the potential impact on several individual limitations can cause cumulative impacts. Major limitations within the Far Western Sub-Corridor include threatened species and Commonwealth heritage items. Other limitations to consider are large areas of State Forests and Conservation Reserves, State heritage items, dryland salinity and contaminated sites. In addition, flood liable land has the potential to impact on the design of the route options. The alignment of the route options within the Far Western Sub-Corridor would be required to consider and avoid major limitations and large protected areas. The design should consider flood liable land, dryland salinity and potential impacts to heritage items along the existing rail lines. Extensive Environmental Impact Assessment would be required and would need to include contamination assessments and community consultation for principal towns.

5.2 Central Inland Sub-Corridor

Feature	Description
Overview	The Central Inland Sub-Corridor links Melbourne to Brisbane via any inland route that includes the Werris Creek – Armidale-Tenterfield rail links. The Study team has identified 65 possible route options through the Sub-Corridor. The total distance along the Sub-Corridor is between 1,774 km and 1,961 km depending upon the route adopted. Much of the track already meets the design criteria adopted for the Study however, to complete the Sub-Corridor there is a requirement to construct new rail track between Armidale and Tenterfield (Stanthorpe).
Market Demand	In addition to carrying Melbourne-Brisbane freight, a rail freight line through the Central Inland Sub-Corridor can be expected to result in some diversion of the freight that moves between regional areas and ports. Demand would be largely the same as for the Far Western Sub-Corridor, however there would be less diversion of grain and cotton in northern NSW, as the line would not go through those areas. As this Sub-Corridor provides an alternative to the existing Coastal Sub-Corridor, it is better suited to addressing future capacity constraints, avoiding rail congestion in the Sydney Metropolitan area.
Operating Efficiency	The Sub-Corridor is marginally longer than the Far Western Sub-Corridor but the distances are not significant. The route is substantially shorter than the Hybrid Route and of similar distance to the Coastal Route. The generally steeper grades along Sub-Corridor imply higher operating costs. The Sub-Corridor will support trains of 1,800 metres in length and double stacking if the route is via Shepparton. The fastest possible transit time along the Sub-Corridor is 23.1 hours via Albury or 24.2 hours via Shepparton at a projected capital cost of $7.96 billion ($ nominal) and $8.48 billion ($ nominal) respectively. These transit times are below the threshold transit time of 27 hours that has been identified as necessary to promote effective competition with road, but are not sufficient to enable overnight transport of freight from Melbourne to Sydney.
Infrastructure Requirements	Significant infrastructure investment will be required to achieve a transit time of 27 hours or less. Depending on the route and capital spend constraint, key infrastructure projects involve: • Junee – Stockinbingal (Bethungra Spiral). • A series of potential deviations on the existing alignment between Dubbo and Cambooya. Major deviations include Tamworth Bypass, Kootingal Deviation, Werris Creek turnout and Bolivia Deviation. • The Cambooya Bypass– Calvert route option incorporates the Gowrie – Grandchester route option. The Gowrie – Grandchester improvement would provide a direct connection from Gowrie, near Toowoomba, to Grandchester via a series of tunnels and viaducts bypassing low speed curves and steep grades associated with the Toowoomba Range (alignment provided by QR). A connection from the proposed Cambooya Bypass route option on the Toowoomba - Wallangarra Line would complete a direct alignment for the Central Inland Sub-Corridor.
Environmental Constraints	The Central Inland Sub-Corridor contains such major limitations as threatened species and Commonwealth heritage items. Railway infrastructure features in the listed heritage items. Other limitations include large areas of State Forests, Conservation Reserves and Wildlife Corridors. Furthermore complex river networks would require high numbers of crossings. The alignment of the route options within the Central Inland Sub-Corridor would be required to consider and avoid major limitations and large protected areas. The design should aim to minimise river crossings and potential impacts to heritage items along the existing rail lines. Extensive Environmental Impact Assessment would be required and would need to include community consultation for principal towns.

5.3 Coastal Sub-Corridor

Feature	Description
Overview	The Coastal Sub-Corridor follows adopts the route from Melbourne to Junee via either Shepparton or Albury and then adopts the existing Coastal Route between Junee and Brisbane. The Sub-Corridor option incorporates the program of works currently being undertaken by the ARTC that have been assumed to be completed by the commencement date of the forecasts in 2009. The Sub-Corridor is marginally longer than the Far Western and Central Inland Sub-Corridors at 1,740 km to 1,938 km depending on the route adopted between Melbourne and Junee but is significantly shorter than the Hybrid Sub-Corridor.
Market Demand	The market demand for the upgraded Coastal Route is the starting point for all options. The current ARTC upgrade program, by improving capacity and reliability, will lead to a substantial increase in demand, especially on the longer Melbourne-Brisbane sector. The increasing demand will eventually start to strain the new capacity gradually as shown by increasing delays. Deteriorating reliability would have a negative impact on demand; however operators consider that Sydney congestion problems are a more serious impediment. The capacity problem would occur later if there was an inland route that took some freight off the coastal route. As the coastal route already exists, regional impacts are confined to modal shift of some freight between intermediate points.
Operating Efficiency	The Coastal Sub-Corridor will not support trains of greater than 1.5 km in length between Sydney and Brisbane or double stacking due to the substantial number of bridges and tunnels along its length. The fastest possible transit time along the Sub-Corridor is 21.6 hours via Albury or 22.4 hours via Shepparton at a projected capital cost of $10.20 billion ($ nominal) or $10.71 billion ($ nominal) respectively. This addresses the Cowan Bank and Hunter proposals but not all of the delays caused by congestion in the northern Sydney Metropolitan area. While the Southern Sydney Freight Line will provide an independent freight route through southern Sydney, congestion caused by Sydney metropolitan services in northern Sydney and between Sydney and Newcastle is a more significant problem that would require significant tunnelling to overcome.
Infrastructure Requirements	Further infrastructure investment beyond the current ARTC program does not indicate substantial additional benefits in terms of either significantly reduced transit time or greater demand. The Study Team analysis suggests that the current problems associated with congestion north of Sydney can not be easily or cost effectively addressed.
Environmental Constraints	The Coastal Sub-Corridor is the most developed of all the Sub-Corridors and therefore has the highest amount of limitations. Major limitations include National Parks, a World Heritage Area, Commonwealth heritage items, significant wetlands and high density of threatened species. These major limitations would have a key influence on the alignment of the route options along the Coastal Sub-Corridor. Other limitations that would influence the Coastal Sub-Corridor are the high number of communities in the vicinity of the route options, State Forests, Conservation Reserves, State heritage items and the risk of dryland salinity and Acid Sulphate Soils. Given the density of limitations on the Coastal Sub-Corridor, route options would need to be restricted to minimise impact and cumulative effects on major environmental limitations. Where possible, the route options should minimise passing through protected areas to avoid fragmentation and to reduce biodiversity impacts. Community consultation would be a main focus of the planning studies, in addition to an extensive Environmental Impact Assessment for the route options.

5.4 Hybrid Sub-Corridor

Feature	Description
Overview	The Hybrid Sub-Corridor combines elements of the inland route options and the Coastal Route, linking Melbourne to Brisbane via Muswellbrook and Maitland. As the longest route, the Sub-Corridor has the highest number of improvement projects, combining the projects identified for the Coastal Sub-Corridor north of Maitland and the projects identified for the Far Western and Central Inland Sub-Corridors South of Werris Creek. In total, 79 possible route options have been identified through the Sub-Corridor. The total distance along the Sub-Corridor is between 1,974 km and 2,118 km depending upon the route adopted.
Market Demand	A key reason for including the Hybrid Sub-Corridor in the options considered by the Study Team is that it potentially avoids rail congestion in Sydney by bypassing the Sydney Metropolitan area. In avoiding Sydney, western NSW and southern Queensland, the Sub-Corridor does not capture freight to the same extent as either the Coastal or the Far Western Sub-Corridors. In addition, its comparatively longer distance, longer transit time and higher maintenance and operating costs make it less attractive compared to the other options. Accordingly, the market demand projected for the Hybrid Sub-Corridor is the lowest of all of the Sub-Corridors under each of the scenarios tested.
Operating Efficiency	The Hybrid Sub-Corridor provides the longest transit distance of at least 1.974 km (depending on the specific route selected). Operating costs are higher relative to the other options due to its longer distance. The fastest possible transit time along the Sub-Corridor is 25.6 hours via Albury or 26.4 hours via Shepparton at a projected capital cost of $6.32 billion ($ nominal) and $6.80 billion ($ nominal) respectively. These transit times are only marginally below the threshold transit time of 27 hours, which has been identified as necessary to promote effective competition with road from Melbourne to Brisbane. As the Hybrid Sub-Corridor incorporates many of the constraints identified for the Coastal Sub-Corridor, it will not support trains of greater than 1.5 km in length north of Sydney or double stacking due to the substantial number of bridges and tunnels along its length.
Infrastructure Requirements	The Sub-Corridor incorporates the current ARTC program of works for the Coastal Route north of Maitland and the Werris Creek to Maitland section of the existing track. The corridor requires significant investment in new infrastructure. Depending on the route and capital spend constraint, key additional projects involve a series of potential deviations on the existing alignment between Dubbo and Acacia Ridge. Major deviations include Werris Creek, Hexham, North Taree and Coopernook.
Environmental Constraints	The Hybrid Sub-Corridor has the potential to impact on threatened species and Commonwealth heritage items. In addition major limitations, there are Conservation Reserves, State heritage items and areas of dryland salinity. The alignment of the route options within the Hybrid Sub-Corridor would be required to consider and avoid major limitations and protected areas. The design should aim to minimise potential impacts to heritage items and dryland salinity. Extensive Environmental Impact Assessment would be required and would need to include community consultation for the main towns.

6 Environmental Assessment

The Study included an assessment of the key environmental issues and potential legislative considerations relevant to the assessment of the route options for the Corridor. The environmental review identified relevant International agreements, Commonwealth and State government legislation that will need to be addressed in any future planning process. It is apparent that due to the complexity of the legislative framework, a co-ordinated approach by governments will be required in the implementation of the route options. Similarly, there is a range of key environmental risks that may impact on the further development of the route options.

The Study provides an understanding of the key environmental issues associated with each of the specific route options.

The Study Team developed a comprehensive GIS database incorporating publicly available information relating to specific environmental issues, which were addressed under the following categories;

- Protection areas and heritage;
- Flora and fauna;
- Water;
- Noise;
- Soils and contamination; and
- Land use.

Where possible the identification of these issues has been used to refine the route options such that the risk of environmental issues affecting the options is minimised. Where the issues have not been able to be fully resolved or avoided in the route options design, mitigation measures have been identified to minimise the risks associated with the options.

Further detailed design of the route options would need to continue to give due consideration to environmental limitations and should seek to minimise risk to these key environmental issues, by implementing the identified mitigation measures. An extensive phase of project planning, community and stakeholder consultation and Environmental Impact Assessment processes would be required for all chosen route options. This would involve an iterative process to resolve the alignments and the detailed design of the final route options.

The incidence of Major Environmental Limitations within close (i.e. 5km) proximity of the optimised route for each of the Sub-Corridors is as follows:

- **Far Western Sub-Corridor** – 21 Major Environmental Limitations (1 Commonwealth Heritage item and 20 Threatened Species);
- **Central Inland Sub-Corridor** – 33 Major Environmental Limitations (1 National Park, 11 Commonwealth Heritage items and 21 Threatened Species);
- **Coastal Sub-Corridor** – 102 Major Environmental Limitations (5 National Parks, 2 Significant wetlands, 1 World Heritage Area, 10 Commonwealth Heritage items and 84 Threatened Species); and
- **Hybrid Sub-Corridor** – 4 Major Environmental Limitations (all Commonwealth Heritage items).

7 Financial and Economic Assessment

The Study concluded with a detailed analysis of the feasibility of the four rail Sub-Corridor Options identified in the ***Route Options Assessment***. These were based on the projected future rail freight demand on the upgraded route and the possible access price regimes that could be applied as determined in the ***Market Assessment*** and ***Demand Analysis***; the likely improvements in train availability and reliability; and the projected construction and maintenance costs determined in the ***Route Options Assessment*** and ***Infrastructure Assessment***.

The Financial and Economic Assessment was undertaken from three perspectives:

- **Government Budgetary Effect** - representing the net budgetary effect of the option if it were solely funded and operated by the Federal Government;
- **Wider Economic Cost/Benefit Position** - representing the net wider economic cost/benefit position taking into account broader social consideration, positive and negative externalities; and
- **Commercial Feasibility** - representing the commercial value of the option if it was funded and operated by the private sector.

Six key financial indicators were included:

- **Net Present Value Government Sponsorship (NPV)** - The NPV of the infrastructure upgrade cash flows assuming funding and ownership by the Federal Government;
- **Net Present Value Commercial Ownership** - The NPV of the infrastructure upgrade cash flows assuming funding and ownership by professional private sector infrastructure owners;
- **Net Present Value Cost/Benefit** - The NPV of the infrastructure upgrade project from a wider perspective. Project will be broadly assessed for any external social, economic and environmental costs/benefits;
- **Benefit/Cost Ratio** - Ratio of the NPV of Benefits to Costs under the wider evaluation;
- **Cash Payback Period** - The length of time in years before the project delivers a cash surplus. This provides an indication of the number of deficit budgetary cycles required before the project supports itself; and
- **Sum of Construction Costs** - This indicates the actual cash deficits required to be funded via budgetary transfers.

Sensitivity analysis was considered for the following:

- Risk and Scenario Analysis;
- Discount Rates and Consumer Price Index (CPI);
- Discount Rates and Real Interest Assumptions;
- Weighted Average Cost of Capital (WACC) Range; and
- Building Price Index.

The core results of the ***Financial and Economic Analysis*** are described in the following paragraphs and tables.

7.1 Summary of Results of the Financial and Economic Assessment

Eight route sub-corridor options were analysed, with revenue based on Coastal Sub-Corridor access real prices ($2.65 per '000 Gross Tonne Kilometre in 2009).

This rate was used given the risks involved in speculating around road/rail price relativities over the study period and is a realistic forecast based on current rail access fees to ensure rail maintains its competitive position. Over time there may be scope for increased rail access prices once significantly improved level of rail performance is demonstrated to the market

The Net Present Value (NPV) data for each route option case is illustrated below.

7.2 Far Western (Shepparton) Sub-Corridor - $M

Infrastructure Costs	Government	Private	Economic Cost/Benefit
Capital Cost $1.5 Billion*			
Construction	-1,414	-1,044	-1,170
Operating Cost	-942	-282	-420
Access Revenue	2,053	557	859
Externalities	0	0	639
Total	**-303**	**-769**	**-92**
Capital Cost $3 Billion*			
Construction	-1,892	-1,318	-1,509
Operating Cost	-841	-233	-359
Access Revenue	1,935	494	782
Externalities	0	0	588
Total	**-798**	**-1,057**	**-498**
Capital Cost Unconstrained			
Construction	-3,537	-2,261	-2,672
Operating Cost	-718	-176	-284
Access Revenue	1,770	407	674
Externalities	0	0	518
Total	**-2,485**	**-2,029**	**-1,764**

* Includes upgrade to standard gauge between Toowoomba and Brisbane but no tunnel between Gowrie and Grandchester

7.3 Far Western (Shepparton) Sub-Corridor

The NPV results demonstrate that this option is not financially attractive under any of the analysis views. The results degrade with the capital spending amount because of two factors:

- The greater the construction spend the longer the delay in generating significant revenue from the upgrade; and
- The relative inelasticity of the freight flows to marginal quality increases once the route is established.

$1.5 billion Capital Spend

Capital expenditure of $1.5 billion will not be sufficient to enable the construction of a Class 1 freight rail line. Major projects, including the Gowrie to Grandchester route option through the Toowoomba Ranges will not be possible within this budgetary constraint. This will result in a rail line that will be subject to significant speed restrictions in key sections that will adversely influence its operational viability. It will have a relatively poor linehaul transit time of 30.0 hours from Melbourne to Brisbane, higher in the reverse direction. When the pickup and delivery components are added this will result in an overall transit time that is not competitive with the road transport alternatives.

$3.0 billion Capital Spend

Capital expenditure of $3.0 billion will not be sufficient to enable the construction of a Class 1 freight rail line as at least $3.6 billion is required to complete construction of the route deviation through the Toowoomba ranges. As a result the capital spend on this Sub-Corridor is only $2.0 billion out of the allowable $3.0 billion budget producing a transit time of 27.1 hours, marginally competitive with road transport.

Unconstrained expenditure

Capital expenditure of around $3.6 billion will be required to achieve the fastest possible transit time possible across the Sub-Corridor (via Shepparton) of 21.3 hours. This level of capital expenditure is the lowest for the four Sub-Corridors via Shepparton and will result in the fastest transit time due to the shorter distance covered by the Far Western Sub-Corridor.

Revenue Impacts

The Far Western Sub-Corridor benefits from additional regional freight flows, with the Shepparton alternative gaining marginally more regional freight by virtue of the anticipated additional Southern NSW and Northern Victorian traffic. The Shepparton route options have a number of characteristics that offset its better financial result compared to options via Albury:

- Much of the Shepparton alternative requires new construction, while the Albury alternative is already established and operable as a Class 1 freight rail line;
- The Shepparton route options are generally along existing reservations but will still require reconstruction of formations and full track construction, together with associated environmental and planning approvals; and
- The need for construction of the Shepparton options leaves limited funding within the $1.5 billion budget to allow for additional options to be considered. The Albury alternative therefore has greater opportunity for improved transit time through new capital projects.

7.4 Far Western (Albury) Sub-Corridor - $M

Infrastructure Costs	Government	Private	Economic Cost/Benefit
Capital Cost $1.5 Billion			
Construction	-1,422	-990	-1,135
Operating Cost	-854	-237	-364
Access Revenue	1,987	507	803
Externalities	0	0	582
Total	**-289**	**-720**	**-114**
Capital Cost $3 Billion			
Construction	-2,878	-1,840	-2,174
Operating Cost	-750	-184	-297
Access Revenue	1,847	425	703
Externalities	0	0	528
Total	**-1,781**	**-1,598**	**-1,240**
Capital Cost Unconstrained			
Construction	-3,065	-1,959	-2,315
Operating Cost	-729	-178	-289
Access Revenue	1,811	417	689
Externalities	0	0	507
Total	**-1,983**	**-1,721**	**-1,408**

7.5 Far Western (Albury) Sub-Corridor

The NPV results demonstrate that this option is not financially attractive under any of the analysis views. The results degrade with the capital spending amount because of two factors:

- The greater the construction spend the longer the delay in generating significant revenue from the upgrade; and
- The relative inelasticity of the freight flows to marginal quality increases once the route is established.

$1.5 billion Capital Spend

As with the Shepparton option, capital expenditure of $1.5 billion will not be sufficient to enable the construction of a Class 1 freight rail line. Major projects, including the Gowrie to Grandchester route option through the Toowoomba Ranges will not be possible within this budgetary constraint. This will result in a rail line that will be subject to significant speed restrictions in key sections that will adversely influence its operational viability. It will have a linehaul transit time of 26.4 hours from Melbourne to Brisbane, higher in the reverse direction. When the pickup and delivery components are added this will result in an overall transit time that is marginally competitive with the road transport alternatives.

$3.0 billion Capital Spend

Capital expenditure of $3.0 billion is almost sufficient to enable the construction of a Class 1 freight rail line as around $3.1 billion is required to complete construction of the route deviation through the Toowoomba Ranges.

Unconstrained expenditure

Capital expenditure of around $3.1 billion will be required to achieve the fastest possible transit time possible across the Sub-Corridor (via Albury) of 20.6 hours. This level of capital expenditure is the lowest for the four Sub-Corridors via Albury and will result in the fastest transit time due to the shorter distance covered by the Far Western Sub-Corridor.

7.6 Central Inland (Shepparton) Sub-Corridor - $M

Infrastructure Costs	Government	Private	Economic Cost/Benefit
Capital Cost $1.5 Billion			
Construction	-1,423	-1,051	-1,178
Operating Cost	-889	-267	-397
Access Revenue	1,581	428	661
Externalities	0	0	620
Total	**-730**	**-889**	**-294**
Capital Cost $3 Billion			
Construction	-2,874	-1,945	-2,252
Operating Cost	-761	-201	-315
Access Revenue	1,492	365	589
Externalities	0	0	582
Total	**-2,144**	**-1,781**	**-1,396**
Capital Cost Unconstrained			
Construction	-7,738	-3,964	-5,055
Operating Cost	-521	-95	-174
Access Revenue	1,176	212	388
Externalities	0	0	429
Total	**-7,084**	**-3,847**	**-4,412**

7.7 Central Inland (Shepparton) Sub-Corridor

The NPV results demonstrate that this option is not financially attractive under any of the analysis views. The results degrade with the capital spending amount because of two factors:

- The greater the construction spend the longer the delay in generating significant revenue from the upgrade; and
- The relative inelasticity of the freight flows to marginal quality increases once the route is established.

$1.5 billion Capital Spend

Capital expenditure of $1.5 billion will not be sufficient to enable the construction of a Class 1 freight rail line. Major projects, including the Gowrie to Grandchester route option through the Toowoomba Ranges will not be possible within this budgetary constraint. This will result in a rail line that will be subject to significant speed restrictions in key sections that will adversely influence its operational viability. It will have a poor linehaul transit time of 31.9 hours from Melbourne to Brisbane, and 31.7 hours in the reverse direction. When the pickup and delivery components are added this will result in an overall transit time that is not competitive with the road transport alternatives.

$3.0 billion Capital Spend

Capital expenditure of $3.0 billion will not be sufficient to enable the construction of a Class 1 freight rail line. Expenditure of at least $5.0 billion is required to complete construction of the route deviation through the Toowoomba Range. It will have a linehaul transit time of 28.8 hours from Melbourne to Brisbane, and 28.6 hours in the reverse direction, providing an outcome that at best is likely to be only marginally competitive with road.

Unconstrained expenditure

Capital expenditure of around $8.5 billion will be required to achieve the fastest possible transit time across the Sub-Corridor (via Shepparton) of 24.5 hours. This is the third fastest Shepparton outcome behind the Far Western and the Coastal Sub-Corridors.

Revenue Impacts

The Central Inland Sub-Corridor options benefit from additional regional freight flows, with the Shepparton alternative gaining marginally more regional freight by virtue of the anticipated additional Southern NSW and Northern Victorian traffic. As with the Far Western Sub-Corridor, the Shepparton route options have a number of characteristics that offset its better financial result compared to options via Albury:

- Much of the Shepparton alternative requires new construction, while the Albury alternative is already established and operable as a Class 1 freight rail line;
- The Shepparton route options are generally along existing reservations but will still require reconstruction of formations and full track construction, together with associated environmental and planning approvals; and
- The need for construction of the Shepparton options leaves limited funding within the $1.5 billion budget to allow for additional options to be considered. The Albury alternative therefore has greater opportunity for improved transit time through new capital projects.

7.8 Central Inland (Albury) Sub-Corridor - $M

Infrastructure Costs	Government	Private	Economic Cost/Benefit
Capital Cost $1.5 Billion			
Construction	-1,433	-998	-1,143
Operating Cost	-814	-226	-347
Access Revenue	1,572	401	636
Externalities	0	0	597
Total	**-675**	**-823**	**-258**
Capital Cost $3 Billion			
Construction	-2,876	-1,946	-2,253
Operating Cost	-767	-202	-318
Access Revenue	1,530	374	604
Externalities	0	0	577
Total	**-2,113**	**-1,774**	**-1,389**
Capital Cost Unconstrained			
Construction	-7,333	-3,839	-4,861
Operating Cost	-541	-101	-182
Access Revenue	1,216	222	405
Externalities	0	0	428
Total	**-6,658**	**-3,718**	**-4,210**

7.9 Central Inland (Albury) Sub-Corridor

The NPV results demonstrate that this option is not financially attractive under any of the analysis views. The results degrade with the capital spending amount because of two factors:

- The greater the construction spend the longer the delay in generating significant revenue from the upgrade; and
- The relative inelasticity of the freight flows to marginal quality increases once the route is established.

$1.5 billion Capital Spend

As with the Shepparton option, capital expenditure of $1.5 billion will not be sufficient to enable the construction of a Class 1 freight rail line. Major projects, including the Gowrie to Grandchester route option through the Toowoomba Ranges will not be possible within this budgetary constraint. This will result in a rail line that will be subject to significant speed restrictions in key sections that will adversely influence its operational viability. It will have a linehaul transit time of 28.6 hours from Melbourne to Brisbane, and 28.1 hours in the reverse direction. When the pickup and delivery components are added this will result in an overall transit time that is barely competitive with the road transport alternatives.

$3.0 billion Capital Spend

Capital expenditure of $3.0 billion will not be sufficient to enable the construction of a Class 1 freight rail line as at least $3.5 billion is required to complete construction of the route deviation through the Toowoomba ranges. As a result the capital spend on this Sub-Corridor of $3.0 billion produces a transit time of 27.8 hours only marginally better than the $1.5 billion spend.

Unconstrained expenditure

Capital expenditure of around $8.0 billion will be required to achieve the fastest possible transit time across the Sub-Corridor (via Albury) of 23.7 hours. This is the third fastest Albury outcome behind the Far Western and the Coastal Sub-Corridors.

7.10 Coastal (Shepparton) Sub-Corridor - $M

Infrastructure Costs	Government	Private	Economic Cost/Benefit
Capital Cost $1.5 Billion			
Construction	-1,435	-999	-1,145
Operating Cost	-812	-241	-361
Access Revenue	1,277	344	532
Externalities	0	0	693
Total	**-970**	**-896**	**-280**
Capital Cost $3 Billion			
Construction	-2,875	-1,946	-2,252
Operating Cost	-778	-226	-341
Access Revenue	1,296	343	534
Externalities	0	0	677
Total	**-2,358**	**-1,829**	**-1,382**
Capital Cost Unconstrained			
Construction	-9,264	-4,294	-5,653
Operating Cost	-489	-110	-182
Access Revenue	1,095	242	404
Externalities	0	0	510
Total	**-8,658**	**-4,161**	**-4,920**

7.11 Coastal (Shepparton) Sub-Corridor

The NPV results demonstrate that this option is not financially attractive under any of the analysis views. The results degrade with the capital spending amount because of two factors:

- The greater the construction spend the longer the delay in generating significant revenue from the upgrade; and
- The relative inelasticity of the freight flows to marginal quality increases once the route is established.

$1.5 billion Capital Spend

Capital expenditure of $1.5 billion will only marginally enhance the operation of the existing coastal route, adding to the value of the current ARTC investment and providing a more efficient Class 1 freight rail line. It will have a linehaul transit time of 27.0 hours from Melbourne to Brisbane, and 27.4 hours in the reverse direction. When the pickup and delivery components are added this will result in an overall transit time that is only marginally competitive with the road transport alternatives.

$3.0 billion Capital Spend

Capital expenditure of $2.4 billion will produce a linehaul transit time of 26.5 hours from Melbourne to Brisbane, and 26.8 hours in the reverse direction, again providing an outcome that is more competitive with road, but not significantly better than the $1.5 billion capital spend.

Unconstrained expenditure

Capital expenditure of around $10.7billion will be required to achieve the fastest transit time possible across the Sub-Corridor (via Shepparton) of 22.4 hours. This is the second fastest Shepparton outcome behind the Far Western Sub-Corridor.

Revenue Impacts

The Coastal Sub-Corridor options do not benefit from the regional freight flows in the same way as the Far Western, Central Inland and Hybrid Sub-Corridors. However, the Shepparton route options have a number of characteristics that offset its better financial result compared to options via Albury:

- Much of the Shepparton alternative requires new construction, while the Albury alternative is already established and operable as a Class 1 freight rail line;
- The Shepparton route options are generally along existing reservations but will still require reconstruction of formations and full track construction, together with associated environmental and planning approvals; and
- The need for construction of the Shepparton options leaves limited funding within the $1.5 billion budget to allow for additional options to be considered. The Albury alternative therefore has greater opportunity for improved transit time through new capital projects.

7.12 Coastal (Albury) Sub-Corridor - $M

Infrastructure Costs	Government	Private	Economic Cost/Benefit
Capital Cost $1.5 Billion			
Construction	-1,435	-1,000	-1,145
Operating Cost	-881	-260	-389
Access Revenue	1,445	387	600
Externalities	0	0	683
Total	**-872**	**-873**	**-251**
Capital Cost $3 Billion			
Construction	-2,870	-1,942	-2,248
Operating Cost	-845	-244	-368
Access Revenue	1,482	389	608
Externalities	0	0	666
Total	**-2,233**	**-1,797**	**-1,342**
Capital Cost Unconstrained			
Construction	-8,924	-4,215	-5,517
Operating Cost	-562	-128	-211
Access Revenue	1,318	293	488
Externalities	0	0	510
Total	**-8,167**	**-4,050**	**-4,729**

7.13 Coastal (Albury) Sub-Corridor

The NPV results demonstrate that this option is not financially attractive under any of the analysis views. The results degrade with the capital spending amount because of two factors:

- The greater the construction spend the longer the delay in generating significant revenue from the upgrade; and
- The relative inelasticity of the freight flows to marginal quality increases once the route is established.

$1.5 billion Capital Spend

As with the Shepparton option, capital expenditure of $1.5 billion will further enhance the existing Class 1 freight rail line along the coastal route. It will have a linehaul transit time of 26.0 hours from Melbourne to Brisbane, and the same in the reverse direction. When the pickup and delivery components are added this will result in an overall transit time that is marginally competitive with the road transport alternatives.

$3.0 billion Capital Spend

Capital expenditure of $3.0 billion will produce a linehaul transit time of 25.5 hours each way making the route more competitive with road.

Unconstrained expenditure

Capital expenditure of around $10.2 billion will be required to achieve the fastest possible transit time across the Sub-Corridor (via Albury) of 21.6 hours. This is the second fastest Albury outcome behind the Far Western Sub-Corridor.

Interpretation of Coastal Sub-Corridor results

In interpreting the results from a wider national perspective rather than a specific project perspective, an adjustment is needed to allow for the negative impact on the Coastal Sub-Corridor of diverting freight (to an inland Sub-Corridor) that the coastal Sub-Corridor is capable of carrying (assuming that the capital spend substantially eases the congestion problems north of Sydney). With some of the infrastructure costs being fixed in nature, the diversion of revenue would make the Coastal Sub-Corridor less profitable than it would have been otherwise. A broad estimate of this effect is that an inland route makes the NPV of a coastal route worse in the order of $55 million (economic cost-benefit perspective) or $125m (government perspective)

7.14 Hybrid (Shepparton) Sub-Corridor - $M

Infrastructure Costs	Government	Private	Economic Cost/Benefit
Capital Cost $1.5 Billion			
Construction	-1,433	-998	-1,143
Operating Cost	-850	-237	-363
Access Revenue	1,310	333	528
Externalities	0	0	665
Total	**-973**	**-901**	**-313**
Capital Cost $3 Billion			
Construction	-2,870	-1,942	-2,248
Operating Cost	-778	-206	-323
Access Revenue	1,272	311	501
Externalities	0	0	644
Total	**-2,377**	**-1,838**	**-1,426**
Capital Cost Unconstrained			
Construction	-6,387	-3,499	-4,363
Operating Cost	-566	-113	-199
Access Revenue	1,066	206	367
Externalities	0	0	513
Total	**-5,887**	**-3,406**	**-3,682**

7.15 Hybrid (Shepparton) Sub-Corridor

The NPV results demonstrate that this option is not financially attractive under any of the analysis views. The results degrade with the capital spending amount because of two factors:

- The greater the construction spend the longer the delay in generating significant revenue from the upgrade; and
- The relative inelasticity of the freight flows to marginal quality increases once the route is established.

$1.5 billion Capital Spend

Capital expenditure of $1.5 billion will improve the inland components of the Hybrid Sub-Corridor and further enhance the north coast line to Brisbane as a Class 1 freight rail line. It will have a linehaul transit time of 30.2 hours from Melbourne to Brisbane, and 30.5 hours in the reverse direction due to the longer travel distance compared to the other Sub-Corridors. When the pickup and delivery components are added this will result in an overall transit time that is not competitive with the road transport alternatives.

$3.0 billion Capital Spend

Capital expenditure of $3.0 billion will produce a linehaul transit time of 28.4 hours from Melbourne to Brisbane, and 28.7 hours in the reverse direction, again providing an outcome that is not competitive with road.

Unconstrained expenditure

Capital expenditure of around $6.8 billion will be required to achieve the fastest possible transit time across the Sub-Corridor (via Shepparton) of 26.4 hours. This is the slowest of the Shepparton outcomes.

Revenue Impacts

The Hybrid Sub-Corridor options benefit from additional regional freight flows, with the Shepparton alternative gaining marginally more regional freight by virtue of the anticipated additional Southern NSW and Northern Victorian traffic. However, it will not achieve the same outcomes as the Far Western and the Central Inland Sub-Corridors for the northern New South Wales regions. As with the Far Western Sub-Corridor, the Shepparton route options have a number of characteristics that offset its better financial result compared to options via Albury:

- Much of the Shepparton alternative requires new construction, while the Albury alternative is already established and operable as a Class 1 freight rail line;
- The Shepparton route options are generally along existing reservations but will still require reconstruction of formations and full track construction, together with associated environmental and planning approvals; and
- The need for construction of the Shepparton options leaves limited funding within the $1.5 billion budget to allow for additional options to be considered. The Albury alternative therefore has greater opportunity for improved transit time through new capital projects.

7.16 Hybrid (Albury) Sub-Corridor - $M

Infrastructure Costs	Government	Private	Economic Cost/Benefit
Capital Cost $1.5 Billion			
Construction	-1,426	-993	-1,138
Operating Cost	-843	-234	-360
Access Revenue	1,420	360	572
Externalities	0	0	666
Total	**-850**	**-867**	**-260**
Capital Cost $3 Billion			
Construction	-2,878	-1,947	-2,254
Operating Cost	-781	-206	-324
Access Revenue	1,374	334	540
Externalities	0	0	640
Total	**-2,285**	**-1,819**	**-1,398**
Capital Cost Unconstrained			
Construction	-5,981	-3,355	-4,150
Operating Cost	-600	-126	-216
Access Revenue	1,188	239	418
Externalities	0	0	529
Total	**-5,393**	**-3,242**	**-3,419**

7.17 Hybrid (Albury) Sub-Corridor

The NPV results demonstrate that this option is not financially attractive under any of the analysis views. The results degrade with the capital spending amount because of two factors:

- The greater the construction spend the longer the delay in generating significant revenue from the upgrade; and
- The relative inelasticity of the freight flows to marginal quality increases once the route is established.

$1.5 billion Capital Spend

As with the Shepparton option, capital expenditure of $1.5 billion will improve the inland components of the Hybrid Sub-Corridor and further enhance the north coast line to Brisbane as a Class 1 freight rail line. It will have a linehaul transit time of 28.7 hours from Melbourne to Brisbane, and the same in the reverse direction. When the pickup and delivery components are added this will result in an overall transit time that is not competitive with the road transport alternatives.

$3.0 billion Capital Spend

Capital expenditure of $3.0 billion will produce a linehaul transit time of 27.4 hours each way that will still not produce a route that is competitive with road.

Unconstrained expenditure

Capital expenditure of around $6.3 billion will be required to achieve the fastest possible transit time across the Sub-Corridor (via Albury) of 25.7 hours. This is the slowest of the Albury outcomes.

Interpretation of Hybrid Sub-Corridor results

In practice the results would be worse than those shown to the extent that North-South trains added to congestion in the heavily used Hunter Valley area, especially as North-South trains pay lower access charges than coal trains.

8 Data Collection and Stakeholder Consultation

The Study included extensive data collection and liaison with key stakeholders. The Study Team collected and considered a large volume of relevant information and data from a wide range of organisations and interested parties and obtained access to previous studies and analysis.

The Study Team has collated data relating to:

- Relevant existing background reports and information from the Department of Transport and Regional Services (DOTARS) and other sources;
- Rail and road freight data and passenger data, and other relevant information (in particular, the reasons for choice of mode) from industry sources;
- Spatial data relating to existing transport infrastructure, environmental issues and other contextual information,
- Other rail freight related data on intermodal terminals, ports, train operations, and infrastructure design parameters and associated costs; and

The high level of co-operation by industry, including existing and potential rail customers and operators, freight forwarders and port operators, as well as government agencies has enabled the Study Team to compile a comprehensive view of industry perspectives backed by relevant data.

The Study Team has also received written and oral advice from a number of key stakeholder groups including;

- Australian Government, State Governments, rail industry representatives, freight forwarders and other rail customers (current and potential), potential rail providers, major freight clients, regional stakeholders / local councils, Area Consultative Committees (ACCs) and other interested parties; and
- Conducted a review and assessment of submissions received from interested parties.

These meetings enabled discussion and validation of data and information elements, assumptions, methodologies adopted for analysing the data and conclusions reached, highlighting of issues and focus points and provision of feedback, comments and information.

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