Final Report

A study of the potential for dedicated freight infrastructure in Australia

Department of Infrastructure and Regional Development

October 2014 Update

Building a better working world

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2 October 2014

Private and confidential

Re: An investigation of the potential for dedicated freight infrastructure

Dear Mark

I am pleased to provide you with our final report on our study of the potential for dedicated and priority freight infrastructure in Australia.

This report consolidates the results of our investigations that were commenced in February 2012 as part of Stage One of the study, and largely completed in Stage Two by the middle of that year. Since that time, and due to the nature of the study and the need to engage with and obtain data from state infrastructure agencies, we have been undertaking a process of gradually refining and updating our analysis so that this report could be finalised.

Purpose of our report and restrictions on its use

The Department of Infrastructure and Regional Development (formerly the Department of Infrastructure and Transport) engaged Ernst & Young (EY) to undertake an investigation of the potential for dedicated freight infrastructure in serving Australia's container ports. This accompanying final report ("the Report") provides an overview of the analysis completed by EY.

The Report may be relied upon by the Department of Infrastructure and Regional Development for the purpose of assessing the case for dedicated freight infrastructure in Australia. EY disclaims all liability to any party other than the Department of Infrastructure and Regional Development for all costs, loss, damage and liability that the third party may suffer or incur arising from or relating to or in any way connected with the provision of the deliverables to a third party without our prior written consent. Where the Report is distributed to outside parties, EY does not accept any liability for reliance on the report's findings. If others choose to rely on the Report in any way they do so entirely at their own risk.

Scope of our work

All assumptions developed by EY have been discussed in the Report. We have not independently verified, and we do not accept any responsibility or liability for independently verifying, any such information. We do not make any representation as to the accuracy or completeness of the information provided by the Department of Infrastructure and Regional Development and other project stakeholders. We accept no liability for any loss or damage, which may result from your reliance on any research, analyses or information so supplied.

Summary of our work

Our work has found:

- Unlocking of productivity gains in landside transport networks is vital to the competitiveness of the national economy. The inefficiencies hindering productivity in Australia's ports and freight networks are varied – so are the solutions.
- The challenges facing each of Australia's container ports are unique. Each port has varying levels of capacity, congestion, growth in the freight task and long term planning issues, coupled with unique landside transport links and governance arrangements.
- Examples of good dedicated or priority freight infrastructure are beginning to emerge in Australia in line with experience overseas. This includes examples for the movement of bulk freight in particular, with examples for containerised freight including links such as those serving Port Botany through the intermodal terminals at Enfield and Chullora. These examples demonstrate the ability to alleviate congestion and enhance freight efficiency for major container ports, although many of the dedicated freight lines that currently exist still involve conflicts with urban passenger rail networks.
- There are different reasons under which this type of infrastructure may be justified. Each proposal for dedicated or priority freight infrastructure must be considered on a case-by-case basis.
- There are emerging proposals for dedicated or priority freight infrastructure in Australia, at varying stages of development.
- We have undertaken two detailed case studies of conceptual projects for dedicated freight infrastructure serving the major container ports in Melbourne and Brisbane. In both of these examples, many of the demand-side and supply-side preconditions for considering the case for investing in dedicated freight infrastructure appear to be in place. However, the infrastructure solutions that were brought forward for consideration in this study contained certain limitations that would undermine their provision as dedicated or priority freight links. In this regard, the case studies provide valuable lessons on the challenges for such infrastructure in serving Australia's container ports on an economically and commercially feasible basis.
    - The Melbourne case study considered proposals for a new link between the Port and the West Gate Freeway, which would run through a heavily congested part of the road network in the inner west of the city. While the new link would be expected to provide a range of transport benefits for freight operators and other road users, there are a number of factors that would limit the scope to provide it on a commercially sustainable basis, and any moves to restrict access to non-freight vehicles would erode much of the economic benefits of the project.
    - As a contrast, the Brisbane case study considered a proposal for a dedicated heavy rail freight line from the Surat Basin to the Port of Brisbane, which would provide the potential for freight movements to avoid major arterials that are becoming increasingly congested and separate freight and passenger train paths on the busy Citytrain network. However, in this case, given the scale and complexity of the railway construction task, the estimated economic benefits of the project were significantly outweighed by the upfront capital costs. In this context it is not surprising that opportunities for cost recovery from commercial freight users would be limited, and the Port of Brisbane has advised that they have been refining the project in consultation with key stakeholders in the development of its submission. The stated aim of the Port is to identify a sustainable and balanced transport solution that, following the completion of a pre-feasibility study that is currently underway, will demonstrate the commercial, social and environmental viability of dedicated rail from the Surat Basin to the Port of Brisbane.
- While these case studies do not demonstrate the case for dedicated or priority freight infrastructure, there may be good opportunities for such investments in Australia in the

near future. What we have learned is that in cases where the principles of demand suggest there could be a good case for investment, it is important that solutions are discovered that are properly focussed on the objectives for container freight efficiency, and can be provided in a well-designed and cost effective fashion.

We have greatly enjoyed the opportunity of working with you on this engagement. We will watch with interest as the Australian container freight sector responds to its future growth and infrastructure challenges, and we will continue to work with the industry in developing solutions that target the unique situation facing our container ports.

Yours sincerely

John Matthews
Partner

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Executive summary

Promoting freight productivity is vital to the nation's economic performance

Australia is heavily reliant on efficient ports, freight networks and supply chains to provide competitive links and international gateways for international trade. It is estimated that the transport and logistics sectors of the Australian economy contribute 14.5 % of GDP, with Australia's supply chain worth an estimated $150 billion every year.

The total container trade at Australia's ports is expected to grow from around 6 million TEU in 2010 to more than 20 million TEU by 2030. Container imports at Australia's metropolitan ports are expected to double in size every ten years placing substantial pressure on landside transport networks.

Despite their national significance, Australia's ports and landside transport networks face several challenges from growth in the freight task, most notably rising congestion levels and urban encroachment.

These constraints hinder the productivity of Australia's freight networks and impose economic, social and environmental costs to industries and communities. Congestion alone represents a drag on the national economy and without action, could cost up to $20 billion by 2020.[1]

Dedicated and priority freight infrastructure is one approach that can be used to un-lock productivity gains and address congestion and capacity constraints

While different ports face different challenges, many of their issues stem from a common problem: much of the infrastructure used by the freight sector is shared, and conflicts around access and use are not efficiently managed or addressed. For example, freight transporters compete with both passenger vehicles on roads and passenger trains on rail. This gives rise to 'conflicts' in the provision and use of infrastructure by parties with competing interests and demands.

The introduction of dedicated and priority freight infrastructure could transform port and landside logistics by separating freight traffic from other forms of traffic and thereby provide an efficient purpose-built means of transporting freight.

At a state level, there has been a raft of policy activity targeting improved efficiency for Australia's ports. At a national level, the Ports Strategy published by Infrastructure Australia and the National Transport Commission was the first genuinely national approach to infrastructure planning. The ports strategy made several recommendations including that the 'Bureau of Infrastructure Transport and Regional Economies (BITRE) assess the conditions under which the introduction of dedicated freight land transport infrastructure would be justified'.

The objective of this study is to provide a practical and evidence based assessment of the conditions that would support the development of dedicated and priority freight infrastructure in Australia, and assist BITRE in responding to the Ports Strategy recommendation.

This study consisted of two stages. The first stage involved a scoping study aimed at developing a broad understanding of the conditions that may justify this type of infrastructure and identifying potential case studies for dedicated or priority freight infrastructure. The second stage (considered selected case studies in more detail by conducting a rapid cost benefit anlaysis, financial analysis and commercial assessment.

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[1] BITRE, Estimating urban traffic and congestion cost trends for Australian cities, 2007

Scoping Study Findings (April 2012)

The Scoping Study, which was completed in April 2012, defined the issues that drive considerations of dedicated freight infrastructure proposals to improve the efficiency of port related freight movements across infrastructure networks, minimise negative externalities associated with freight movements and influence freight policy development. The Scoping Study examined international examples and their emerging application in the Australian context, with a key output being the analysis of a set of potential case studies for more detailed examination in the second stage of this Study.

The Scoping Study found:

There are many examples of this type of infrastructure in Australia and overseas. These vary in terms of their purpose and effectiveness, and highlight the need for each proposal to be considered on a case by case basis

In Australia, dedicated freight infrastructure has been used to transport bulk freight such as coal and iron ore from mines to ports. These systems carry large volumes of homogenous products and are typically built in isolation and not widely integrated with wider freight networks. Most of the dedicated and priority freight infrastructure servicing Australia's mining sector is self-funded or funded by private investment.

Dedicated freight rail also services several of Australia's major container ports including Port Botany, Port of Brisbane and Fremantle Port. For example, at Port Botany, there are segments of dedicated rail links from the port to intermodal terminals and Enfield and Chullora. However, these rail links also share transport corridors with passenger rail that has priority on the network. This creates 'conflicts' between competing users of the transport corridor, even if segments of the tracks are dedicated to one use or the other.

There are several interesting international examples of dedicated and priority freight infrastructure. A freight tunnel connecting Port Dublin to a major motorway has alleviated freight congestion by removing more than 8,000 trucks per day from the Dublin city centre. The tunnel gives priority access to freight by tolling all vehicles under a certain weight. A cost benefit analysis of the tunnel identified a range of benefits including time savings, fewer accidents and reduced accidents costs, and concluded that the net present value of the study was €54.4 million.

The Alameda corridor is a USD 2.4 billion twenty mile long railway dedicated to transporting freight between the United States busiest container ports and the transcontinental rail line. This effectively reduced transportation time from two hours to 45 minutes and eliminated conflicts at 200 rail crossings.

There is a range of factors that influence the viability of dedicated and priority freight infrastructure

Each port has a complex mix of interactions between several key parameters including congestion levels, port capacity, trade task, transport links, prices and regulatory and governance frameworks. Each type of dedicated and priorty freight infrastructure is associated with a unique stream of costs and benefts. These factors combined mean that it is not possible to develop a standardised equation or congestion threshold for considering dedicated and priority freight infrastructure. Rather, each port and infrastructure proposal must be considered on a case by case basis.

There are however, a range of underlying factors that affect the viability of dedicated and prority freight infrastructure. These include a mix of supply and demand market factors.

Table E.1: Factors of Demand and Supply

Factors of Demand	Factors of Supply
Conflicts between users The freight task and volumes Congestion Land use planning Amenity concerns Poor freight access Safety concerns Willingness to pay	Capacity Cost effectiveness Form of infrastructure (i.e road, rail)

As the drivers of supply and demand for dedicated and priority use infrastructure change over time, so does the viability of such infrastructure. Therefore, it is vital to take a long term and dynamic view of all the factors affecting supply and demand for freight infrastructure to adequately plan for the future transport task.

The challenges at Australia's major container ports vary from port to port – so do the solutions

We have examined each of Australia's major container ports on a case by case basis with reference to the current and forecast freight task, capacity constraints, rail and road access, governance arrangements and pricing approaches for access and use of infrastructure. We found that several ports face capacity constraints, high congestion levels, and growing pressure on landside transport networks to handle the rising freight task. The scale and range of the problems facing each port varies depending on the unique characteristics of their surrounding infrastructure network and connecting supply chains.

There is patchwork of policy activity underway by state governments aimed at enhancing freight efficiency. These include large scale capital investment in new infrastructure such as the Gateway Motorway in Brisbane, upgrades to existing infrastructure such as the M5 West widening project in Sydney and importantly, reform and regulation to improve access and use of existing infrastructure such as the Port Botany Landside Improvement Strategy.

There are several emerging proposals for dedicated or priority freight infrastructure in Australia and we have identified two for further consideration as case study examples

Our conversations with stakeholders and research on Australia's major container ports revealed several emerging proposals for dedicated or priority freight infrastructure, at varying stages of development – ranging from being in the planning stage to being more greenfield suggestions.

In selecting the case studies, we assessed each of the proposals against the factors of demand and supply for dedicated and priority freight infrastructure to develop a short list of potential case studies. Secondly, we considered a range of practical realities such as the availability of data to undertake a cost benefit analysis, the need to ensure a range were selected for road and rail and importantly, the ability for the study to deliver meaningful information on dedicated and priority freight infrastructure.

In doing this, we identified two case studies for more detailed investigation and a rapid cost benefit analysis in stage two. The first case study presented is for Melbourne and focuses on a concept project to provide a new road link between the Port of Melbourne (PoM) precinct and the West Gate Freeway. The second case study is for Brisbane and focuses on a concept project to provide a new rail link between the Port of Brisbane and the Surat Basin to the south west of the city.

Case Study Findings (2012-2014)

EY consulted with VicRoads and Port of Brisbane Pty Ltd to obtain and analyse data in the development of the detailed case studies. While they are linked to past project and other sources of actual data, the projects analysed are purely conceptual in order to explore issues in providing dedicated freight infrastructure between each port and their user catchments. While we have drawn on the results of previous work undertaken in developing the projects, for example by VicRoads and the Victorian State Government in particular, we wish to stress that the concept projects do not constitute State Government or defined Port projects.

Due to the nature of this exercise, the depth of data required and the need to engage with and obtain data from state infrastructure agencies and stakeholders, we have been undertaking a process of gradually refining and updating the analysis in order to finalise the case studies for this report. There have been significant changes in government policies and infrastructure development over the period during which these case studies were finalised. However, the findings of the case study provide valuable insights into the issues and challenges for dedicated freight infrastructure in serving our larger container ports that sit close to or within highly congestion urban areas.

The case studies found:

The new link in the Melbourne case study would be expected to provide a range of benefits for freight operators and other road users. However, there are a number of factors that would limit the scope to provide it on a commercially sustainable basis, and any moves to restrict access to non-freight vehicles would erode much of the economic benefits of the project.

Road links between the Port of Melbourne and the West Gate Freeway have been an ongoing concern for the Port and its surrounding communities. In particular, Francis Street and Whitehall Street link the Port to the West Gate Freeway as well as neighbouring container parks and are regularly utilised as a link to the Port by many users. Discontent regarding use of these suburban streets has been building over many years and more recently, strong population growth across Yarraville and Footscray has heightened the issue.

This issue has been studied as part of previous State Government initiatives, which included the provision of a new link to alleviate trucks travelling through this urban area. These initiatives did not include any aspect of dedicated or prioritised truck access for the new link. Our concept project is to include this in the analysis. Thus it considers prioritised truck access to the West Gate Freeway via the new route.

While a range of demand and supply pre-conditions appear to be in place for a priority freight link to support the operation of the PoM and ensure it is better integrated with priority freight links in the west of Melbourne, the project as defined does not constitute a suitable form of dedicated freight infrastructure.

This could be due to a number of demand and supply factors, including:

- The size of the freight task, while large, may not justify investment in priority infrastructure given the extent of other traffic types in the area (demand).
- The patterns of demand in the inner-west of Melbourne are diverse and involve a number of origin-destination flows that are not related to the Port, meaning that it is not possible to disentangle these flows and target freight demand through a single infrastructure investment (demand).
- The existence of alternative routes to access the Port from the M1 corridor via CityLink and other strategic connections reduces the criticality of improving connections to the west.
- The design has not been developed with the aim of prioritising freight vehicles, and if this was an overarching objective, then the design solution might be better targeted at addressing PoM access issues (supply).

- The nature of the existing road layout and other barriers (natural or otherwise) may limit the opportunity to develop cost effective solutions on the west side of the Port (supply). This recognises that there may be an access problem on the west of the Port, but that there may be insurmountable barriers to developing suitable dedicated freight infrastructure.

While each of these causes are possible, the case study also highlights that the need for dedicated freight infrastructure would be limited when alternative network modifications provide a feasible way of addressing the perceived problems. It is only when there is a lack of alternative network options available that the case for investing in dedicated freight infrastructure is strengthened. In this example, it might be when congestion on the M1 corridor reaches a certain level and spills over onto the new route that it becomes imperative to restrict access to private motor vehicles in order to prioritise freight flows.

Should this occur, and as the size of the PoM freight task continues to grow, we may reach a point where the market, including road freight operators and the PoMC, may start to demand and be willing to pay for a tailored infrastructure solution to strengthen the connection between the Port and key transport links in the west of Melbourne.

The Victorian Government recognises the challenges and opportunities in managing the efficient movement of freight vehicles on the city's transport networks. In August 2013 it released its freight and logistics plan – *Victoria: The Freight state*. This plan has an overarching goal to maximise the contribution of the freight and logistics sector to Victoria's productivity and liveability.

A number of directions have been identified in the plan that will contribute to addressing some of the issues identified in this case study. For example, there is an emphasis on using spare overnight capacity (Direction 8), providing an efficient freight network that includes major new investments (Direction 9), increasing the role of rail freight (Direction 10), and better managing freight delivery in urban areas (Direction 15).

The Victorian Government has identified the western section of East West Link as the next priority project to improve freight efficiency by providing a new major connection between the Port and key industrial centres in the west. This is anticipated to also reduce noise and air pollution in the western suburbs by providing a motorway option for trucks, and contribute to urban renewal in the west by providing a safer environment for pedestrians and cyclists.

Detailed planning for the western section of the East West Link will be underway in 2014, with early works expected to be commenced by the end of 2015.

The Brisbane proposal would provide the potential for freight movements to avoid major arterials that are becoming increasingly congested and separate freight and passenger train paths on the busy Citytrain network. However, given the scale and complexity of the railway construction task as it was defined for the case study, the estimated economic benefits of the project were significantly outweighed by the upfront capital costs.

This involves development of a new and upgraded 300 kilometre long railway from the coalfields west of Brisbane over the Toowoomba Range to the Port of Brisbane. The line would be targeting millions of tonnes of coal situated in the Surat basin. This has the potential to deliver spin-off benefits to the container trade by paving the way for long train lengths, double stacking, dedicated access and improved transit time for all rail freight.

A central issue with this study is whether the costs and reliability issues associated with congestion on current road and rail networks justify the construction of such a significant infrastructure proposal. Our economic and financial analysis has suggested that the case for the project would be difficult to justify.

The central issue with the proposal is the very high cost of construction, which is linked to the scale and complexity of the task of constructing a new railway through difficult terrain as well as an established and well utilised urban rail corridor. Our analysis has shown that even with substantial coal and other significant volumes from the inland rail, this railway as a whole could not generate revenues sufficient to justify the cost. This would not be the case in a more remote area, or where the terrain is more straightforward, which highlights the challenges for considering investments in dedicated rail freight links in the Brisbane context.

Advice from the Port of Brisbane is that lower cost options currently are being investigated as part of its pre-feasibility study, which is being undertaken to identify a sustainable and balanced transport solution that will demonstrate the commercial, social and environmental viability of dedicated rail from the Surat Basin to the Port of Brisbane. As part of their ongoing work, the Port has also been re-thinking and updating its assessment of market potential for the project, and preliminary findings suggest the railway may deliver greater value potential than what has been modelled in this case study.

Where to from here?

While these case studies do not demonstrate the case for dedicated or priority freight infrastructure, there may be good opportunities for such investments in Australia in the near future. What we have learned is that in cases where the principles of demand suggest there could be a good case for investment, it is important that solutions are discovered that are properly focussed on the objectives for container freight efficiency, and can be provided in a well-designed and cost effective fashion.

PART A: Scoping Study (April 2012)

1. Introduction

1.1 Background to the Study

In 2008, Infrastructure Australia (IA) and the National Transport Commission (NTC) were tasked by the Council of Australian Governments (COAG) to prepare a National Ports Strategy. That Strategy was finalised and agreed by Australian Infrastructure and Transport ministers, and is to be considered for adoption by COAG in early 2012.

The Strategy seeks to improve the efficiency of port related freight movements across infrastructure networks, minimise negative externalities associated with freight movements and influence freight policy development. A recommendation in the Strategy (rec 3.10) is that:

> *"The Bureau of Infrastructure Transport and Regional Economies should assess the conditions under which the introduction of dedicated freight land transport infrastructure segments related to relevant container ports would be justified"*

The Bureau of Infrastructure Transport and Regional Economies (BITRE) appointed Ernst & Young (EY) to prepare a report that would inform its response to the recommendation. It sought advice on the conditions under which dedicated land freight transport infrastructure segments would be justified, and consideration of any case studies for such freight infrastructure development around container ports in Australia.

1.2 What is 'dedicated or priority freight infrastructure'?

For this study, the term 'dedicated or priority freight infrastructure' refers to infrastructure that demarcates freight traffic from other transport users such as commuters or passengers, either by providing exclusive or preferential access to freight on that infrastructure network or asset.

Dedicated freight infrastructure can involve a wholly discrete network such as a dedicated truck road, or a segment of wider access infrastructure such as a truck lane on a major freeway.

Priority freight infrastructure may involve signalling, pricing or other measures such as curfews that provide advantageous access to freight users.

Introducing dedicated and priority freight infrastructure may mean retrofitting existing infrastructure to provide dedicated or priority use or developing new infrastructure.

The focus of this study is on dedicated or priority freight infrastructure associated with Australia's major metropolitan container ports.

In defining the conditions that would justify dedicated or priority freight infrastructure, we have examined economic, market and commercial conditions around Australia's five major container ports – Port Botany, Melbourne Port, Port of Adelaide, Freemantle Port and Port of Brisbane.

1.3 Study objectives and purpose

The objective of the study is to assist BITRE to respond to the National Ports Strategy recommendation by providing a practical and evidence based assessment of the conditions that would support the development of dedicated and priority freight infrastructure around Australia's major container ports.

The study consists of two stages of work and this report constitutes completion of Stage One.

Stage One: A scoping study and literature review

The purpose of this stage is to:

- Define the issues that drive dedicated or priority freight infrastructure proposals with reference to international examples and the Australian context
- Propose case studies for further examination in Stage Two

The key output from this stage of the analysis is a set of case studies for more detailed examination.

Stage Two: Detailed analysis on case studies

The purpose of this stage is to:

- Undertake detailed research and analysis of the case studies identified in Stage One and conduct a rapid cost-benefit analysis on each case study
- Drawing on the findings of the cost benefit analysis, identify the conditions under which dedicated and priority freight infrastructure would be justified

The key outputs from Stage Two are case studies in the form of rapid cost-benefit analyses, rapid financial analyses and gauging potential private sector interest in delivering the projects.

1.4 Methodology

1.4.1 Stage One

Stage One is comprised of four steps set out below, which is the basis of this Report.

Step 1: Literature Review

A literature review drawing on international and domestic literature from government, industry and academia. The focus of the review was on developing a deep understanding of the challenges facing Australia's port and freight sectors and the market for developing infrastructure.

The findings in this review were then applied to the Australian context through an examination of Australia's major ports.

Step 2: Stakeholder Consultation

Stakeholder consultations were undertaken with port and supply chain industry leaders and policy makers.[2] The purpose of the discussions wasto establish the potential for dedicated freight infrastructure around Australia's major container ports and identify a list of potential case studies for Stage 2 of the study.

Step 3: Establish the principles for dedicated and priority freight infrastructure

Drawing on the research gathered in the previous steps, develop a principles-based framework for considering the conditions which justify dedicated and priority freight infrastructure. The principles-based framework considers the drivers of demand and supply for dedicated and priority freight infrastructure.

Step 4: Identify case studies for further examination

Apply the framework to the long list of potential case studies of dedicated and priority freight infrastructure to identify 2-3 case studies for further examination in Stage Two of the study.

1.4.2 Stage Two

Stage Two is comprised of five steps set out below.

[2] A full list of stakeholders consulted can be found in Appendix A

Step 1: Project Data Collection and Further Consultation

Working closely with state government and other project stakeholders in order to obtain relevant project data and insights.

This involved first working with stakeholders in order to understand the availability of robust data. EY contacted the key state government transport officials to discuss the availability of data for the case studies.

Project stakeholders were cooperative in the provision of sensitive project data that has enabled detailed and rich analyses of project drivers.

Step 2: Rapid Cost-Benefit Analysis

This step sought to identify and value the cost and benefit steams associated with each of the case studies. In the case of the Melbourne case study, it involved interrogating traffic modelling and economic appraisal data already completed as part of a formal business case for the proposal. For the Brisbane case study, it involved undertaking an independent cost-benefit with available data in line with national project evaluation guidelines.

Step 3: Financial Analysis

The study assessed the commercial feasibility of the project through identifying and measuring the cost and revenue streams associated with each case study. This analysis also sets the scene for considering the types of commercial delivery models that would be suitable for the case study.

Step 4: Commercial Analysis

Based on the findings of Stage One, combined with the economic and financial assessments, the study considered the potential commercial models and governance issues for introducing dedicated and priority freight infrastructure.

Step 5: Assess Market Views

For each of the proposals, the study considered the level of market interest and demand from relevant stakeholders, and in particular with respect to contributing to its commercial delivery.

1.5 Structure of this report

This report covers the findings of Stage One of the study. It includes:

- A discussion on Freight and Port Productivity in Australia
- A review of examples of dedicated and priority freight infrastructure
- An assessment of the principles for considering dedicated and priority freight infrastructure
- An assessment of the potential need for dedicated or priority freight infrastructure at Australia's major container ports
- An analysis of the range of potential case studies for further investigation

The detailed case studies that are part of Stage Two are to be reported separately.

2. The Pursuit of Freight Productivity

This chapter examines the critical nature of improving freight productivity in Australia. It considers:

- The importance of freight productivity
- Market failures relating to freight infrastructure
- Responses to Market Failures
- The rationale for dedicated and priority freight infrastructure

2.1 The Importance of Freight Productivity

Australia's freight networks are vital to the Australian economy. As an island nation with widely dispersed populations, we rely on efficient freight networks to facilitate the movement of goods from our shores to our cities and across the country. Despite this, our freight networks suffer from poor productivity, which imposes economic, social and environmental costs to industries and communities.

While freight inefficiencies take on a number of forms, congestion is the major impediment facing the country's two largest metropolitan ports – Sydney and Melbourne – which combined, account for 70% of Australia's container freight throughput. Congestion can be measured by the avoidable social cost it imposes on the community, including extra travel time, increased unreliability, higher vehicle and fuel costs and poorer air quality.

Transport inefficiencies such as congestion represent a drag on national competitiveness in the form of higher transport costs and lost productivity. The social cost of congestion in our capital cities was estimated at $9.4 billion in 2005, including 3.5 billion in private time cost, $3.6 billion in business time costs and $1.2 billion in extra vehicle operating costs. The Sydney metropolitan area had the highest cost of congestion out of all Australian cities; $3.5 billion. Without significant action, the cost of congestion in Australia's capital cities is expected to double by 2020, reaching approximately $20.4 billion per year.[3]

The landside costs at Australian ports are another impediment on productivity and competiveness of freight supply chains. These are the largest and most rapidly increasing cost element of container freight transport. Indeed, for Sydney and Melbourne, landside costs exceed the total of all other port container supply chain costs.[4] Rapidly rising costs would suggest that supply constraints are becoming more acute at those ports.

Therefore, Australia's major container ports and landside connections are at a critical juncture, whereby the level of publically provided infrastructure will soon be inadequate to service the growing freight task for many of Australia's metropolitan ports. This highlights the urgent need for reform and investment to improve the productivity of freight networks servicing Australia's ports.

If action is taken, a background paper to the ports strategy indicates that the potential productivity gains from improving the efficiency of Australia's ports could be up to $300 million per year to the Australian economy[5].

Improving the productivity of ports and landside transport networks would have direct benefits through a better functioning freight sector and reduced costs of moving freight and indirect benefits through enhanced competitiveness down the supply chain to supporting industries. Combined, this would lead to greater national output. Improved freight productivity could also benefit transport

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[3] BTRE2007, Estimating urban traffic and congestion cost trends for Australian cities, Working paper 71.
[4] Infrastructure Australia and the National Transport Commission, National Ports Strategy Background Paper, 2010
[5] GHD Background Paper 3 for the National Ports Strategy 2010

system users through reduced accident exposure risk, improved amenity and better environemntal outcomes.

There are several potential drivers of productivity imovements in Australia's freight networks: improvements in technology, an increase in organisational efficiency, better coordination along the freight supply chains, and re-allocation of investment and resources to the most productive and cost-effective mode of transport.

These 'natural' drivers of freight productivity are somewhat hampered by the market failures associated with freight infrastructure. This gives rise to a fundamental need for market development and innovative solutions to improving freight productivity.

2.2 Market Failures relating to Freight Infrastructure

Economic theory suggests that market failures in the provision of freight infrastructure and services constrain freight efficiency and lower overall productivity.

'Market failures' occur where the market does not provide the level of infrastructure required or does not promote its efficient use. It can include situations where the market does not allocate resources efficiently, does not provide what users demand in the quantities or at the time that they want, or where there are spill over effects to third parties.

In the case of freight infrastructure in Australia, notable market failures can be seen both in ports' supply chains that move goods and raw materials, and in freight infrastructure planning and funding. Four key market failures relating to freight infrastructure are considered in detail below.

Infrastructure as a public good

The market may not provide the necessary freight infrastructure when required because of the public good characteristics of infrastructure, meaning that an investor is unable to capture the full benefits of investment, creating a disincentive to investment.[6] As a result, road and rail infrastructure has tended to be delivered by direct government provision.

Consultation with the ARTC brought to light that, to attract users, it prices some of its regulated infrastructure at up to 30% of the ceiling minus floor price,[7] meaning that rail infrastructure providers do not fully recover their capital costs. There are many examples of intermodal rail freight operators closing down due to the lack of profitability.[8]

Competitive distortions between road and rail

Non-excludable and open infrastructure characteristics make it difficult to effectively price road infrastructure. The resulting competitive distortion between road and rail transport can give rise to an 'unlevel playing field' between modes.

In a perfect market, users of road and rail would pay the short-run marginal costs plus an amount to cover other costs structured so that price-marginal cost ratios are similar where the modes compete. This would ensure the most efficient allocation of resources between competing modes. However, road and rail have inherently different pricing models.

Unpriced negative externalities in the form of congestion, pollution and poor amenity are not accounted for in road freight pricing. The inability of road prices to capture and pass on the costs of using the infrastructure further distorts consumption and investment decisions.

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[6] Australia's Infrastructure Policy and the COAG National Reform Agenda, *Luke McInerney, Chris Nadarajah and Frances Perkins,* The Australian Treasury.
[7] Discussions with ARTC management in Adelaide March 2012
[8] CRT in Melbourne with its Cargo Sprinter train between the port and Altona North ceased business in 2006 and Patrick Rail ceased its regional and metropolitan service to Camellia in 2010. Patrick said they had been subsiding the service to create greater throughput through its Port Botany terminal. Rail Express April 27 2010.

The 2006 Productivity Commission (PC) Inquiry into Road and Rail Freight Infrastructure Pricing found limited price distortions between road and rail once registration and fuel charges were accounted for, and factoring in externalities.

The Commission also argued that road and rail have unique advantages and therefore substitutability is low: road freight is flexible and suited to short distances and time-sensitive items, while rail is suited for higher volumes and longer hauls.[9] The federal Bureau of Infrastructure, Transport and Regional Economics (BITRE) likewise estimated that rail only effectively competes with road on freight journeys over 1000 kilometres.[10]

As such, short haul rail freight faces challenges in competing with road transport. As well as this, consultation with several stakeholders including the ARTC, Asciano, QRN and Sydney Ports Corporation suggested that the different pricing regimes between road and rail was a key barrier to more efficient network use around congested container ports.

Poor coordination in container freight supply chains

Coordination externalities arise where a group of companies or individuals do not coordinate to develop the most efficient solution, either in terms of infrastructure development or supply chain performance. There may be several reasons why effective coordination is difficult, including imperfect information, mistrust between parties or poor visibility of the requirements of others.

Fragmented supply chains with multiple participants require a high-level of coordination between each functional stage of the supply chain. Failure to coordinate can result in several inefficiencies. A study on Port Botany's supply chain found that lack of coordination along the supply chain results in increased costs, underutilisation of resources, capacity mismatches at different stages in the supply chain, bottle necks and an overall mismatch between system demand and capacity.[11]

A recent study by Shipping Australia also highlighted the inefficiencies of rail service quality effecting Port Botany caused by lack of coordination along supply chains.[12] There is a misalignment between stevedore timeframes and accessing the rail network. This means rail operators have to work around the stevedores' timetable when collecting freight, and then work around the RailCorp/ARTC timetable in accessing the rail network. Misalignment of the schedules causes delays and increased costs in moving the freight out of the port yard.

2.3 Policy Responses to Market Failures

There is a wide range of potential policy options to address market failures and improve the productivity of Australia's ports and landside connections. This section outlines key policy developments targeting improved freight productivity, a more thorough examination of the policy initiatives in each port can be found at Chapter 5 of this report.

It is important to recognise that dedicated and priority freight infrastructure is only one of a range of policy initiatives for improving the freight productivity of Australia's ports. While stakeholders acknowledged the potential innovative role for dedicated and priority freight infrastructure in improving freight productivity, several stakeholders also commented on the importance of 'sweating' existing assets through reform initiatives before investing in new infrastructure.

Strategic Planning

In recent years there has been greater emphasis on strategic coordination and planning of infrastructure to drive productivity. For the port sector, this has culminated in the development of the National Ports Strategy which was the first genuinely national perspective to coordinate ports planning in Australia.

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[9] BITRE (2009), *Where and how do road and rail freight compete with or complement each other?*, Fact Sheet, April.
[10] BITRE,2009, Road and Rail Freight: Competitors or Complements?, Information Sheet 34
[11] IPART, Reforming Port Botany's links with inland transport, Draft, 2007
[12] Shipping Australia Metropolitan Intermodal Terminal Study 2011

The ports strategy made a series of recommendations covering planning, implementation, landside efficiency and accountability. The strategy seeks to improve the transparency across port supply chains, improve the efficient coordination of freight movements, and minimise negative externalities.

State governments have also adopted a more strategic focus on planning and coordination for ports and transport networks:

- The NSW Government is preparing a state ports policy for later in 2012, as part of its development of a NSW Freight Strategy.
- The Victorian Government is developing the Transport Solutions strategy with the aim of reducing road, rail and port logistical bottlenecks, improving freight efficiency and prioritising investment in road, rail and port facilities across local, arterial and national transport corridors.
- The Queensland Government are developing a strategic plan for ports following the release of an integrated freight strategy last year with an emphasis on optimising existing assets.

Pricing reform

There are several initiatives underway aimed at reforming road infrastructure pricing.

In 2007 the Council of Australian Government (COAG) set an agenda for road infrastructure price reform with the aims of delivering more efficient road transport networks and enhancing freight productivity. A Road Reform Unit was established. Central to this is the promotion of the user pays principle and strengthening the link between price and actual use of the road network.

The current charging framework for road infrastructure consists of a combination of registration fees and fuel-based subsidies but does not reflect the actual use of the road network by vehicles. The Road Reform Unit has developed an Evaluation Framework Reference Guide and Policy Framework Reference Guide outlining the high-level principles to guide the development of alternative pricing models. Two of the pricing principles are that prices should reflect marginal costs of use of the infrastructure and should recover the efficient cost of infrastructure provision. Cost-based prices provide signals for heavy vehicle operators to make informed operational choices that have the potential to change the nature of road use and ultimately, reduce road maintenance costs.

These policy moves towards direct pricing of road use are supported by improved technology to monitor truck freight movements and more accurately estimate the cost of using the infrastructure.

Targeted mode shift from road to rail

Movement of container freight by rail rather than road is key strategy for alleviating congestion around ports. Most states have policies to increase the share of rail. NSW has set a target to double the share of rail freight from 14% to 28%, and Victoria has earmarked it as a key initiative in future transport plans and strategies. In Western Australia, there is a long term plan to cap container movements through Fremantle Port at 1.2 million TEU, almost double the current level, and for rail to handle 30% of the container movements. At the federal level, there is also strong support for policies that would encourage rail freight to remove trucks from the roads.[13]

Improved coordination

In 2008, the NSW Independent Pricing and Regulatory Tribunal (IPART) recommended a logistics coordination team be established to drive efficiencies at Port Botany.[14] In response, the NSW Government established the two-stage Port Botany Landside Improvement Strategy (PBLIS) reform process.

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[13] See http://www.financeminister.gov.au/archive/media/2010/mr_202010_joint.html and Joint Media Statement by Anthony Albanese Federal Minister of Infrastructure and Transport and John Fullerton, CEO of ARTC, “Port Botany Rail Upgrade: First Stage Completed” 3 April 2012

[14] Recommendation 15, IPART (2008), *Reforming Port Botany's Links with Inland Transport.*

Stage 1 has involved a Regulated Operational Performance Management (OPM) process for roads, and a voluntary approach for rail. Road performance regulations set benchmarks for transferring freight between stevedores and road carriers, with financial penalties applying to both groups for delays/late arrivals, etc. Already, this has delivered consistent improvements to truck turnaround times, increased take up of off peak and weekend time slots, and greater transparency around stevedores' time slots.

It was intended that Stage 2 would be introduced in 2012 if voluntary measures in Stage 1 are not proven to be effective. Stage 2 measures could include a Demand Management System (peak period pricing), options to improve empty container parks' operating hours and performance, and a regulated OPM Rail Framework.[15] It is understood that at this time, no further work will be completed for a Demand Management System at the Port.

Another initiative aimed at improving coordination is Adelaide's Vehicle Management System introduced to improve truck waiting times.

Control and management along supply chains

There is growing trend towards ports reaching beyond their traditional port boundaries to manage other parts of the supply chain's landside connections, such as freight railways, intermodal terminals, container parks and cold store facilities, all of which use the port's monopoly influence to maximise overall supply chain efficiency. Through management and greater control over supply chains, ports can achieve greater efficiency by exerting 'command and control' rather than struggling with lack of coordination along fragmented supply chains with many operators.

The Port of Brisbane operates the multimodal terminal near the dock. Similarly, Sydney Ports owns and is developing the Enfield intermodal terminal as a container staging area. It is in Brisbane where this trend is being extended to the fullest extent. The port, which was only privatised in late 2010, is looking to control a major rail link to the port in order to ensure its ability to grow.

Institutional reform

Recent decades has seen extensive institutional reform in Australia's port sector towards more commercialised enterprises with clear commercial objectives.[16] The precise nature of the reform has varied between jurisdictions with a common underlying theme to establish more commercial operations that improve port performance.

In September 2011 The NSW Government announced its intention to refinance the Port of Botany via a 99 year lease. This is in effect a privatisation on a similar basis to the Port of Brisbane. The refinancing process is expected to be completed by mid-2013. In principle, by introducing a private operator, the refinancing has the potential to reduce conflicts of interest by separating the operational and regulatory functions of Port Botany, drive improved efficiencies, attract private investment and raise public funds to upgrade supporting infrastructure networks.

Privatisation of the Port of Brisbane has provided a more commercial and market focused outlook for the port. A good example of this is the Port Access Charge (PAC) for collecting funds to build the last mile of the Port of Brisbane Motorway. The PAC of $7.83 per TEU is levied on containers transported by road while rail containers are exempt from the levy.

Improving Truck Productivity

Improving truck productivity refers to the number of containers per truck, round trip. This is monitored by the BITRE's Waterline publication, which shows truck productivity increased from 2.1 in September 2006 to 2.3 in December 2010. In part this could be the result of trucks with greater capacity, that is, B-Doubles taking some market share from semi-trailers. The greatest gains in this

[15] Gunn (2011), *Congestion Versus Landside Reform at Port Botany.*

[16] Infrastructure Australia and the National Transport Commission, Background paper for the NPS 'Effective port governance and project evaluation' April 2010

area will come from increased back-loading of trucks. This will require greater coordination, with matching of export and import bookings within the stevedore's vehicle booking systems.

The Port of Freemantle has permission from the ACCC to give preferential treatment to two way loaded trucks that both deliver and receive containers. Unfortunately the project was cancelled due to high costs, but it would have had the potential to enhance the productivity of trucks.

Regulatory reform

The former prescriptive approach to regulating heavy vehicles, including mandating how to achieve regulatory standards was found to inhibit innovation, limit efficiency and raise freight costs.[17] This is now being replaced with the National Transport Commission's Performance Based Standards. The move to a more cost-effective framework has the potential to enhance the productivity of road transport.

The introduction of Performance Based Standards has brought forward innovations from the trucking industry to expand the capacity of high performance vehicles. In Queensland, large government expenditures on upgraded road infrastructure has accompanied the introduction of new A-double trucks that can carry two forty foot, hi-cube containers (four TEU) with a higher weight per unit, taking containerised grain and cotton volumes from rail.

Another example of regulation is a cap on inner harbour container movements at the Port of Freemantle. The cap of 1.2 million TEU is almost double the current TEU level and effectively places an upper limit on congestion caused by freight trucks. This has required long term planning to move a large proportion of containers onto rail and develop plans for a new port at Kwinana, 20 kilometres south of the current port.

Investment in infrastructure

There is a patchwork of investment in infrastructure across states and territories targeted at improving freight productivity and alleviating congestion. Key initiatives in each state are listed below:

[17] http://www.pc.gov.au/__data/assets/pdf_file/0003/47532/freight.pdf

Table 1: Investments by State

NSW	► Enfield Intermodal Terminal: due to commence in 2013 and handle 300,000 TEU per year ► Moorebank Intermodal Terminal: a proposed terminal with potential capacity of 1 million TEU per year ► M5 West project: widening the M5 West Motorway from two to three lanes in each direction between Camden Valley Way and King Georges Road. ► Southern Sydney Freight Line: development of a dedicated freight line connecting the Metropolitan Freight Network at Sefton Park to Glenlee and the freight corridor to Melbourne. ► Northern Sydney Freight Corridor: upgrade of the corridor including building a rail underpass and new track segments.
VIC	► Truck Action Plan: proposed truck route between West Gate freeway and Footscray road. ► Webb Dock development for a third stevedore ► West link: Proposed tunnel and freeway connecting Footscray and Dynon Road
QLD	► Upgrade of key motorways: to increase road capacity. Several key motorways are being upgraded including the Gateway Motorway and Port of Brisbane Motorway ► Cross River Rail Service: a tunnel under Brisbane River coupled with an underground line north to south through the city. This could though change as a result of the March 2012 change in government ► A range of measures to increase the Port's capacity for coal volumes
WA	► Stirling Highway/High Street Intersection: proposed upgrade to address congestion, currently on hold due to community opposition ► Roe Highway extension: proposed upgrade to reroute freight traffic, currently on hold due to community opposition and environmental concerns ► Passing loop in Spearwood: aimed at increasing rail capacity by enabling multiple trains to operate on the same line. ► Intermodal Terminal at Kewdale: further expansion to handle government container volumes by rail
SA	► Northern Connector Project: this will include the development of a road segment connecting key transport links to the port ► Goodwood and Torrens Junctions: upgrades to rail infrastructure to address conflict points for freight and passenger rail.

2.4 Rationale for Dedicated and Priority Freight Infrastructure

Much of the infrastructure used by the freight sector is shared. For example, road and rail freight networks for containers share infrastructure with passenger travel. Sharing infrastructure may at times be an efficient use of that infrastructure network, and indeed there are overseas examples where shared networks are used effectively. However, where infrastructure networks are contestable, there can be access 'conflicts' between parties with competing interests and demands.

Shared infrastructure has several implications for the way in which Australia's infrastructure markets are structured and operate. It is difficult to clearly identify and apportion the benefits of the infrastructure to different users. Without clearly identifiable users and beneficiaries, it is difficult to apply the 'user pays' principle.

The operation of shared infrastructure servicing parties with competing interests often requires 'priority' to be given to one party over the other. Many rail networks servicing Australia's ports 'give way' to passenger rail on shared infrastructure and operate at restricted times during the day.

Dedicated and priority infrastructure has the potential to separate competing demands on transport networks. In doing so, it disentangles the roles and responsibilities of government and industry and provides a clear identifiable user and beneficiary of the infrastructure. Such a market development would allow for application of the user pays principle and swiftly shift the onus for provision of freight infrastructure from government to industry.

The introduction of dedicated and priority freight infrastructure could transform port and landside logistics by separating freight traffic from other forms of traffic and thereby providing an efficient purpose-built means of transporting freight. In this regard, dedicated and priority freight infrastructure is one approach that can be used to unlock productivity gains and address congestion and capacity constraints where it promotes the freer movement of freight.

The underlying 'theme' of port strategy is the desire to unlock productivity gains and raise international competiveness through the efficient use and provision of infrastructure. Importantly, the ports strategy noted that high levels of passenger usage dominate rail and road infrastructure around Australia's ports and therefore, at some level of demand, it may be worth considering dedicated or priority freight infrastructure.

The draft National Land Freight Strategy considers dedicated and priority freight infrastructure to be a potentially important contributor to a truly national and interoperable freight network. The draft strategy paper notes a move toward dedicated road infrastructure, where traffic density permits, between port and intermodal centres or freight cluster sites. It also suggests dedicated freight infrastructure as an option to overcome crowding out of freight on some routes and for appropriate separation of personal and freight transport in urban areas (including dedicated rail infrastructure).[18]

However, a case by case study of existing dedicated and priority freight infrastructure suggests that there are factors to consider other than simple traffic volumes and densities, although these do bolster the economic case for that infrastructure. There may be other considerations such as port access, land use, or managing user conflicts on the network.

[18] National Land Freight Strategy, Discussion Paper, February 2011

3. Examples of Dedicated and Priority Freight Infrastructure

This section sets out examples in Australia and overseas of dedicated and priority freight infrastructure. It considers:

- Why these pieces of infrastructure were developed
- How they addressed local freight productivity problems
- What outcomes they have delivered

In Australia, examples of dedicated freight infrastructure do exist, but rarely around container ports. Where cases of dedicated freight infrastructure exist at container ports in Australia, they are, with a few exceptions, provided in only limited segments of the overall freight link and/or poorly integrated with the transport network.

A primary problem with the so-called dedicated rail infrastructure in Sydney, Brisbane, Adelaide and Fremantle is that none of them are truly unencumbered as they all share a corridor or interact with passenger trains at some point, and due to passenger priority, delays result. Unfortunately, data on each of the examples of domestic dedicated/priority freight infrastructure is limited, restricting the ability to analyse the infrastructures' effectiveness.

There are a number of international cases (road and rail) where dedicated freight infrastructure has been used. Enough information on each of these international projects was found in order to provide a comprehensive analysis of the principles that justified the investment in dedicated freight infrastructure, and their effectiveness.

The rail examples studied were found at the Ports of Los Angeles, Miami and Rotterdam and involve in the main, separating freight and passenger trains and carrying out large infrastructure investments to reduce interaction with motor vehicles in busy city environs.

One of the road examples that were studied involves a road tunnel connecting the Port of Dublin to areas beyond the central business district, providing an alternative means for heavy vehicles to travel between the port and the motorway and reduce congestion in the city. Other road forms of dedicated freight infrastructure considered were studies of truck only lanes, which involve the segregation of lanes solely for heavy vehicles from remaining lanes on the motorway to increase road safety and reduce congestion. All of these forms of dedicated freight infrastructure have been chosen because they have direct relevance to Australia and this study.

3.1 Australian cases of dedicated and priority freight infrastructure

In Australia, examples of dedicated freight infrastructure do exist, but mostly around bulk freight, such as to move iron ore and coal from mine to port. In the Pilbara, the movement of iron ore utilises unencumbered access to the track at any time. On the East Coast, the coal lines have to cross main lines or interact with passenger and other freight trains, but the infrastructure is such that interactions are in the main minimal (passing loops and overpasses).

These systems carry large volumes of one product from a few customers to one point, one way. The provision of the infrastructure and the transport service is either self-provided or provided by third parties who receive sufficient profit to keep re-investing to expand capacity. They are extremely efficient and in many cases involve world best-practice in their task. These assets also have clearly defined property rights, such that the infrastructure owner is properly incentivised to optimise that infrastructure's use.

However, when it comes to the provision of dedicated infrastructure around container ports, the picture is somewhat less efficient. Volumes are smaller, more diverse and minutely partitioned. Interaction with passenger traffic on road or rail is constant leading to congestion and a more complex freight task. Most container freight journeys are shorter distance, involve operations in urban environments, and these supply chains cater to many customers who require door -to-door service, a factor which can make road more suitable.

It is for these reasons that in each of the container ports considered in this study, rail share of container movements varies between six and 14%.

Table 2: Australian Container Ports: Rail Share of Container (TEU) Moves

Port	Melbourne	Sydney	Brisbane	Fremantle	Adelaide
Percentage Rail	9%	14%	6%	12%	10%
Number of TEU	178,000	250,000	57,000	68,000	30,000

A quick survey of Australian ports highlights a few examples of freight infrastructure at our main container ports[19] and the constraints they face. None are truly dedicated as they all share a corridor or interact with passenger vehicles or trains at some point.

Information regarding each of the dedicated/priority freight infrastructure examples found in Australia was limited. In turn this limited the ability to undertake a comprehensive analysis of the effectiveness of said infrastructure.

3.1.1 Port of Botany

In Sydney at Port Botany, there has long been a rail freight system connecting the port to the intermodal terminals at Enfield and Chullora. However, freight trains do not have dedicated access to the track as it has to cross suburban passenger lines, where passenger trains have priority.

This is the main problem with so-called dedicated rail infrastructure not only in Sydney but also in Brisbane, Adelaide and Fremantle/Perth. For major portions of their journey, the freight lines share the same rail corridor as passenger trains. Hence they have to cross over these lines at multiple points to navigate past stations and stay within the corridor. With passenger trains at peak times, or in Sydney's case given the greater frequency of passenger trains at all times, delays result, because they do not have priority.

It is only on the Southern Sydney Freight Line (SSFL) currently under construction in Sydney's south that grade separations are being built to ensure against interactions between freight trains and passenger trains on a shared corridor.[20]

3.1.2 Brisbane Port

Dedicated Rail Infrastructure

In the case of Brisbane, the situation is very similar to Sydney. At multiple points and also at outer areas of the city to the west and north, container and other freight trains share the rail infrastructure with passenger trains. Closer to the port, from the heavily industrialized area of Acacia Ridge, the freight-only line, which not being electrified means that passenger trains cannot use it, runs to the port. However, the corridor used by this freight line is shared with passenger trains, causing interactions and delays. This line is significantly underutilised by containers as no shuttle trains run between the rail terminal at the port and Acacia Ridge. The lack of passing loops in Brisbane, as in Sydney, also limits capacity as fewer trains can be on the essentially one-way system at any one time.

[19] Full discussion of the rail networks serving the container ports is contained in Chapter 4 above.
[20] Source: http://www.ssfl.artc.com.au/ and discussions with ARTC, 23 March 2012

Prioritised Road Infrastructure

In 2010, the Queensland Department of Transport and Main Roads undertook a trial on the Brisbane Urban Corridor, a major freight corridor in the south-west industrial area of Brisbane, near Acacia Ridge.[21] The trial was to consider whether restricting trucks to using the left lane of the two-lane road for various sections of the 11 kilometre route would help ease congestion or reduce delays for motorists without compromising safety.

The results of the six month trial found it did not “significantly reduce congestion” or increase efficiency along the corridor because:

- Full enforcement of the use left lane rule was not achieved, participation was voluntary and not at very high levels
- With only a “small proportion” of trucks moving into the left lane, cars did not take advantage of any additional capacity created in the right lane
- Consistent travel time improvements for cars were not recorded
- The trial did not clear queues more quickly

The trial was also unpopular with the surrounding community and with truck drivers who participated. The department is now investigating legislative and technological solutions to this issue. The actual road has a large number of local access points, where cars have to enter the left lane to exit, or enter. This meant there were always cars weaving in or out of the left lane.

Trucking industry stakeholders told us that a system is in place on the same section of road that aims to reduce congestion by discouraging through-traffic. Trucks entering and leaving the section are monitored, with those completing the 11 kilometre journey in less than 35 minutes being fined because it indicates they travelled through without stopping to make a pick up or delivery. However, industry sources told us that drivers stop for five minutes or so to get their time up and then transit the whole road.

The government’s aim is to get through-traffic to travel on the Logan Motorway, a toll road further south of the Brisbane Urban Corridor. The toll, plus the extra kilometres involved, is unattractive to industry. Furthermore, because the Brisbane Urban Corridor transits an area that is industrially intensive, trucks cannot be banned completely from it.

These findings confirm in a theoretical sense the view of a 2005 Staff Paper from the BITRE.[22] The Staff Paper considered the issue from the perspective of welfare economics. It found that although a truck has a high value of time for the vehicle as a whole, on a passenger car unit (PCU) basis, which relates to a vehicle’s use of road space (the study assumed an articulated truck requires the same road space as three cars), its value of time is comparable to that of a private car. From an economic efficiency viewpoint, the value of truck-only lanes can therefore be questionable. It also found that splitting road users between lanes by regulation, which the trial tried to do, may be inferior on economic efficiency grounds to using pricing (charging more for use of less congested, higher-speed lanes). Generally, regulation can be a clumsy instrument for achieving segregation of high- and low-value-of-time traffic.

3.1.3 Port of Fremantle

In Fremantle/Perth there is an extensive dedicated freight railway, within its own corridor, with links to a number of intermodal terminals/freight cluster points such as Kewdale/Canning Vale and Kwinana. But there is one sector, at the Fremantle Rail Bridge, where it has to share access with passenger trains for roughly a kilometre. This does result in limiting access. Passenger rail takes

[21] QTMR, Brisbane Urbane Corridor “Trucks Use Left Lane” Trial: Summary Report March 2011

[22] The Economic Efficiency of Lane Differentiation Policies, Staff paper given by Dr Mark Harvey, to the 28th Australasian Transport Research Forum, 28-30 September 2005, Sofitel Wentworth Hotel, Sydney

priority, the impact of which is that the freight services are unable to operate during peak hours (0700-1000 and 1600-1900).

3.1.4 Port of Adelaide

In Adelaide, the Australian weakness of mixed gauges comes to the rescue, with the standard gauge freight line on a different gauge to the broad gauge passenger network. But as they share some of the same corridor, there are conflict points where they cross over each other. A plan that seeks to address this is currently being considered by Infrastructure Australia.

This freight line is mainly used for bulk grain, with only 30,000 containers going on rail to/from the port to regional areas north of Adelaide. If the current plans before Infrastructure Australia result in an unencumbered dedicated freight line, it will be the first such to a major container port in the country. Grain would be the main beneficiary with containers just a small by-product on the track.

3.2 International examples of dedicated and priority fright infrastructure

The international examples of dedicated freight infrastructure detailed in this section involve in the main, separating freight and passenger trains and carrying out large infrastructure investments to reduce interaction with motor vehicles in busy city environs.

The road examples involve two tunnels from port areas to beyond the central business district and two examples of truck only lanes, a concept that has found a lot of interest in the United States. They have been chosen because they have direct relevance to Australia and this study. Rail forms an important role at our container ports and is seen by many as having an enhanced role in relieving congestion by taking trucks off roads.

Road tunnels are one way, albeit an expensive one, to remove vehicles from one congested area to another less congested area. But they will not be able to pay for themselves without sufficient volumes. For road tunnels to give preference to freight vehicles either a blanket ban has to be in place or a toll used to discriminate in favour of trucks. The Dublin Port Tunnel provides a good example of use of a toll.

Truck-only or managed lanes are a newer strategy, particularly in the United States. They have relevance beyond the port context and may be applicable to the heavily congested motorways in Sydney and Melbourne.

3.2.1 Port of Dublin - Dublin Port Tunnel

The Port of Dublin is Ireland's largest sea port, servicing approximately two-thirds of the country's port traffic. Before the GFC, its volumes grew rapidly, but with the sharp contraction in the Irish economy, volumes have since declined.[23] In 2010, the port handled 554,000 TEU, 28% below its 2007 peak of 774,000 TEU. At the end of 2006, near the peak in containers and general trade though the port, Dublin built a Port tunnel.

The Case for the Port of Dublin Tunnel

Dublin is the country's premier port based in the very heart of that city, similar to Melbourne. Traffic congestion in the centre of Dublin became severe in the late 1990's, for a number of reasons:

- Prior to the tunnel, all traffic travelling between the port of Dublin and the M50 motorway – a motorway that indirectly connects Dublin to the rest of the country – had no choice but to travel through the city centre and fifty sets of traffic lights.[24]

[23] Port of Dublin, *"Dublin Port Facilities"*, http://www.dublinport.ie/about-dublin-port/facilites/, accessed 23 March 2012
[24] Dublin Port Tunnel, *"About the Tunnel"*, http://www.dublinporttunnel.ie/about/, accessed 21 March 2012

- The port relied almost solely on road transport to carry freight. Freight in Ireland tends to be carried a short distance over which road transportation is more cost effective. Freight by rail did exist but due to limited demand, the service was basic, and in fact closed operations in 2005.[25]
- Population of Dublin was growing due to immigration; when the Dublin City Council approved the Dublin Port Tunnel, the population had reached 1.2 million people, and was projected to increase to 1.7 million. As such general traffic within the city had grown and was expected to grow further.
- Growth of the freight task being serviced by the Port of Dublin, having doubled to 28.1 million tonnes between 1996 and 2010, led to thousands of heavy goods vehicles travelling through the city centre on a daily basis.

Due to these traffic congestion issues, a tunnel linking the port to the motorway was proposed. The Dublin Port Tunnel opened to traffic on December 20th, 2006. It is a twin bore tunnel, 4.5 kilometres long, which enables traffic to bypass the centre of Dublin between the Port and the M50 motorway. The tunnel diverts heavy vehicles away from the general traffic found within the city centre, reducing freight journey times, and relieving congestion.

The Tunnel tolls vehicles weighing less than 3.5 tonnes. It is thus not a dedicated road for freight, but due to its tolling structure, it gives preference to freight vehicles.

Table 3: Tolls for the Dublin Port Tunnel

Time of the Day	Toll Charge
6am – 10am Monday to Friday	€10
4pm – 7pm Monday to Friday	€10
All other times	€3

When evaluating the proposed scheme, the Dublin City council found that:[26]

- The key benefit of the scheme would be its contribution to economic development by improving trade with Europe. A vital strategic corridor would be established, facilitating throughput and port development as the restriction imposed by traffic congestion would be alleviated.
- The scheme would not only facilitate a coordinated implementation of investments in public transport, but also improve the accessibility and development potential of the Dublin Docklands.
- However, these benefits would need to be balanced against the tunnel's adverse environmental effects. This tunnel would see a lot of land taken, adversely effecting property values and vegetation.
- Furthermore, the tunnel would have negative impacts on over 200 properties near the tunnel due to adverse construction effects as well as future traffic noise.

The Council concluded that while attention was required to address adverse consequences, the overall benefits of the proposal were significant. The NPV of the project was estimated at €789m,[27] and so it was in the best interests of the country to invest in the tunnel.

Effectiveness

Since the Dublin Port Tunnel was opened in 2006, two studies have evaluated its effectiveness. A cost-benefit analysis after the tunnel had been open to traffic for over 3 years concluded that the NPV of the tunnel was €54.4 million.[28] This study also found that the earlier study, prior to

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[25] Handling Network, *"Rail Freight in Ireland"*, 2011
[26] Dublin City Council, *"Environmental Impact Statement – Overall Evaluation"*, 1998
[27] Rattigan, S. *"The Dublin Port Tunnel: A Cost-Benefit Analysis"*,
[28] Ibid

construction had overstated the projects NPV as the cost of the scheme had been underestimated at €215 million, when it really cost €752 million.

It was recognised that 8200 heavy vehicles use the tunnel daily (one way trips), and 82.4% of heavy vehicles have been removed from the city centre,[29] leading to a range of benefits:

- ► The largest benefit of the project is travel time savings for both users of the tunnel and those remaining in the city centre. It was estimated that travel time was reduced by 19%, and that 46,100 people saved time. The value of these savings was €25.5 million.
- ► Reduction in accident rates and costs, as accidents were less likely to occur on the motorway. The cost savings per year were estimated at €12.3 million[30] (2002 prices)
- ► Due to less vehicle braking, vehicle operating costs also fell. As travel times were reduced by 19% in the city centre, €20.8 million in vehicle operating costs were saved annually. However, those using the tunnel go around the city and travel an added 11 kilometres relative to using the city centre, and the added cost of this is an estimated €5.4 million.

The HGV Management Strategy Review (2009) concluded that by removing heavier vehicles from the city centre, the HGV Management strategy has:[31]

- ► Reduced noise and pollution levels in the city
- ► Made city streets safer for vulnerable road users
- ► Made it possible to reallocate road space to vital public transport
- ► Removed 97% of 5+ axle vehicles from the East Wall Road.

However, proposals have recently been made to move the port of Dublin away from its current location. The new Port of Drogheda facility proposed for Bremore in north county Dublin near Balbriggan, about 32 kilometres north of Dublin City is being considered as the new location for the port. The reason for this proposal to move is because it is felt that the existing port does not provide enough space for future operations. Such a change would see the Dublin Port Tunnel's importance to the city of Dublin diminish as its use is most likely to fall. However, the port relocation plan has been rejected due to current economic hardships in Ireland.

Funding

The overall project cost was €752 million including €448 million in construction costs.

This project was funded by the Irish government under the National Development Plan and Transport 21 and by the European Union from the Cohesion Fund at 85% aid. This project was delivered through the authority's PPP mechanism.[32]

In the National Development Plan (NDP) (where the Dublin Port Tunnel was announced), PPP's were identified as being essential in helping to deliver much needed infrastructure required on the national road network. The NDP planned to spend €1.3 billion to finance PPP projects on national roads, which represented 23% of the planned total road investment program under the NDP. The government felt private finance was vital to remedy Ireland's infrastructural deficit as quickly as possible.[33]

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[29] Dublin City Council, *"HGV Management Strategy Six Month Review",* 2007, Dublin, DCC
[30] Rattigan, S. *"The Dublin Port Tunnel: A Cost-Benefit Analysis*", 2009
[31] Road and Traffic Department, *"HGV Management Strategy Review 2009"*
[32] National Roads Authority, *"M50 Dublin Port Tunnel"*, accessed 26 March 2012, http://www.nra.ie/RoadSchemeActivity/DublinCityCouncil/M50DublinPortTunnel/SchemeName,16534,en.html
[33] National Roads Authority, *"Introduction"*, accessed 26 March 2012, http://www.nra.ie/PublicPrivatePartnership/

3.2.2 Ports of LA and Long Beach - Alameda Corridor

The Port of Los Angeles is the busiest container port in the US; servicing 7.8 million TEU a year. It occupies 7,500 acres of land and water along 69 kilometres of waterfront.[34] It is adjoined by the Port of Long Beach which is the second busiest container port in the US. This port occupies 3,200 acres of land across 40 kilometres of waterfront. The seaport boasts approximately USD100 billion dollars in trade and provides more than 316,000 jobs; servicing 3.65 million TEU annually.[35] These two ports, with combined volumes of 11.45 TEU are a vital gateway to US-Asia trade.

The Case for the Alameda Corridor

International trade was growing substantially during the 1980's and 1990's, growing at nearly 3% a year. As such it was expected that cargo serviced by the Ports of Los Angeles and Long Beach would at least double if not triple between 1998 and 2020.[36] Such growth made it critical that port operations were efficient. However, Southern California already had a congested transportation network with poor intermodal connections, and so improvements to existing infrastructure were needed to accommodate the projected increases in freight.[37]

Prior to the corridor, there were four existing rail lines that were used to transport freight between the port and the national rail system in Los Angeles.

- The tracks had safety concerns, having little more than 'wigwag' crossing signals, dating from the original construction of the lines. The lines also went through the middle of the city; forcing trains to travel slowly (limited to 32 km/h).
- A large part of the tracks were shared with passenger services leading to scheduling conflicts and a reduction of freight rail capacity.
- The existing rail lines caused over 200 at-grade railroad crossings, equating to long waiting times for vehicles on local roads, and traffic congestion problems in the area.
- In response to these problems, the Alameda Corridor Transportation Authority (ACTA) was created in 1989 to fund, construct and operate the Alameda Corridor. The Alameda Corridor is a USD2.4 billion, twenty mile long railway solely dedicated to transporting freight directly between the ports and the transcontinental rail lines in downtown Los Angeles. [38] It is a series of bridges, underpasses, overpasses and street improvements that separate freight trains from street traffic and passenger services in order to improve rail links and alleviate the traffic congestion at at-grade crossings.

A hurdle presented itself when support from the cities through which the corridor would pass was needed. Many mid-corridor cities faced significant adverse effects if the corridor was constructed:

- Adverse effects of construction on local businesses, residents and road congestion
- Increased rail traffic and subsequent noise and air pollution
- Continued negative effects on residents and businesses near the corridor.

Through court proceedings and mitigations to each city, such as employing and training local residents, and providing funding for local youth; ACTA was eventually able to receive approval to construct the corridor.

Effectiveness

The Alameda Corridor has been able to reduce travel times to the national rail network from at least 2 hours, to 45 minutes, and increased train reliability. Freight trains no longer go through the city

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[34] The Port of Los Angeles, http://www.portoflosangeles.org/, accessed 21 March 2012
[35] Port of Long Beach, The Green Port, http://www.polb.com/, accessed 22 March 2012
[36] Agarwai, Giuliano & Redfearn, *"The Alameda Corridor: A White Paper"*, 2004
[37] Los Angeles County Metropolitan Transportation Authority (2002), *"Southern California Freight Management Case Study"*, http:www.LACTMA.net/trans_planning/CPD/publications/images/SoCA_FreightStudy.pdf
[38] Agarwai, Giuliano & Redfearn, *"The Alameda Corridor: A White Paper"*, 2004

and so do not have to give priority to passenger rail and are able to travel at faster speeds (64km/h instead of 32km/h). The corridor has eliminated conflicts at 200 at-grade rail crossings and reduced traffic delays. Hence ACTA claims that the corridor has improved the quality of life for residents of Southern California and fostered economic development. Approximately 50 trains a day use the Alameda corridor, carrying 13,000 TEU of containerised cargo, with numbers varying with arrivals of container vessels at ports. This represents about a third of the containers that are serviced by the ports of Los Angeles and Long Beach.

However, the Alameda corridor was expected to transfer a larger proportion of the total cargo. The reasons why it has not are:

- About 80% of the freight originating in Southern California stays in the region. More than 75% of all truck tonnage has a trip length of less than 50 miles.[39] Much freight is transported a short distance over which trucks are more cost effective. On average, goods for local distribution can be moved in four to seven days by truck compared to ten days by rail.[40]
- The Alameda Corridor ends in downtown Los Angeles. Beyond the Alameda corridor there are more tracks, but now they are shared with passenger rail, and as a result, the rail network beyond downtown LA gets congested.[41] Therefore some claim that the corridor was only able to push the existing bottleneck north and east, to Colton rail yard, the largest rail yard in Southern California, which has over 1,500 railcars passing through on a daily basis.

In response to these issues of congestion, two major railway improvement projects are proposed beyond the Alameda Corridor; The Alameda Corridor East Project and the Orange County Gateway; each involve the construction of grade separations and safety improvements.

Funding

The Alameda Corridor Transportation Authority was created so to fund this project in 1989. The project had several funding sources and a dependence on future revenue for debt repayment.

The Alameda Corridor is one of the few infrastructure mega-projects in recent years that have opened on time and within budget. It is a potential model of private-public partnership and innovative financing that may offer insights as to how large-scale infrastructure projects could be executed in the future.[42] The sources of funding can be seen below in

Table 4.

Table 4: Sources of funds for the Alameda Corridor

Source of Funding	Funds provided (USD million)	Percentage provided (%)
Revenue Bonds	1160	49
Federal Loan	400	16
Ports	394	16
MTA grants	347	14
Other	130	5
Total	2431	100

A USD400 million federal loan was obtained and then these federal dollars were leveraged through backing loans. ACTA lobbied the federal government for 2 years for the funds, and finally received the loan as the project was deemed environmentally friendly and a ‘high priority corridor’. The state government then provided a low interest rate loan and agreed to take a subordinated position on the bond.

[39] Agarwai, Giuliano & Redfearn, *“The Alameda Corridor: A White Paper”*, 2004
[40] Sanchez, F. *“Alameda Corridor: A $2.4bn flop?”*, Long Beach Press Telegram, 15 June 2003
[41] Erie, S. (2004) *“Globalising LA: The Politics of Trade, Infrastructure and Regional Development”*, Stanford: Stanford University Press
[42] Agarwai, Giuliano & Redfearn, *“The Alameda Corridor: A White Paper”*, 2004

ACTA issued USD1 billion in senior lien bonds, about half of which was tax exempt, and USD163 million in subordinate lien bonds. Relying on future revenue to repay debts made investment in the bonds risky, but an optimistic upbeat economic setting and positive projections of the corridor ensured the funds were raised. ACTA also received a grant from the LA County Metropolitan Transportation Authority, in exchange for the inclusion of an LACMTA representative on the ACTA board.

In 1994, the ports purchased necessary rights-of-way from railroads for USD394 million to assure impartial dispatching of trains once the corridor was operational and also to get access and control to the railroad property. The cost of capital of the project was 6.5%.

3.2.3 Port of Rotterdam – The Betuwe Route

The Port of Rotterdam is the largest port in Europe, and the world's tenth largest container port in terms of TEU handled per year; handling 11.1 million TEU during 2010.
It encompasses over 105 square kilometres stretching over 40 kilometres of waterfront.[43] It is an important entry port for Europe wide cargo.

The Case for the Betuwe Route

Currently the Port of Rotterdam is completing a 20% (2000 hectares) extension of the port area. This expansion of the port's size will represent a major increase in port handling volumes, with a projected growth of cargo by 5% a year. Therefore additional service frequency and reliability of road transport, inland waterways and rail services was required in order for the port to be able to efficiently handle freight and maintain its competitive edge. However, the supporting infrastructure seemed incapable of handling such growth:

- The Port of Rotterdam relied heavily on road transport - although by Australian standards, its reliance on other modes is exceptional - with 57% of container throughput being taken by road before the Betuwe route was complete (rail - 13%, inland waterways – 30%). However, there were many congestion problems on the roads in Rotterdam, particularly the A15, which is a crucial traffic artery for the port.[44] A big problem on the A15 was that the numbers of accidents on the motorway were growing (a major incident every few days).
- Passenger trains have priority on the Netherlands rail system, and they were increasingly taking up the networks capacity. It would be common to see freight trains stopping at borders or making way for passenger trains due to scheduling issues.
- Freight trains faced multiple bottlenecks such as single track bridges that caused delays when the bridge needed to be lifted for shipping.
- If these congestion problems were not relieved, freight flows on the rail network would grow at a slower rate than it potentially could (53% by 2025 instead of 64%), and the flows of transit freight would move away from Rotterdam.[45]

The Betuwe route, a 160 kilometre freight dedicated double track rail line between the Port of Rotterdam and the German national rail network; was completed in 2007, at a cost of €4.7 billion. The project allows freight trains free access across Europe and aims to provide an efficient alternative to the congested roads used to transport freight to and from the port. The freight rail line will improve travel times – trains can now travel at 100km/h instead of 60km/h[46] and reliability, as well as greatly increase the capacity of freight rail up to 200 trains a day can travel along the route - boosting Rotterdam's development as a major centre for transport, distribution and

[43] Port of Rotterdam Authority, http://www.portofrotterdam.com/en/Pages/default.aspx, accessed 22 March 2012
[44] OECD, *"Transcontinental Infrastructure Needs to 2030/2050: Port of Rotterdam Case Study"*,
[45] Koetse, M. J. & Rouwendal, J. *"Transport and Welfare consequences of Infrastructure Investment: A case study for the Betuwe Route"*,
[46] Ibid

production.[47] This is an important rail line as over 100 million tonnes of cargo throughput (25% of the port's total) travels between Germany and the port.

There was a large amount of public and political opposition to the Betuwe route:

- Rails operational capacity is often determined by other infrastructure and its operational limitations. For example, the Betuwe route considered by itself may be efficient, but the rail network it reaches in Germany may be congested, making rail from Rotterdam less attractive for haulers.
- Many believed that the project would have a negative economic impact and not repay the initial investment, though did not appreciate that the entire project would be funded by the government using their tax dollars.
- There were many concerns about the safety of the route as well as the environmental damage that the construction and operation of the scheme would cause.
- Doubts arose about whether a new freight rail line would attract demand from other transport routes. The port authority believed this route could increase rail's modal share of freight transportation to 20% by 2035.

In response to some of these worries considerable attention was paid to community impacts of the proposed route, with mitigation including passing the tracks through tunnels, sunken sections, the roofing of the most sensitive sections of the track, and added insulation in 400 homes.[48]

Furthermore, the Netherlands has amended the national environmental law, reducing the number of required project justification documents to streamline the environmental review process for nationally significant projects such as the Betuwe route.

Effectiveness

The Betuwe route has faced a number of issues since its opening in 2007:

- With a total cost of €4.7 billion, there were substantial cost overruns during construction. The initial budgeted cost of the project was €2.3 billion.
- The capacity of the line was expected to be around 200 trains per day. However, during the first two years of availability, only 20-30 trains used the rail link per day[49] due to signalling and safety problems as well as other issues.
- Although tolls per unit (€2.33 per train kilometre) are higher than unit variable costs of operation and maintenance, toll revenues do not cover the total costs of operation and maintenance. Together with the substantial costs of investment, the Betuwe route has had a negative economic impact.[50]

However, project management aims to reach a daily average use of 150 freight trains per day, within the next five years as usage of the line has increased steeply since 2009. During the second quarter of 2011 approximately 70 trains travelled (one way) over the Betuwe route per day. About 78% of all freight trains that travelled between Rotterdam and the German border chose to use the Betuwe Route during 2011.

Funding

The Betuwe Route cost €4.7 billion, and as the project was a Trans-European Network transportation project, the European Union provided €135 million in funding. The remainder of the project was entirely funded by the Dutch government. Private financing in the line, promoted by the

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[47] European Commission, 2005, Trans-European Transport Network: TEN-t Priority Axis and Projects 2005, Brussels
[48] US Dept of Transportation, *"Freight Transportation: The European Market"*, June 2002
[49] OECD, *"Transcontinental Infrastructure Needs to 2030/2050: Port of Rotterdam Case Study"*,
[50] Koetse, M. J. & Rouwendal, J. *"Transport and Welfare consequences of Infrastructure Investment: A case study for the Betuwe Route"*, *VU University, Dept of Spatial Economics, Amsterdam, The Netherlands.*

government in a bid to offset the large and rising costs, never materialised. There was some thought at this time of selling the rail infrastructure to private hands in the future. However, there has been some public–private cooperation in this project:

- Construction of rail service centres, built with government funds, are being managed by a private firm
- The port invested in a railroad bridge as part of a strategy to increase rail access to the port.

3.2.4 The Port of Miami – The Port of Miami Rail-only Tunnel

The Port of Miami is a significant transportation and economic hub for South Florida, contributing over USD12 billion to the local economy annually.[51] Port terminals handle more than nine million tonnes of cargo each year, including 0.85 million TEU in 2010, making it the largest container port in Florida and the ninth largest in the US. In addition, the port is considered the cruise capital of the world, forecast to handle over 3.6 million cruise passengers every year by 2015.

The Case for the Port of Miami Rail-only Tunnel

Due to growth of trade, as well as the Panama Canal expansion and the Port of Miami Deep Dredge Project, the port expects to handle more than 1.5 million TEU of containerised cargo and more than 3.6 million cruise passengers annually by 2015. These optimistic forecasts, compounded by the redevelopment occurring in downtown Miami made it necessary that supporting local road and rail infrastructure were efficient and capable of handling an increased task. However, in 2007, when this rail-road was being considered:

- Existing rail-roads were single tracked and ran through the city causing at-grade rail crossings. Therefore the service was restricted to off-peak hours due to traffic on local Miami roads. The railways were used infrequently, servicing 11% of freight throughput, and normally were only used to carry heavy machinery. 65% of freight serviced by the port originated from or was destined for an area within 50 miles of the port. Over such short distances rail services are not cost competitive relative to road transport.
- The port relied heavily on trucks to transport freight. To move between the interstate (giving them access to the rest of the country) and the port, they had to travel through the streets of downtown Miami which were going through a development boom.[52] Consequently the majority of roads that linked the port of Miami and downtown Miami had a volume to capacity ratio[53] of 0.7 or above. Many were operating at a ratio of 1.0, meaning the roads were at capacity.
- Nearly 16,000 vehicles travelled to and from the port of Miami through downtown streets each weekday. Truck traffic made up over 20% of this number.[54] By 2025, 24,350 vehicles are forecast to travel to the or from the port daily, making congestion problems through downtown Miami even worse.[55]
- Existing truck and bus routes presented safety hazards and restricted the port's ability to grow.[56] They also congested and limited redevelopment of the northern portion of Miami's Central Business District.[57]

In response to restricted port access and worsening downtown congestion, local leaders explored a range of improvements that would support both port growth and downtown redevelopment, while reducing traffic conflicts. A freight rail corridor utilising a combination of tunnelling and open-cut-below-grade techniques to bypass Miami's CBD was proposed. This service would consist of a 25 acre Intermodal Container Transfer Facility (ICTF) on-port property, and frequent short-shuttle

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[51] The Four Gates Company, *"The Economic impact of the Dante Fascell Port of Miami-Dade County"*, May 2006
[52] Cambridge Systematics Inc. *"Port of Miami Freight Access Study",* February 2007
[53] Volume to Capacity Ratio is the amount of cars on the road relative to the capacity of the road.
[54] Port of Miami Tunnel, *"Project Overview"*, accessed 26 March 2012, http://www.portofmiamitunnel.com/project-overview/project-overview-1/
[55] Ibid
[56] Robertson, A. (2010) *"Miami can't Afford to have Port of Miami Tunnel Delayed",* Miami Herald
[57] Ibid

trains would connect the port directly to the Western Miami-Dade county distribution infrastructure via an expanded Florida East Coast Railway network.[58] The proposed scheme aimed to increase rail's capacity to service freight, reducing the need to use road transport and the number of trucks travelling via downtown Miami.[59]

- Curfews would cease to effect rail operations, with a 24-hour a day timetable, and there would be 100% turnover of containers at the intermodal container transfer facility. The on-port ICTF having three loading and unloading tracks
- By investing in this shuttle service, 90% of all Port of Miami containers would be handled by rail, leaving only 10% to be carried by trucks, and greatly reducing traffic congestion on downtown Miami roads.

For the rail tunnel to be operationally feasible, separation of the freight line from the remainder of the Florida East Corridor had to be extended through Miami to a point outside the immediate area of congestion, and support track needed be developed to manage train flows and train lengths into and out of the port. However, many of the project's characteristics lead to low levels of public support:[60]

- The port was already investing in the Port of Miami Road Tunnel which would also cost over USD1 billion, in order to achieve the same purpose of reducing traffic congestion. Therefore it would be difficult to acquire finances for this project.[61]
- The boring of a tunnel would leave a significant environmental impact on Dodge Island, which was already set to be impacted by the boring of the Miami Road tunnel.
- Building shipper support for a rail corridor would be challenging The port had limited acreage to use for the project and 65% of cargo serviced originated within 50 miles of the port, making rail uncompetitive with road transport in both cost and service for a large amount of throughput.

Status

At the moment the Port of Miami has not started construction of this project, and instead is waiting for the completion and opening of the Miami Port Truck Tunnel in 2014. Unfortunately, not enough data was available on the road tunnel for us to consider it as a case study.

When the merits of this project were under consideration, and the authors of the study were proposing their recommendations, Miami was heavily affected by the Global Financial Crisis. Florida real estate values have been some of the hardest hit in the US. The Global Financial Crisis slowed the redevelopment of downtown Miami, put a stop to the construction of the Port of Miami Road Tunnel[62] (construction resumed in 2009), and adversely affected the growth of the port.

While there were high expectations in regards to growth in both cruise passengers and TEU of containerised cargo serviced by the port, growth since 2008 has been subdued in both categories:[63]

- In 2007 it was forecast that cruise passengers at the port of Miami would grow to over 5 million. In the year before the GFC, cruise passengers totalled 4.1 million, and had grown 9.2% from the previous year. However, by the end of 2010, cruise passengers only grew by approximately 13,000.
- Forecasts in 2007 indicated that by 2015 the port of Miami would service 1.5 million TEU of containerised cargo per year. In 2007, the port serviced 0.89 million TEU, and by 2010 this figure had decreased to 0.85 million.

[58] Cambridge Systematics Inc. *"Port of Miami Freight Access Study",* February 2007
[59] Tester, H. (2011) *"Port of Miami Tunnel Dig to get into High Gear",* NBC Miami
[60] Ibid
[61] Gabriel Lopez-Bernal, *Port of Miami Container Crisis"*, Transit Miami, April 2007, http://www.transitmiami.com/miami/port-of-miami-container-crisis-part-2
[62] Port of Miami Tunnel, *"Project History"*, Miami-Dade County, http://www.portofmiamitunnel.com/project-overview/project-history/, accessed 27 March 2012
[63] Port of Miami, *"Port Statistics"*, Miami-Dade County, http://www.miamidade.gov/portofmiami/business-port-statistics.asp, accessed 27 March 2012

The projected steady growth of cruise passengers and container throughput were both used as arguments as to why the port of Miami rail tunnel was needed. As such, the GFC seems to have diminished the immediate need for the project. Furthermore, when the Sub-Prime Crisis began, construction of the Miami Port Road Tunnel was already underway:

- This was an expensive project; budgeted to cost over USD1 billion
- The road tunnel aimed to serve the same purpose as the rail tunnel; reducing traffic congestion.

Therefore it was resolved that, as the road tunnel was already going to be constructed, and at quite a substantial cost, during the GFC, the city could not afford to invest in another expensive project with such similar objectives. The project will be considered again in the future.

3.2.5 United States: Dedicated Truck Lanes – i70 – Eastern States

The interstate 70 (i-70) is a highway that stretches over 2153 miles in the US. It runs from the I-15 near Cove Fort, Utah, to a Park and Ride near Baltimore. The section of this highway under consideration is an 800 mile stretch of road, 240 miles of which passes through urban areas, starting at the Ohio/West Virginia state line; extending west across Ohio, Indiana, Illinois and Missouri, and ending just west of Kansas City, Missouri. At present, due to over 45,000 vehicles using this interstate daily, there is heavy congestion over 53% of the 240 mile segment of the i70 that covers urban areas.

Dedicated truck lanes (DTLs) have been proposed in an attempt to alleviate the problem. The proposal involves using existing infrastructure and segregating it, dedicating 4-lanes, 2-lanes on each side of the interstate solely for the use of Trucks. The dedicated truck lanes are seen as a way to reduce congestion, improve safety, and offset the maintenance costs of general purpose lanes.

This example is a non-port related one. However, it is included here because it provides analysis of dedicated truck lanes on major existing roads.

The Case for Dedicated Truck Lanes

In 2011 a detailed analysis evaluating the current and future problems and needs on the I-70 corridor demonstrated that the current conditions of the I-70 corridor warrants investments and improvements:[64]

- The average daily traffic throughout the entire corridor is over 45,000 vehicles, with a maximum over 250,000.
- Average daily truck traffic is over 11,000, with a maximum over 26,000. The volume of freight movement along the I-70 route is growing. Current truck volumes are such that truck traffic is 21.5% in urban areas and 28% in rural areas, which is higher than other Interstates.
- Between 2002 and 2008, exports from corridor states nearly doubled, increasing from USD75 billion to nearly USD140 billion.
- Over 53% of the 240 mile urban segment was under heavy congestion. This congestion was seeing truck speeds below posted limits.
- The projected 2035 average daily traffic will be over 100,000, which includes over 25,000 trucks.
- By 2045, 70% of the I-70 corridor is expected to be congested if additional improvements are not made.
- The pavement is in need of improvement and sections of the road have obsolete design features.[65]

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[64] Federal Highway, Administration, *"Dedicated Truck Lanes: Feasibility Study"*, 2011
[65] Federal Highway, Administration, *"Dedicated Truck Lanes: Feasibility Study"*, 2011

- Crashes on the I-70 are higher than the national average, with 10,444 crashes during 2009, 26% involving trucks. By 2045, 30,500 crashes are expected on the road in a no-build scenario. In 2011, the crash rate for trucks in congested areas was 3.5 times greater than that of passenger vehicles.

Given the amount of freight trucks using the roads and the degree of congestion, the project proposes that dedicated and segregated truck lanes are constructed along an 800 mile section along the I-70 from the I-435 beltway on the eastern part of Kansas City, Missouri to the Ohio/West Virginia border near Bridgeport. The concept proposes segregating the existing infrastructure and using four lanes, two in each direction as DTLs, with at least one interchange per county providing access to the truck lanes.

For this project to be approved it would need both public and political approval. The DTL generated significant initial support among many stakeholder groups who saw potential benefits:[66]

- Reduce congestion.
- Improve safety.
- Offset the maintenance costs of general purpose lanes.
- They present an opportunity to pilot increased size and weight vehicles on a facility dedicated to trucks.
- They can attract freight movement from other parallel routes (I-80 and I-40).
- Increased highway capacity and improvement in reliability and transport costs.

However, there were also concerns among the I-70 stakeholders with the construction of DTLs due to uncertainties regarding:

- Access to business and communities along I-70. Limiting truck access to a few locations would severely limit the support of local business communities.
- The cost of infrastructure and how it would be funded.
- DTLs impact on the larger transportation systems within communities.
- High productivity vehicle operations and implementation: will High productivity vehicles be forced to only use DTLs?
- Spikes in fuel prices will lead to discussions about other forms of transportation that are more fuel efficient.

To evaluate whether or not the DTLs should be made, scenarios where the lanes were built and not built were compared, and the ramifications of each scenario were projected and then compared. In the study three scenarios were compared:

- No-Build Scenario: Continue with the existing I-70 roadway and its current maintenance, operations and preservation.
- Scenario 1: Develop two dedicated truck lanes in each direction within the existing I-70 corridor alignment. Furthermore, provide 70 truck access points, 21 urban interchanges, and physically separate the DTLs from the general purpose lanes with barriers.
- Scenario 2: Develop two dedicated truck lanes in each direction within the existing I-70 corridor alignment. Furthermore, provide 43 truck access points, 18 urban interchanges, and physically separate the DTLs from the general purpose lanes with barriers.

The following analyses were conducted to evaluate the impact of DTLs:

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66 Federal Highway Administration, *"CORRIDOR: Interstate 70 (I-70): Dedicated Truck Lanes - Missouri to Ohio"*, Indiana DOT in partnership with the Missouri, Illinois and Ohio DOT's

- Safety: Within 15 years, building DTLs would reduce crashes by 33%, fatalities by 100 to 150, injuries by 4,000 – 4,500, property damage accidents by 8,000-10,000 and will lead to USD1 billion in savings. This exists due to the correlation between congestion and safety on the road. Furthermore, DTLs are expected to reduce truck/car conflict crashes by 95%.
- Economic: The total regional economic output benefit through to 2030 is approximately USD36 billion in additional output and 258,000 additional jobs due to construction, operation and maintenance of the DTLs as well as added travel efficiencies.
- Reduction in Congestion: This was evaluated by comparing DTLs to additional general purpose lanes. The comparison showed significant improvements in I-70's operation with DTLs with significant reductions in lane density almost throughout the interstate (assuming that 80% of trucks would use DTLs). In the No-build scenario, 70% of the corridor is anticipated to be congested in 2045. With DTLs, half of the expected congestion in general purpose lanes will be eliminated, while 97% of DTLs will be uncongested.
- Environmental Analysis: The DTLs held no fatal environmental flaws, but could affect noise, air quality, environmental justice and carbon emissions.
- Approximately USD10.6 billion in tolls could be earned if DTLs are constructed and then tolled at a rate of USD0.10 per mile, which was deemed optimal for revenue purposes.

Initial planning cost estimates show the cost to construct, operate and maintain DTLs for 40 years at approximately USD50 billion. This is in comparison to USD32 billion to reconstruct, operate and maintain the I-70 corridor in its existing configuration for the same 40 year period.

Status

Based on the analysis presented, the design and operations scenario that was recommended was:

- Fully separated DTLs inside the passenger lanes.
- DTLs follow beltways in urban areas.
- Truck access provided through either 43 fully separated interchanges or 70 access points with a combination of fully separated interchanges and slip ramps.
- Electronic tolling of all vehicles using the I-70, and allowing high productivity vehicles to use the I-70.
- Uniform regulations and operating approaches across the corridor.
- Design features to allow integration of technologies, alternative fuels and operating scenarios that may realistically be available in the future.

Given this analysis, these options would provide the best design features to:

- Improve safety and reduce congestion.
- Improve freight productivity.
- Produce the best operating scenario to provide a financial return on investment.
- Result in the best cost avoidance or lowest costs for long term pavement maintenance.

At this stage no formal design standard has been selected and agreed upon for the I-70 dedicated truck lane corridor. In the current economic climate in the United States, it may be hard to raise the necessary capital for the project. In terms of its value or return to society, we could only find reference to a multi-variable analysis covering safety, congestion, cost, environment and economics. No NPV was available.

3.2.6 United States Dedicated Truck Lanes – SR 60 - California

The Regional Transportation Plan for the Southern California Association of Governments identifies dedicated truck lanes (DTLs) as a means to:[67]

- More efficiently keep goods movement flowing smoothly.
- Improve overall mobility along the freeway.
- Improve traffic safety and air quality.

When evaluating whether or not dedicated truck lanes were feasible for the region, high priority was placed on the SR-60 corridor. The SR-60 is a state highway in California running from the I-10 near the Los Angeles River, east to the I-10 in Riverside County. It runs for 70 miles, serving the cities and communities on the eastern side of the LA metropolitan area and runs through the industrial sections of the San Gabriel Valley and through the growing warehouse district south of Ontario. The section studied was the 38 mile stretch from the I-710 to the I-15. In 1999, the Southern California Association of Governments commissioned a truck lane feasibility study for the SR-60.

The SR 60 is a very constrained urban corridor with few opportunities for improvements as most of its centre median is utilised. Consequently, all truck lane improvements would require freeway widening outside the existing paved roadway and may involve some right of way acquisition.

This example is different to the i-70 considered above in that the additional truck lanes would be constructed outside the current road.

The Case for Dedicated Truck Lanes

The SR 60 is one of the most heavily truck-trafficked corridors in Southern California; some segments of the corridor carried 28,000 trucks a day in 2000, which was about 15% of total traffic.[68]

The SR 60 also currently has a few safety issues, having, in the past, nearly 400 accidents per year involving trucks:

- The most crucial safety issue along the SR 60 corridor involved the SR 60 and SR 57 merge segment. Short distances were provided here for truck weaving even though trucks need extra distance due to their size and operational characteristics.
- California law required trucks to stay in the two right lanes and travel 10mph slower than general traffic. This caused safety concerns when vehicles needed to merge into the stream of traffic because it led to more interaction between general traffic and trucks. Such interaction intimidated car drivers and caused visibility issues.

Consequently, providing exclusive lanes for trucks would definitely improve the SR 60 corridor's safety record, as they would lead to less interaction between trucks and passenger vehicles.

Truck volumes travelling along the SR 60 are projected to grow in the 25 years between 1994 and 2020. Truck volume statistics for 1994 and forecasts for the 2020 are given in the table below:

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[67] Kaku Associates of Santa Monica

[68] Fischer, M. J. *"Planning Truck-Only Lanes: Emerging Lessons from the Southern California Experience"*, August 2002

Table 5: Truck volumes per hour per direction on different parts of the SR 60

Location	1994	2020	Growth 1994-2020
West End	1,890	2,850	960
East of I-605	1,360	2,200	840
SR-57 Junction	1,474	2,970	1,500
East of SR-71 Junction	1,180	2,310	1,130
East End	2,200	4,000	1,800

Source: Southern California Association of Governments

The volume of trucks in the SR 60 freeway combined with the other vehicles utilising the two slow lanes was higher than the capacity provided by those lanes. The SR 60 suffered from congestion in the morning (5am to 8:45am) and the evening (3:15pm to 7:45pm). With the average travel times ranging from 14 to 32 minutes (22-34mph) in the morning and 7 to 23 minutes (28-43mph) in the afternoon.

This study analysed two scenarios, in order to see the impacts that dedicated truck lanes could have on the safety and operations of the SR 60:

- No Build scenario: Both trucks and other vehicles remain on the existing 'mixed-flow' lanes'.
- Build Scenario: Provide an exclusive truck facility that runs the entire length of the study corridor (38 miles between the I-710 and the I-15).

This analysis indicated that:

- The total number of mixed flow lanes provided on the SR 60 would not be sufficient to allow the route to operate at an acceptable level throughout most of the corridor.
- Once the exclusive truck lanes are implemented, it would alleviate some of the burden from the mixed flow lanes, but additional mixed flow lanes will still be needed by 2020 for the SR 60 to operate at 'Level of Service F(0)'; an acceptable level of service.
- Total number of mixed flow lanes required under the 'build scenario' is always smaller than under the 'no build' scenario.
- With exclusive truck lanes, the weaving activity for the mixed flow traffic is expected to improve compared to the level of service in the year 2000. However, higher weaving flows are expected to occur at interchanges containing the truck facility access points. Hence truck interchanges need to be made in a way that accommodates the exclusive lanes truck weaving activities.
- When large trucks are involved in fatal crashes, there were two vehicles involved in the incident 60% of the time. In these multi-vehicle accidents, fatalities were 40 times more likely to occur than when the crash involved only smaller vehicles. Therefore reducing interactions between the two types of vehicles could enhance safety, and the number of fatal crashes could be reduced.

Consequently, it was recommended that the growth in truck traffic would be ideally accommodated by dedicated truck lanes to preclude the SR 60 from reaching unacceptable levels of congestion. Since an exclusive truck lane could accommodate approximately 800 trucks per hour, the predicted growth in truck traffic would need four exclusive truck lanes (two in each direction).

The Truck Lane Task Force identified three main strategies as sensible to the SR-60 corridor:

- Allowing trucks to share the carpool (High Occupancy Vehicle (HOV)) lanes at limited time periods
- Adding truck lanes (2 in each direction) to the freeway at grade outside the existing freeway roadway. These lanes will be separated from the mixed flow lanes by barriers.

- Adding truck lanes (2 in each direction) above the freeway grade, and were proposed to be built within the existing median island of the SR 60.

The evaluation of each of these strategies was based on several criteria including accessibility and mobility, cost-effectiveness, safety impacts, operational characteristics, regulatory concerns, regional benefits and environmental sensitivity.

Based on the characteristics of each alternative for each criteria and on the year 2020 truck volumes forecast to use the truck facility, the Task Force subsequently decided that the “mix trucks with carpools” alternative would not be ideal for the SR 60:

- It would create safety problems due to the variability of speed between cars and trucks as well as cars in the carpool lane suffering from blocked visibility.
- It did not allow for passing opportunities or storage space for breakdowns.
- Invoked regulatory issues since state law limits trucks to right lanes, and carpool lanes contain usage limitations due to funding sources.
- This option did not really add capacity to the road and based on the forecast 2020 truck volumes, it was determined that there is demand for four dedicated truck lanes.

Forecast truck volumes indicated that a four-lane facility would be required to accommodate the truck demand, either at grade or above grade. The alternatives were analysed based on operational conditions, safety, physical constraints and cost as well as environmental impacts.

Above grade dedicated truck lanes are more likely to provide operational and safety concerns than DTLs that are at grade:

- Operationally, longer ramps are required in an above grade structure to accommodate truck deceleration on the exit ramps (due to downgrade) and to accommodate truck acceleration on the entrance ramps (due to upgrade).
- Safety concerns involve the incident response on above grade sections which are often more challenging. Security underneath above grade structures is also a concern.
- Furthermore, the construction costs of above grade sections would be much higher than at grade dedicated truck facilities.

On the other hand, the at-grade widening alternative would require acquisition of new right of way at various locations along the corridor:

- For 30% of the corridor’s length, adding a lane of capacity would require acquisition of new right of way on each side of the corridor.
- Adding two lanes in each direction would require new right of way for 50% of the corridor on the north side, and for 60& of the corridor on the south side.

This would adversely affect residences, commercial properties and environmentally sensitive areas adjacent to the freeway. Impacts of above grade segments would be of a lesser degree

- Adding an above grade structure in the freeway’s existing right of way would be possible within existing paved section for 40% of the SR 60.
- Only 2% of the corridor length would require new right of way.

Status

A recommended alternative was developed combining elements of both analysed alternatives to form a hybrid solution. The main feature of the recommended alternative is to add four dedicated truck lanes throughout the corridor. These dedicated truck lanes would be constructed both at grade and above grade:

- At grade, for the majority of the corridor.
- With two sections above grade, each above grade section being at each end of the corridor:

  I. One above grade section would be at the western end of the corridor (from I-710 to Vail Street).

  II. The other above grade section would be as the eastern end of the corridor; east of the I-605 (from I-605 to Fullerton Road).

It was felt that due to operational and safety concerns above grade sections along the corridor should be kept to a minimum. In the two separate sections of the corridor where above grade structures were recommended, it was felt that elevating the truck lanes would avoid the extreme amount of property acquisitions that would have been necessary if the dedicated truck lanes had been made at totally at grade in those locations.

The Truck Lane Task Force and Goods Movement Advisory Committee accepted the consultant report in late 2000 and were encouraged that the project appeared feasible. Additional planning/engineering studies were expected to begin in Fiscal Year 2002/2003.

However, this project has yet to be implemented in Southern California even though the plan to construct them was in the Regional Transportation Plan of 2004. Currently there are projects being undertaken on the SR 60, including a Pavement Rehabilitation Project and the Boulevard Bridge Repair. Furthermore, in 2007, major freeway expansion was undertaken near where the 91, 60 and 215 converge in order to mitigate the traffic congestion on the route. However, the expanded freeway still serves dual functions throughout the corridor. There are no mentions of current or future projects involving dedicated truck lanes.

Funding

The program would be expensive. The Southern California Association of Governments included USD4.3 billion for the SR-60 truck lanes in the 2001 Regional Transportation Plan, of which approximately 70% was expected to come from public funds with the remainder financed through tolls.

The analysis found that approximately USD1.2 billion of USD4.3 billion in corridor construction costs could be financed via user fees on exclusive truck lanes.

The toll analysis was conducted to maximise toll revenues. The optimum revenue occurred at a toll rate of:

Table 6: Optimal toll rates

Truck Category	USD per mile
Heavy-Heavy Trucks: Greater than 33,000 pounds Gross Vehicle Weight	0.70
Medium-Heavy Trucks: Between 14,000 and 33,000 pounds Gross Vehicle Weight	0.53
Light-Heavy Vehicle Trucks: Between 8,500 and 14,000 pounds Gross Vehicle Weight	0.35

Source: Fischer, M. J. *"Planning Truck-Only Lanes: Emerging Lessons from the Southern California Experience"*

At this toll rate, most models forecast that 70% of the potential users of the truck lanes would be diverted to the mixed flow lanes and revenues would cover only 30% of the amortised capital cost and maintenance cost of the project.

It was concluded that dedicated truck lanes are feasible along the SR 60 under certain conditions:

- If the option is pursued to add an above grade structure in designated portions of the corridor for engineering and environmental reasons.
- If public recognition of the benefits of SR-60-corridor truck lanes to the overall transportation picture results in support for public funding (federal, state and regional) for financial viability.

With a large gap between user-fee revenue and construction cost, it seems unlikely that other private sources of funding could be found, as it seems unlikely that the venture would be profitable. Therefore, project construction will require an infusion of capital from local, state and federal sources. This public investment may be justified because providing dedicated truck lanes would reduce the requirement for mixed-flow lanes on the SR-60 freeway in 2020.

One possible scenario for funding for the SR-60 truck lanes was developed. This funding scenario attempts to raise as much debt backed by the net user fee revenue as possible, and fund the gap with a combination of federal, state and local grants, local debt and GARVEE bonds.[69]

Table 7: Funding Scenario

Funding Source	Value	Percentage
Project-Backed Debt:		
User Fee Revenue Bond	508	12%
Capital Appreciation Bond	427	10%
Federal Loan	222	5%
Grants	1,200	28%
Non-Project Debt:		
Local Debt	1,000	23%
GARVEE Bond	900	21%
Interest Earned on Construction Fund	24	1%
TOTAL	4,281	100%

Ongoing operations of the SR-60 truck lane facilities would primarily be funded with user fee revenues. However, federal and local assistance was going to be needed to handle the GARVEE bonds and local debt, respectively.

3.2.7 Concluding Remarks

Table 8 below, summarises the international cases studies under a matrix of characteristics and benefits. A number of observations can be made about the domestic and international literature review. There is a wide range of different policy and economic reasons behind the development of dedicated and priority freight projects – but some common factors exist which are summarised below:

- Even where a dedicated/priority freight project appears an attractive option to address genuine infrastructure challenges on a network, such infrastructure is not always commercially or economically feasible. In many cases, cost benefit analysis was negative, financing not available, or users unwilling to pay for the full benefit promised.
- Road tunnels are one way, albeit an expensive one, to remove vehicles from one congested area to another less congested area. But they are expensive and require significant volumes to be self-funding.
- Rail is seen by many as having an important role in relieving congestion by taking trucks off roads. Costs are also very high with budget over-runs common.
- Truck-only or managed lanes are a newer strategy that is popular in the United States. They have relevance beyond the port context possibly even to the heavily congested motorways in Sydney and to a Melbourne.
- There are also important lessons to learn from the unsuccessful examples:
    I. Dedicated infrastructure might still conflict with other users in the corridor.

[69] GARVEE bonds are tax-exempt debt instrument financing mechanisms that are backed by annual federal appropriations for federal-aid transportation projects.

II. The clearer the property rights, the more interest from the private sector in investing.

III. Dedicated/priority infrastructure is capital intensive – so it is inherently harder to make the economic case for it – the benefits needs to be much stronger.

IV. This type of infrastructure might not address weak demand – for example, for short haul rail freight, the benefits of dedicated infrastructure may not be enough to outweigh the double handling costs of rail compared to road.

Table 8: Overview of international case studies

	Port of Dublin	Port Miami	Betuwe Route	US I-70	United States – SR 60
Conflicts	√	√	√		√
Congestion	√	√	√	√	√
Rapidly growing demand	√		√		
Productivity/ Vehicle Productivity				√	√
Safety				√	√
Cost Savings				√	
Urban Renewal		√			
Economic or city Development	√	√	√		
Net Benefits	√				
Private financing					
Land use restrictions					

4. Principles for Dedicated or Priority Freight Infrastructure

This chapter builds on the research and analysis in the previous chapters to identfy a set of principles for considering dedicated and priority freight infrastructure. It considers:

- The purpose of the principles and the nature of the market for dedicated and priority freight infrastructure
- Principles underpinning the demand for dedicated and priority infrastructure
- Principles underpinning the supply for dedicated and priority freight infrasture

Summary of principles for dedicated and priority freight infrastructure

The problems facing Australia's ports are unique and so are the solutions. Each port has a complex mix of interactions between several key parameters including congestion levels, port capacity, trade task, transport links, prices and regulatory and governance frameworks. Furthermore, each type of dedicated and priorty freight infrastructure is associated with a unique stream of costs and benefts. These factors combined mean that it is not possible to develop a standardised equation or congestion threshold for considering dedicated and priority freight infrastructure. Rather, each port and infrastructure proposal must be considered on a case-by-case basis.

There are however, a range of underlying factors that drive the viability of dedicated and prority freight infrastructure. These include a mix of supply and demand market factors.

Principles of Demand:

- Conflicts between users
- The freight task and volumes
- Distance
- Congestion
- Land use planning
- Amenity concerns
- Safety concerns
- Willingness to pay

Principles of Supply:

- Capacity
- Cost effectiveness
- Form of infrastructure

As the drivers of supply and demand for dedicated and priority use infrastructure change over time, so does the viability of such infrastructure. Therefore, it is vital to take a long term and dynamic view of all the factors affecting supply and demand for freight infrastructure to adequately plan for the future transport task.

4.1 Key Considerations in Developing the Principles Framework

The objectives of the principles framework are twofold. First, the priciples are applied at a high level to identify the case studies for further examination in Stage Two of the study. Second, a more detailed and thorough application of the principles is conducted in Stage Two of the study to establish the feasibility of dedicated and priority freight infrastructure.

Our research has highlighted the unique nature of ports in Australia and internationlly – the challenges facing each port are different and so are the solutions. At each port there is a range of complex interactions between key parametres including congestions levels, port capacity, trade task, transport links, prices and regulatory and governance frameworks.

Furthermore, there is a range of different types of dedicated and priority freight infrastructure across different modes and each type of infrastructure has a unique stream of benefits and costs.

Therefore, there are a number of combinations of key parameters and infrastructure types that may support the development of dedicated and priority freight infrastructure however, each port and each proposal for dedicated and priorty freight infrastructure must be considered on case by case basis.

Our examination of examples of dedicated and priority freight infrastructure, combined with a research on Australia's ports, has identified several key parameters suggest underlying principles for considering dedicated and priority freight infrastructure.

We have taken a market-focused approach to establishing the conditions under which dedicated and priority freight infrastructure could be justified, identifying a range of factors that influence the supply of and demand for such infrastructure.

4.2 Factors of Demand

Examining the demand for dedicated and priority freight infrastructure is an important step in considering the conditions under which dedicated and priority freight infrastructure could be justified.

4.2.1 Conflicts between users

Conflicts between users with competing interests on shared infrastructure is a fundamental driver of dedicated and priority freight infrastructure. Indeed, separating users on infrastructure was the cited in several international examples including the Port Dublin road tunnel, Port Miami rail tunnel, and the Port of Rotterdam rail line.

The extent to which this type of infrastructure delivers efficiency gains depends largely on the nature of the development. In some instances, dedicated and priority freight infrastructure may mean that 'dedicated' infrastructure is developed in 'shared' corridors. This is the case for rail servicing Port Botany whereby dedicated freight lines share the transport corridor with priority freight trains.

While conflicts are a key determinant of dedicated and priority freight infrastructure, they are not required for this type of infrastructure to be viable. For example, dedicated infrastructure being developed to service Australia's iron ore and coal fields is not in response to conflicts. Rather, this is in response to demand for large scale freight transportation.

4.2.2 Congestion

There is substantial congestion on many roads surrounding Australia's major container ports. In Sydney, the M5 East is heavily congested with congestion lasting more than 13 hours a day and slowing traffic to 22 kilometres per hour towards the city and 30 kilometres per hour from the city to the port. Congestion is also a widespread problem in Melbourne with several pinch points around the port including the West Gate Freeway, Docklands Highway and Somerville Road in Yarraville.

As the freight task increases, this congestion will worsen. Road freight has grown rapidly in recent years and currently carries approximately 91% of the national container trade. Melbourne expects truck numbers to go from 6,000 journeys a day currently to 12,000 per day in 2035. Sydney expects a doubling in only ten years, with numbers going from 2,900 to 6270 by 2021.[70]

However, while road congestion is increasing, the numbers of vehicles accessing the port are a relatively small share of overall traffic. This is the case in Sydney with freight vehicles accounting for only 10% of traffic on the M5, or less than 8000 trucks per day. Similarly, freight transport in Melbourne accounts for around 14% of road transport in and around Melbourne, while the port generates less than 2% of vehicles on the Metropolitan network.[71]Hence, road freight is a contributor, but not the key driver of congestion. Therefore, separation of freight and passenger traffic would likely have a significant benefit for freight traffic, without a notable impact on congestion overall.

Nonetheless, dedicated or priority freight infrastructure has the potential to deliver productivity gains to freight supply chains and alleviate congestion. An example is the Dublin Port Tunnel, which connects the port with major highways, bypassing the city centre. The tunnel gives preference to trucks through applying tolls to vehicles weighing less than 3.5 tonnes. Average travel time has been reduced by 19% delivering time savings valued at more than €25 million as well as benefits in the forms of reduced accident costs and vehicle operating costs.

4.2.3 The freight task and volumes

The volume of the freight task and ability to achieve economies of scale in transportation is critical to the viability of dedicated and priority freight infrastructure. There are several examples of such infrastructure developed to support the coal fields of eastern Australia and the iron ore fields of Western Australia. The large volumes of over 50 – 60 million tonnes on each individual system[72] are financially self-sustaining and return either an adequate regulated profit on third party provided lines in eastern Australia, or contribute to the ultimate high profitability on the vertically integrated company owned lines in Western Australia.

Australia’s two largest container ports at Melbourne and Sydney face a freight task of 2.4 million TEU and 2 million TEU respectively. This is expected to grow significantly reaching 7 million TEU for Sydney by 2030 and 8 million TEU for Melbourne by 2035. The critical question is: are the current and/or forecast volumes of freight sufficient volume to warrant investment in dedicated or priority freight infrastructure. The answer to this question must be grounded in analysis of congestion levels and the capacity of existing infrastructure.

An issue with the major Australian container ports is that freight comes and goes to multiple destinations, albeit predominantly, as shown by origin/destination studies, within a short, 0- 40Km radius of the port. The lack of consolidation along a single corridor results in a large number of low volume vehicles (2 – 3 TEU capacity trucks) required to carry out the freight task. The use of intermodal terminals, which has developed most extensively in Sydney, is one way to combat this plethora of vehicles around congested port areas. The theory is that containers are “funnelled” in large batches to a location removed from the port area. Rail, with its greater carrying capacity is employed to move batches of 90 - 100 TEU per shuttle to Enfield, 18 kilometres from the port, with further plans to also run in future out to Moorebank, which is around 30 kilometres from the port. Another example of funnelling is in Brisbane, where large capacity trucks, A-doubles, capable of carrying four TEU, are used during off-peak times to run empty containers between the stevedore’s terminal and empty container yards within the port confines. These are called block bookings.

While the theory of funnelling is clear and appealing in moving large volumes of containers from a congested area to a less congested area, the economics of it is fraught with difficulty. Rail, the predominant and only vessel, apart from water borne barges to achieve it is uneconomic over short

[70] See Shipping Australia limited, Metropolitan Intermodal Terminal Study, 2011 page 7.
[71] Victorian Freight and Logistics Council, Freight Transport and Urban Congestion
[72] In fact one such example of dedicated freight infrastructure, that by GVK Hancock Coal in Queensland’s Galilee Basin, involves dedicated line of 498 kilometres to carry up to 60 million tonnes of coal to port.

distances compared to trucks. It is difficult to find any successful unsubsidised rail intermodal examples anywhere in the world. In Fremantle the Western Australia Government subsidises rail by $43 per TEU to carry containers from the port to the main freight distribution area at Kewdale, by rail. Despite this only 47,000, less than 10% of the ports TEU, travelled by this mode. Little mention has made so far in the extensive analysis of both the Enfield and Moorebank intermodal terminal expansion projects about the financial viability of them as shuttle operations from the port. At the same time Patrick Rail closed its rail shuttle service to Camellia in 2010 and earlier in 2007, in Melbourne, CRT similarly closed its port rail shuttle run with German sourced sprinter trains. Queensland Rail Ltd has advised us that they have looked at rail shuttles from Acacia Ridge to the Port of Brisbane for a number of logistics companies but found that the volumes forecast were not sufficient. The costs, particularly in purchasing fast accelerating locomotive engines that could traverse the Citytrain network intermingled with passenger trains, were also too high.

4.2.4 Distance

The distance of freight transportation influences the viability of different types of dedicated and priority freight infrastructure. Road transport has an inherent advantage over short distances compared to rail, and conversely for long distances. The reason is that rail has a lower line-haul cost per tonne-kilometre or TEU-kilometre travelled but incurs higher terminal costs because it relies on trucks to deliver freight from the rail siding or intermodal terminal to the customer's door, with a consequent doubling of handling costs. Over long distances, the low line-haul costs of rail more than compensate for the higher terminal costs. Over short distances, the high line-haul costs of road haulage are less important and lower terminal costs more important.

In Sydney, approximately 98.5% of container imports are destined for metropolitan Sydney, and only 14% of the freight task is carried by rail. With the bulk of the freight task destined for nearby metropolitan areas, it is not surprising that only a small proportion is carried by rail.

4.2.5 Land use planning

Integrated transport and land-use planning gives rise to the possibility of setting aside buffer zones around the port and transport corridors to safeguard the use of freight infrastructure.

With most of Australia's metropolitan ports located on the fringe of rapidly growing cities, urban encroachment and poor integration between transport and land-use planning is a potential barrier to long-term freight productivity. Stakeholder consultations highlighted examples in Adelaide where urban residential developments were established alongside the transport corridor to and from the port. Following this development, curfews were applied to rail freight, which increase the time and costs associated with freight transport.

4.2.6 Amenity concerns

Freight transportation through urban areas gives rise to amenity concerns including pollution, visual impacts and noise, which can potentially be addressed by dedicated and priority freight infrastructure. These amenity concerns are pertinent in city ports such as Port Botany that co-exist with communities and urban development.

4.2.7 Safety benefits

Providing dedicated or priority freight infrastructure separates freight vehicles from passenger vehicles on the roads. This reduces the risk of accidents associated with passenger vehicles travelling alongside large trucks with distinctly different braking patterns. Some proposals for dedicated and priority freight infrastructure consider dual access to trucks and buses. Buses and trucks have similar breaking patterns but there may be problems from buses having to stop frequently.

4.3 Factors of Supply

4.3.1 Capacity

The capacity of existing infrastructure to service the growing freight task is an important consideration for dedicated or priority freight infrastructure.

At Port Botany, there is currently capacity on the rail freight network. While there are instances where demand is higher than supply, RailCorp and the Australian Rail Track Corporation (ARTC) report that the Port Botany freight line to Enfield has, on average, 14 trains scheduled in each direction each day, out of a total 36 potential train paths each way.[73] Reasons for this poor uptake of rail transport include perceived or actual higher prices for rail freight and poor reliability. In the longer term, measures to boost long term rail capacity will be necessary to achieve the targeted doubling in rail mode share and to take freight volumes off the road network[74]. For instance, a 28% rail share of 7 million TEU a year would require more than 40 trains servicing Port Botany each day, an increase of 12% on current capacity.

4.3.2 Cost

The cost of dedicated and priority freight infrastructure is a key determinant of its viability and to make a compelling case for developing this type of infrastructure, the potential benefits must be greater than the costs.

While dedicated and priority freight infrastructure can take on a number of forms, it is typically associated with large scale capital investments. For example, the cost of developing the Port Dublin tunnel was €752 million and the cost of developing the Alameda corridor in L.A. was USD 2.4 billion. The effectiveness of these expensive projects is also an issue. With the exception of the Dublin Port Tunnel, none of the dedicated and priority infrastructure projects we have researched have had a clear positive economic impact as measured by NPV.

Dedicated and priority freight infrastructure can be introduced by reform to existing infrastructure such as developing priority use on existing or planned infrastructure investments.

The high cost of developing dedicated and priority freight infrastructure makes it more difficult to make a positive economic case.

4.3.3 Form of infrastructure

Dedicated and priority freight infrastructure can take on a variety of forms including freight road tunnels, priority truck lanes and dedicated rail. The form of infrastructure is largely determined by the unique nature of the challenges facing the port and the distance of freight travel.

The least expensive likely form of dedicated road freight infrastructure makes use of existing infrastructure, for example, truck lanes (or managed lanes). The lanes need to be clearly demarcated and enforceable as the Brisbane example of trucks using the left lanes shows (see Section 3.1.2, page 21).

Without high-volume commodities originating some distance from the port, it is hard to envisage dedicated freight rail infrastructure emerging without some government subsidy. The examples of dedicated rail freight infrastructure showed them all to be underutilised.

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[73] ARTC advised that there are 14 train paths on an average weekday, but that current capacity is 36 practical paths, or 27 saleable paths. Capacity once re-signalling and Enfield staging are complete will be 48 practical paths and 36 saleable paths (calculated as 75% of practical).

[74] The target from the NSW Government and Sydney Ports Corporations is to double the rail share carried to 40% from the current 20%. See: http://www.sydneyports.com.au/port_development/enfield

4.3.4 Willingness to Pay

Consultations with stakeholders revealed that industry would be willing to pay for infrastructure where there were clear benefits. As such, the ability to measure and showcase user benefits is important for attracting investment in infrastructure. Improved freight productivity as well as social benefits such as reduced congestion and amenity benefits suggests that there may be a role for both industry and government in funding infrastructure developments.

There is an important distinction between stated industry demand, whereby industry actively develops and funds proposals, and the role of the government in establishing proposals for new infrastructure developments. Dedicated and priority freight infrastructure servicing Australia's coal and iron ore sector were industry-lead initiatives grounded in commercial feasibility.

In other cases, where there is overlap between industry and society in terms of the users and benefits of infrastructure, the role of government and industry is less clear. This will require the costs and benefits of such infrastructure to be clearly defined and apportioned to those who benefit.

Dedicated road infrastructure for Australia's container ports is a relatively new concept. Hence, it would require market development, including introduction of efficient price signals on freight infrastructure.

5. The Australian Context: Challenges at Major Container Ports

This section provides an overview of Australia's five main container ports including the port facilities and examines the key 'pinch points' and capacity constraints facing each port.

The Growing Transport Task

The Australia's main container ports are growing at a rapid rate. Table 9 below details the forecasts we gathered. The number of TEU is forecast to double in the next ten years and then grow approximately 66% during the subsequent ten years.

These trends are creating different issues at each state's container port, with governments and stakeholders seeking tailored infrastructure and policy changes to meet the challenges. In summary:

- Adelaide has adequate infrastructure, both current and planned to handle its relatively small volumes of containers.
- Fremantle has forward planning strategies to address its challenges, through a rail strategy and eventual relocation of some of its container trade to Kwinana.
- Brisbane has benefited from recent large expansions in road capacity on important freight routes. On rail, however, the Port of Brisbane has identified major deficiencies in its plans to grow trade through the port. It believes there is a need for dedicated rail freight infrastructure.
- In Sydney, freight congestion issues are caught up with general congestion. Both are becoming critical and there may be a potential to use dedicated freight infrastructure to help solve them.
- In Melbourne, the port's location at the edge of the CBD means there is a great deal of mixing with general traffic. There are various directions outlined in the Victorian Government's freight plan to address issues related to freight movements in and out of the port and across the network more generally.

5.1 Introduction

This section considers whether the factors seen in existing examples of dedicated or priority freight infrastructure are evident at Australia's five major container ports. It provides an overview of Australia's five main container ports including the port facilities and examines the key 'pinch points' and capacity constraints facing each port. Here, we lay the context for dedicated freight infrastructure at our five main container ports. Despite great variation in the data we could access, we consider the same issues across the five ports. These are:

- A profile of the port
- Current and future levels of trade, and the port's existing capacity
- The Port's current landside infrastructure and the modal split between road and rail
- Land transport challenges and the potential for productivity gains
- Actions undertaken to alleviate inefficiencies
- The remaining gaps (or entrenched problems) and the potential for dedicated or priority freight infrastructure to address these

Australia's main container ports are growing at a rapid rate. The number of TEU is forecast to double in the next ten years and then grow approximately 66% in the ten years after that. The gravity of the issues and the seriousness of the response vary with the infrastructure and policy changes each port implements to meet the challenges.

Table 9: Growing Container Trade: TEU Current and forecast (millions)

	2010/11	2020/21	2030/31	% growth over timeframe
Melbourne	2.39	5.25	8.2	243%
Sydney	2.02	3.6	7	247%
Brisbane	0.95	1.92	3.3	247%
Fremantle	0.6	1.1	1.6	167%
Adelaide	0.3	0.49	0.83	177%
Total All Ports	6.26	12.36	20.93	234%

Note: Melbourne's forecasts are 2025 and 2035, Brisbane's 2019 and 2029. Source: various port development studies, with EY compilation.

Ports rely on their hinterland and supply chains to support the movement of trade that travels through them.

The drive to take greater control of their supply chains began with Sydney Port's purchase of the Enfield intermodal site and continues with the privatised Port of Brisbane plans to make its own substantial investments in transport infrastructure. These trends are a stepping away from the old landlord role that our ports undertook after the corporatisation reforms in the 1980s and 1990s. That model is starting to outlive its usefulness as congestion grows and ports need to take more action to ensure that hinterland transport links do not constrain their growth. Privatisation is further driving the change as new management takes over and focuses on shareholder return and growth. The issues raised in our analysis of the transport task at our main container ports show a need, to address the supply chain challenges surrounding our ports. Dedicated freight infrastructure is one potential solution.

5.2 Port of Melbourne

The Port of Melbourne ('the PoM') is currently Australia's largest international container port, handling approximately 37% of the nation's container trade.[75] The port handled 2.4 million TEU during the 2010/11 financial year, growing 6.7% from the previous year.[76]

The PoM has facilities for dry and liquid bulk, break bulk and motor vehicle cargo. The PoM is supported by the ports of Geelong and Hastings, which are configured to handle dry bulk cargoes and petroleum products, and the Port of Portland for timber, grains and bulk liquids. There are also plans to increase container freight movements through the Port of Hastings as PoM reaches capacity in the coming decades.

A total of 73% of containers are sourced and destined for metropolitan Melbourne, with the remainder being primarily exports from Victorian regional areas and other parts of southern Australia. Melbourne is different to other capitals in that it has major industrial areas in several different directions – to its south east, west, north and east. Hence it is less amenable to efficient funnelling through dedicated freight infrastructure compared with Sydney with its predominant freight distribution area to the west and Brisbane with the immediate port environs and Acacia Ridge.

[75] "About the Port", Port of Melbourne Corporation, accessed 21 March 2012, http://www.portofmelbourne.com
[76] Port of Melbourne, *"Port Trade reaches Milestone"*, Melbourne, 20 Jan 2012

Figure 1: Port of Melbourne aerial map

Source: “2006-07 Annual Report”, Port of Melbourne Corporation, 2007.

5.2.1 Port Capacity and Growth in the Freight Task

The total volume of freight handled in Victoria in 2011-12 was 2.58 million TEU. This figure is set to increase dramatically in the coming years, with the Government’s freight and logistics plan, *Victoria: Freight State,* predicting that the State’s container freight task is set to increase significantly to 6.6 million TEU in 2031 and continue to 11.2 million by 2046.[77] An internal review of current and planned capacity at the Port of Melbourne indicates it may approach capacity between 2024 and 2027 (between 5 to 6 million TEU).[78]

5.2.2 Landside Infrastructure

Inland road and rail networks connect Melbourne to cities and towns within and outside Victoria. These key transport links are used for both port (import/export freight) as well as non-port related activities (intrastate trade and general passenger movements).

Road

Approximately 91% of container movements (1.98 million TEU), leaving or entering the port is carried by road. In the immediate area of the Port, the main road transport link is the Docklands Highway, comprised of Footscray Road, Whitehall Street and Francis Street.

Rail

Rail carries approximately 9% of container movements (178,000 TEU) leaving or entering the port. The Port of Melbourne joins Dynon rail freight terminal, which has links to the regional and interstate rail systems via a single dual gauge line, which is grade separated from Footscray Road. Currently no metropolitan freight is moved by rail (*Freight Futures*, 2008). Melbourne has a number of key intermodal terminals which are summarised below:

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[77] Victoria: The Freight State”, Victorian Government, 2013.

[78] Victorian Government, “Victoria’s submission to Infrastructure Australia”, 2011.

Table 10: Key Intermodal Terminals in Melbourne

Location	Description
West Swanson	Operated by DP World and located at the Port. Handles international cargoes and provides rail services to Altona, country Victoria and South Australia
East Swanson	Operated by Patricks and located at the Port. Handles international cargoes and provides rail services to Altona, country Victoria and South Australia
North Dynon	Handles freight between Melbourne and regional locations, and exports freight from regional Victoria through the Port of Melbourne.
South Dynon	Principal hub of interstate rail network. It receives freight from all other interstate cities
Altona	Operated by SCT Logistics. Handles interstate containerised and non-containerised cargoes.
Altona North	Operated by QRN. Previously operated a port shuttle (2003 to 2006) between this terminal and the Port of Melbourne.
Somerton	Operated by Austrack. Located around 20 kilometres north of the Port of Melbourne. The terminal handles international containers.

5.2.3 The Potential for Productivity Gains

The existing road and rail infrastructure connecting to the Port of Melbourne has issues that mean it is not as efficient as it could be. The port's location at the edge of the CBD means there is a great deal of mixing with general traffic.

Road

There are several issues for road infrastructure in the surrounding port area:

Road Congestion in Melbourne

Due to the radial nature of Melbourne's arterial road network (with key road links radiating out from the city centre) significant amounts of freight vehicles travel through inner Melbourne, connecting to the CBD, the port, Dynon rail yard, the Melbourne Wholesale Fruit and Vegetable market and other locations. For example, to reach the industrial areas to the west of Melbourne, trucks need to travel via the residential roads of Yarraville.

The high volume pinch points around the Port of Melbourne include:

- West Gate Freeway (commercial vehicles comprise 14-16% of traffic of around 22,000 vehicles per day), including entrances at Grieve Parade and Millers Road
- Docklands Highway (Whitehall Street and Francis Street) connecting the Port to container parks and the West Gate Freeway (with commercial vehicles comprise 22-30% of all traffic, or up to 8,700 vehicles per day)
- Somerville Road in Yarraville creating congestion on residential streets (commercial vehicles comprise 27% of all traffic, or up to 2,900 vehicles per day).

There is a general view that Port traffic is not the main cause of inner city road congestion, and congestion in and around the Port of Melbourne:

- A 2006 truck survey found that 59% of all truck movements in the Swanson/Dynon Area were not port or rail related.[79]
- The Victorian Freight and Logistics Council noted that freight transport accounts for around 14% of road transport in and around Melbourne, while the port generates less than 2% of vehicles on the metropolitan network.[80]

[79] Freight Futures, 2009, p.38
[80] Victorian Freight and Logistics Council, Freight Transport and Urban Congestion

Increasing concentration of industrial and residential activities in Melbourne's west

The growth in employment and businesses in Melbourne's west will see a greater concentration of demand for freight and port related activities from this region. By 2035, 2.4 million containers (TEU) are expected to originate or be destined to Melbourne's west, compared to 0.5 million in 2007.[81] The increasing concentration of freight activities in Melbourne's west will place pressures on transport infrastructure in these areas.

Existing and proposed inner city developments encroaching on the Port

The current issues surrounding the inner-city road freight task include:

- Movements to/from the Port of Melbourne down suburban roads (Footscray Road, Whitehall Street and Francis Street) to access the West Gate Freeway.
- Conflicts between freight and residential traffic along Buckley Street (north of the port) creating congestion along a retail corridor.
- The road network in Yarraville links the main thoroughfares to the port and connects the port to container and industrial parks. However, these roads include residential streets with community infrastructure and retail development.
- Roads for port-related activities in the area are constrained by physical infrastructure as well as by strong community opposition.
- Non-port related traffic (both from commuters and trucks) is expected to intensify around the Port of Melbourne. The Fishermans Bend Redevelopment, a new inner city suburb will create traffic demand around the port area and on Westgate Bridge.

Rail

Studies have found that considerable spare capacity exists on the broad gauge rail network to move containers between the port and outer metropolitan terminals.[82] However, barriers exist in achieving this:

- Road transport is a cheaper option for freight users as the use of rail involves greater handling costs (ranging from $50 to $115 more per 20ft container).[83]
- Melbourne's metropolitan rail corridors are predominantly used by passenger trains and there are no freight-only rail lines from the port outwards.
- Significant infrastructure investments would be required on the passenger rail network (such as signalling) to handle a greater amount of freight.

5.2.4 Actions Undertaken

Road

A number of proposals have been put forward to alleviate road congestion in inner city Melbourne, which has implications for port-related traffic.

East West Link

A proposed tunnel and freeway project connecting Footscray Road and Dynon Road in the port precinct with Paramount Road in West Footscray. It will also connect to the Western Wing Road. This project is part of the larger East West Link project that will link the roads to the Eastern Freeway. This tunnel aims to respond to increased transport demand due to population in the west, and improve connectivity between east and west Melbourne while reducing freight traffic on local

[81] "Shaping Melbourne's Freight Future", Discussion Paper, Department of Transport, April 2010
[82] Booz Allen Hamilton (2006) Improving rail mode share at the port of Melbourne, Department of Infrastructure
[83] Ibid

streets and provide a critical link in the National Land Transport Network, capable of accommodating the expected freight growth.[84]

Truck Action Plan

Identified by the previous government, this is a proposed truck route between the West Gate Freeway and Footscray Road to reduce the amount of trucks passing through the residential streets in Yarraville and improve freight access from the west to the port of Melbourne.[85] The proposal includes the construction of new ramps connecting the West Gate Freeway and Hyde Street at Yarraville, and upgrades of connecting roads. It is projected to cost $380 million and is currently under review.

Rail

The Victorian Government is currently in the process of developing a strategy to grow the amount of freight moved using rail. The objective of the “Growing Freight on Rail” strategy is to reduce congestion and remove bottlenecks at ports and in key regional centres.[86] This Plan is expected to be completed later in 2012.[87]

5.2.5 Concluding Remarks

Due to the PoM’s inner city location, there is limited land capacity to establish new road corridors to and from the Port. There are limited opportunities to provide dedicated lanes on existing infrastructure without impacting on other road traffic during peak periods.

Capacity exists to expand the role of rail in moving freight to and from the port (thus reducing the amount of freight moved on road). However, there are commercial barriers, including double handling costs in moving freight to and from intermodal terminals located at outer metropolitan areas (Somerton and Altona) to the on-port terminals within the Port. Previous ‘port shuttle’ attempts have failed.[88]

Notwithstanding this, the Victorian Government is finalising a new metropolitan planning and transport strategy for Melbourne. The three key State Government strategies under development, the Metropolitan Planning Strategy, Transport Solutions, and Growing Freight on Rail, are directly relevant to the port because they will include the location of freight hubs and intermodal hubs with potential opportunities for dedicated rail infrastructure to these hubs.

The negative externalities associated with freight traffic in and around residential areas have been driving consideration for truck-related infrastructure such as the Truck Action Plan[89], which is a relatively low cost solution largely aimed at addressing amenity issues by removing trucks from residential areas. While the proposed route is built for the purposes of truck traffic, it is not currently proposed as a dedicated truck route. We carried out a case study where the route would have some form of prioritised access for trucks.

5.3 Port Botany

Australia’s second busiest container port, Port Botany handled just over 2 million TEU in the 2010/11 financial year, growing 5% from the previous year. It is the major state gateway to international markets for containerised agricultural products as well as oil, and bulk liquid and gas products.

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[84] Linking Melbourne Authority, *“About Westlink: Project Objectives”*, www.linkingmelbourne.vic.gov.au

[85] VIC Roads, *“Truck Action Plan: Project Overview”*, www.vicroads.vic.gov.au, accessed 10 April 2012

[86] Premier of Victoria, Press Release, Coalition announces new taskforce for grain freight, 07 September 2011

[87] Victorian Department of Transport (2011) DOT Plan

[88] There was a shuttle train service up to 2006 run by CRT, a freight forwarder to its intermodal terminal at Altona North, North Melbourne. The service ceased because “the State Government has been unable to provide subsidies to make high rail costs competitive with lower road costs”. See also Chapter 6 of Department of Transport (2010) Shaping Melbourne’s Freight Future, Proposals for an intermodal solution to service Melbourne’s growing containerised freight task.

[89] This project is currently under review.

The port handles roughly 30% of all container trade in Australia. Of this 98.5% of inbound containers are bound for the Sydney metropolitan area, while 38.5% of outbound containers come from non-metropolitan areas,[90] making Port Botany a gateway to overseas markets for regional NSW.

Figure 2: Major Roads and Freight infrastructure in Metropolitan Sydney

Source: Transport for NSW

5.3.1 Port Capacity and Growth in the Freight Task

Growth is expected to continue in the future with container trade through Port Botany estimated to nearly quadruple by 2030, reaching 7 million TEUs. This represents a growth rate of 5 to 7% each year for the next 20 years, consistent with the average growth rate since containerised trade began in 1971 of 7.9%.[91]

Current planning approval sets the maximum throughput capacity of Port Botany at 3.2 million TEUs per annum subject to further environmental assessment and approval. Based on available land area, berth length and productivity improvements, the port can service 7 million TEUs per annum over the next 30 years once the third Terminal is operational.[92] The effectiveness and efficiency of the surrounding land infrastructure connections to the port will have a significant bearing on the ultimate throughput capable of being serviced by Port Botany.

Botany Bay is relatively well serviced by surrounding road and rail networks. However, the precinct around the Port is heavily utilised and increasingly congested. In addition to the Port's transport task, the surrounding precinct hosts the Kingsford Smith Airport, major arterial roads to the Sydney CBD, and connects to the Metropolitan Freight Network (MFN).

[90] Gilfillan (2011)
[91] Sydney Ports Corporation (2011), Container Movement and Port Task Information, Unpublished Data
[92] ACCC (2011), *Container Stevedoring Monitoring Report no.13 – October 2011*

Road

For all non-transhipment containers, 1.5 million TEUs (86%) exited or entered the port by road. Even if the government were to meet their rail share target of 28%, truck traffic is forecast to triple by 2030.

The road network around Port Botany includes various local and state owned roads. Foreshore Road and General Holmes Drive provide crucial access for container freight trucks using Port Botany. General Holmes Drive cuts through the suburb of Port Botany while Foreshore Road connects the port with Sydney's orbital network of motorways for onward distribution to Sydney's residential and commercial areas and to major interstate highways.

Rail

The Metropolitan Freight Network (MFN) is a dedicated 80 kilometre freight network that forms part of Sydney's metropolitan passenger rail network. It serves both inter and intra-state freight customers as well as the port. For example, even on the Port Botany to Enfield track port traffic is only 40% of the total. However, the dedicated freight lines are still restricted by sharing the corridor with and having to cross major passenger train lines on which the passenger trains have priority. On other parts of the larger network, freight and passenger trains share the same rail line.

For all non-transhipment containers, 250,000 TEUs (14%) exited or entered the port by rail. Rail's modal share of 14% is the lowest share rail has had since 1997/98. This is due to the Patrick intermodal terminal at Camellia closing in 2010 due to lack of profitability. [93]

There are currently six intermodal terminals servicing Sydney, of which dedicated rail freight connections exist between the Port and Chullora and Enfield. Around 35% of rail containers (111,000 TEU) moved through regional intermodal terminals in 2009-10, though this figure declined in the following financial year.

5.3.2 The Potential for Productivity Gains

In Sydney, freight congestion issues are caught up with general congestion and both are becoming critical.

Road

There are several challenges for road infrastructure in the surrounding port area:

Heavy Vehicle Restrictions

Heavier vehicles are more productive. However, they need to mingle with general traffic leading to safety concerns. Therefore there are heavy vehicle restrictions in the corridor, particularly around Bunnerong Road and Qantas Drive. There are height restrictions on the M5 East tunnel, Cooks River Tunnel and the airport tunnel. Other network access constraints between the Precinct and Western Sydney restrict the operation of higher productivity vehicles in terms of their height, length and/or mass.

Growing Road Congestion

The precinct is home to four of Sydney's five most congested roads: the Eastern Distributor, M5, M4 and General Holmes Drive. Congestion lasts 11 hours or more each day on all four routes. However, this congestion is caused by commuter traffic, as less than 10% of road trips around the port are freight related. Nonetheless, freight travel is growing faster than general travel. Morning peak freight trips on the M5 are forecast to double by 2031.

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[93] See Rail Express 27 April 2010. It quotes the Port Container Director for Patrick as saying "the short–haul nature of rail to and from Port Botany to metropolitan and NSW rural areas would never be competitive to road, as road is the price setter and there is a road task at the beginning and end of each rail journey"

One way to alleviate these congestion issues is for freight vehicles to operate outside peak hours. . As shown by BITRE Waterline statistics, Sydney Port has been very successful in recent years at moving truck loading and unloading to off peak times, particularly weekends. Night operations, however, are more problematic, with many freight operators finding that volumes are insufficient to justify operating longer hours.

Missing Links on the Road Network

The absence of a direct motorway connection between Port Botany and Western Sydney has significant implications for freight vehicles. Trucks either have to access the M4 via King Georges Road/Fairfield Road – aging arterial roads ill-suited to sustained heavy vehicle traffic – or by the much longer M7 route.

Consideration is underway by Infrastructure NSW for a major motorway project including the M4 extension; this is expected to be announced later this year.

Traffic Pinch Points

There are various pinch points in the freight network where small conflicts on shared infrastructure can lead to widespread congestion on the through transport network:

- The rail level crossing over General Holmes Drive, and the intersection of General Holmes Drive with Foreshore Road
- Heavy vehicle and height restrictions on Airport Drive. Where truck heights are not measured prior to the truck leaving the port, higher trucks can cause major delays on the surrounding road network.
- Monthly maintenance on the M5 East prevents high performance vehicles operating in off-peak hours, and steep grade exit ramps slow them down
- High volume restrictions on bridges on M4, Marsh St, and the rail line at Sydenham

Rail

Sydney's rail freight network has many issues. Briefly they are:

Underutilisation of the Rail Network

The Port Botany freight line to Enfield has, on average, seven train services each way scheduled each day, out of 18 return potential train paths. This is due to weak demand for rail caused by unreliable and uncompetitive conditions for rail freight, which has led to road picking up the increase in the freight task while rail freight has remained relatively static.

Unreliable/Inefficient freight rail operations

Poor alignment between train paths to Port Botany and stevedoring windows mean that small delays on the track can cause large delays at the port. Rail operators purchase a stevedore window in advance and then may need to run the gauntlet of multiple network providers and restrictions, including the Metropolitan Freight Network (MFN), the passenger service and the Hunter Valley Coal Chain, to make a narrow window at the port.

Once a train arrives at the port, it may need to be split in the Port Botany Yard across the stevedores, which is an inefficient and time-consuming operation that blocks access to the terminals for other trains. It also is logistically complex to align stevedore windows at the same time to get the right containers into the right stevedore. If they do not align, the train will need to leave the Port, park and find an opportunity to re-enter the Port. This can lead to export containers not being sent, or import containers being late to vacate the terminal. As a result, regional trains tend to purchase two stevedore windows to manage uncertainty around timing and loads. If the train is late it is then penalised for missing the first slot.

Insufficient Train Paths and Passenger Priority

Freight trains cannot operate on shared lines during peak hours. Full curfew applies for 7 hours a day, with restricted operation for all other times except the middle of the night. Trains need to plan around this, which affects their reliability.

5.3.3 Actions Undertaken

Measures are being implemented to improve the landside infrastructure links to Port Botany in order to drive increased efficiency and alleviate congestion. A new terminal (T3) will commence operations in early 2013,[94] adding 1,850 meters of additional wharf space, new rail sidings and another freight terminal with five new berths, bringing total assets to 11 berths.[95]

Port Botany Landside Improvement Strategy (PBLIS)

In late 2008, the NSW Government responded to the Independent Pricing and Regulatory Tribunal's (IPART) Report of March 2008 into the efficiency of the landside operations at Port Botany. The NSW Government's response described the establishment of the Port Botany Landside Improvement Strategy (PBLIS) initiative.

The objective of the PBLIS program is to maximise the amount of trade passing through Port Botany by making the landside supply chain more efficient, transparent, consistent and transitioning to 24/7 operations.

The PBLIS reform was designed as a staged approach as follows:

- Stage 1 (2011): included the regulation and implementation of an Operational Performance Management (OPM) framework for road only in Stage 1, and the regulation of rail pricing. The plan was to monitor activity over the initial 6 to 12 months to determine if the desired change in industry performance has been achieved.
- Stage 2 (2012 onwards): was to be implemented subject to the results of Stage 1, and was envisaged to include a Demand Management System, a review of Empty Container Parks and / or the introduction of rail regulated performance standards. In 2012, Sydney Ports presented a rail strategy to the PBLIS Port Botany Rail Team outlining a proposed governance structure as part of a voluntary approach to coordination. This sought to establish a port Rail Operations Coordination Centre (ROCC) to drive communication and coordination between the relevant stakeholders as an enabler to increasing consistency and efficiency across the port rail supply chain.

Road

In addition to the PBLIS, the following initiatives were undertaken to alleviate congestion around Port Botany:

M5 West Widening Project

This involves the widening of the M5 South West Motorway from two to three lanes in each direction between Camden Valley Way and King Georges Road in order to accommodate the significant levels of traffic (91,000 vehicles use the M5 South West each day[96]). The project is budgeted to cost $400 million, and be complete in late 2014, early 2015. In addition to the extra lanes, the proposal would introduce minor adjustments to road infrastructure and bridges that would enable high productivity vehicle access along the M5 to the port, and noise management measures for affected communities.

[94] ACCC (2011), *Container Stevedoring Monitoring Report no.13 – October 2011*
[95] Sydney Ports, Port Botany Container Terminal Expansion Overview
[96] Roads & Traffic Authority, *"M5 West Widening: Environmental Assessment"*, NSW Government, September 2010

Rail

The NSW state government aims to double rail's modal share from 14% to 28% by 2021, which would equate to 1.96 million TEUs serviced by trains in 2030. This could be accommodated by 40 trains a day, which is above the current capacity of the Port Botany freight line (36 trains).

The Southern Sydney Freight Line

Due to finish in 2013, this project installs a bi-directional freight line connecting the Metropolitan Freight Network at Sefton Park to Glenlee and the freight corridor to Melbourne. This will be a dedicated freight line, suffering no interference from passenger services, ensuring more train paths for freight trains between the Port and south west Sydney, supporting more efficient use of rail, and easing congestion with passenger services on the southern line.

Enfield Intermodal Logistics Centre

Due to commence in 2013, the facility will almost double Sydney's intermodal capacity, with an additional 300,000 TEUs a year. Furthermore, it will provide empty container storage facilities, warehousing, a light industrial/commercial area along Cosgrove Road, a new bridge over the existing marshalling yard, rail connections and ecological/heritage enhancements.

Moorebank Intermodal Terminal

Currently two proposals exist for Moorebank. The Federal Government has proposed a terminal with potential capacity of 1 million TEUs per year, with a large interstate component and with the potential to lower the cost per unit of moving freight on rail through greater economies of scale. The other proposal, from a private alliance, SIMTA, is for a smaller terminal on other land nearby that could offer an early shuttle service to Port Botany. Both the proposed terminals are ideally situated on the Southern Sydney Freight Line, and close to the intersection of the M5 and M7.

South West Rail Passenger Link and Kingsgrove to Revesby Quadruplication

These will extend the Airport and East Hills Line to service Sydney's South West Growth Centre and enable increased rail service frequency to the airport. Both projects are currently under construction, set for completion in 2016 and 2013 respectively. Both projects aim to improve the reliability of passenger rail as well as to provide greater rail capacity. Grade separations will reduce the interactions between the two services. Furthermore, these projects will encourage greater use of public transport, and less congestion on the roads.

Northern Sydney Freight Corridor

The Commonwealth and NSW Governments have jointly announced a $1.1 billion project to upgrade the Northern Sydney Freight Corridor, building a rail underpass at North Strathfield, laying a track between Epping and Pennant Hills, installing new passing loops near Gosford and constructing a holding track at Hexham. This will increase the corridor's freight capacity from 29 to 44 freight trains a day. The project will disentangle freight and passenger services, reducing their interaction, and providing better freight access to the corridor. However, commuter services still retain priority.

5.3.4 Concluding Remarks

The NSW government has proposed multiple strategies that can assist in ensuring that road and rail connections to the port are able to efficiently handle the growing amounts of containers that the port services.

However, there are still gaps that need to be addressed in order to increase the port's capacity up to and beyond the 3.2 million TEU cap.

- Growth in Western Sydney and consequent growth in the freight task in that direction means that direct links from the port to the west may be warranted.
- High productivity vehicles can carry heavier loads and as such add greatly to productivity of road freight. Safety measures are needed so that these vehicles can be used more on the NSW road network.
- Coinciding peak traffic is a key issue. A large proportion of trucks (59% in 2011) use roads during peak hours even though the Port has moved towards 24/7 operations.
- There is a view by some within the industry that rail freight is either priced inequitably or inappropriately for the objective of doubling rail mode share. Both rail and road pay wharfage costs at the Port, while rail alone pays a crane lift fee. Road users instead pay a Vehicle Booking System (VBS) fee for booking a stevedore slot. The regulated price for booking a slot for a container lift onto rail is $15, a 50% premium on the cost of a truck lift of $10.The way the Port Botany rail lines are set up with on-dock access, there are no additional lifts or movements to put a container onto a train compared to a truck.[97]
- The 7 hour curfew on rail freight on lines shared with passenger services decreases the chances of doubling rail's modal share.
- Given the complexity of the rail supply chain in and around Port Botany, and the substantial growth task ahead, substantial improvements in coordination require strategic top-down interventions in order to manage the various stakeholders (stevedores, rail operators, ARTC, RailCorp, Intermodal Terminals).

In Sydney, freight congestion issues are caught up with general congestion. Both are becoming critical and there may be potential to use dedicated or prioritised freight infrastructure to solve them.

- With dedicated or prioritised truck lanes, the mingling between heavy vehicles and the general traffic is vastly reduced. Restrictions on high productivity vehicles would no longer be necessary (as long as there are no height restrictions). Furthermore, it will reduce peak hour congestion because a large proportion of trucks use roads during peak hours
- The NSW government has realised the potential of dedicated freight rail and the separation of freight from passenger services. This is shown by their investments in The Southern Sydney Freight Line, which is a dedicated freight line, as well as the Northern Sydney Freight Line which will help disentangle passenger and freight services. While these improvements will mainly benefit inter-state and regional freight navigating around Sydney, they will also have positive spinoffs for the port. Federal Government investment through the ARTC at Enfield intermodal terminal directly benefits the port[98]. While these projects will improve rail's performance, they do not address the essential competitive disadvantage rail has over short hauls. In order to meet its ambitious aspirational targets for a rail in its Intermodal Terminal Strategy, the NSW Government may find it will have to subsidise rail for short-haul operations. Precedent for this exists in Western Australia, where the State Government funds a $43 subsidy per TEU for containers on short-haul rail routes to the Kewdale intermodal terminal.

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[97] For example, see Access Economics (2010)

[98] See Joint Media Statement " Port Botany Rail Upgrade: First Stage Completed" 3 April 2012, by the Federal Minister of Infrastructure and Transport and Chief Executive of the ARTC

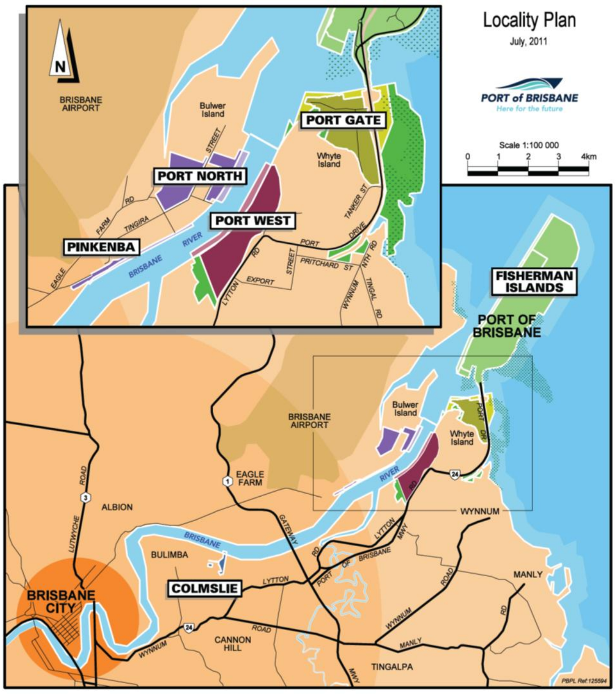
5.4 Port of Brisbane

The Port of Brisbane is Queensland's largest and most diverse general cargo and container port, with facilities for containers, general cargo, motor vehicles and wet and dry bulk. In addition to being the only Australian capital city port free from space constraints (subject to environmental issues) it is also Australia's third busiest and fastest growing container port.

The Port of Brisbane is a large, multipurpose port. As well as large volumes of oil products and dry bulk cargo such as grain and coal, large volumes of break bulk enter the state through the port. During the 2010/11 financial year, the port serviced 978,814 TEU of containerised cargo.

The Port of Brisbane is located on the southern side of the Brisbane River mouth; 24 kilometres from the city's CBD. It is separated from residential and other sensitive land uses. To the north and south the closest residential properties to the port are approximately 500 metres and 1 kilometre away respectively. This separation is further supported by substantial buffer areas.

Figure 3: Locality Map of the Port of Brisbane



5.4.1 Port Capacity and Growth in the Freight Task

The Port of Brisbane forecasts:

- The number of containers will more than triple from 978,814 to over 3.3 million in 2030
- General cargo will increase from approximately 724,000 to nearly 1.5 million tonnes in 2040
- By 2019/20 coal will reach its currently constrained capacity of 10mtpa
- Total trade will increase from 32 million tonnes to 53 million tonnes by 2026.

5.4.2 Landside Infrastructure

The Port of Brisbane provides an interface between rail, road and sea transportation via the Brisbane Multimodal Terminal (BMT). The integration of these transport modes, a dual-gauge rail link, and the location of the BMT behind the container terminals, creates the capacity for efficient movement of large volumes of cargo through the port.

Road

Approximately 94% of the port's container trade is currently handled by road. In the 2010/11 financial year this constituted 893,589 TEU. Reflecting its multipurpose nature, 4.9 million tonnes of dry bulk/break bulk cargo also exited or entered the port by road. With approximately 75% of containers delivered within/or from a 20 kilometre radius of the port, the road links are critical.

The road network comprises a single road to and from the port, called the Port of Brisbane Motorway linking up with the recently privatised Gateway Motorway at Murarie. The Gateway Motorway has links north, south and west to National Highways. It also has many arterial roads off to industrial precincts close to the port and into Acacia Ridge, to the south west.

Rail

Rail carries the remaining 6% of containers (57,000 in 2010/11). Queensland does not have a freight policy that actively promotes more containers on rail. However, freight trains carrying livestock and general freight are subsidised by the Queensland Government. There is a dedicated freight line connecting the port to the Cleveland suburban line, and the container rail interface is off-dock.

There is a separate dedicated line from the port to the major intermodal terminal in Acacia Ridge, in dual gauge (standard gauge and narrow gauge). The narrow gauge part of the dedicated line is used extensively by intermodal trains, grain trains and coal trains. The intermodal element constitutes two trains a day from Townsville/Rockhampton predominantly carrying refrigerated beef to the port. The other service is three times a week from the Goondiwindi region to the west, mainly carrying cotton lint in containers.

5.4.3 The Potential for Productivity Gains

Brisbane has benefited from recent large expansions in road capacity on important freight routes. On rail, however, it has identified major deficiencies in its plans to grow trade through the port.

Growth of Coal Exports

Where the rail system imposes serious constraints on the port is in the export of coal, which has grown 68% over the last eight years. Given the rail network in place and the forecast growth of coal demand, the current network does not have the scope to meet the demand the port is now forecasting.

This impairs the smooth flow of other types of freight traffic, including container freight, although this suffers more from a lack of demand.

Passenger Priority

After navigating the Toowoomba Range, trains enter the Citytrain network near Ipswich. At all times passenger trains are given priority within the Citytrain network. Even the so-called dedicated train line adjacent to the Cleveland line does not afford unencumbered access. Non-passenger services may be required to use the Cleveland line to pass other non-passenger services. The line is single track with only one short passing loop, which constrains capacity. During the morning and afternoon peaks the volume of passenger traffic is such that no freight trains can access the network for a total period of five hours.

The issues with the Toowoomba Range and Citytrain network result in the average freight train taking six hours to travel from the top of the range to the port. If it could travel at the normal speed of 70kph, it would take just over two hours. This is without considering the effect of curfews.

Off-Dock Rail Interface

While the container rail interface at the port is efficient, due to its being off-dock, rail for containers has severe commercial disadvantages for short journeys compared to road.

Western Rail Network

This is the rail network from Brisbane to Toowoomba and then going to Charleville. It represents the major problem area for the port. As well as the intermodal trains to Goondiwindi, long distance passenger trains use the track four times a week as well as grain and coal trains, leading to scheduling issues and reducing freight rail's reliability.

The Toowoomba Range

This is shared between coal, intermodal, passenger and grain trains. The number of grain trains can vary due to seasonal factors and competition from road. Hence, additional coal services can be run depending on the circumstances at the time. These ad-hoc paths cannot be contracted over the paths preserved for non-coal services.

Other issues with the Toowoomba Range:

- Small heritage listed tunnels and weight and height limitations for containers, limit the height of wagons for coal and grain.
- Lack of space for passing loops
- The 15.75 tonne axle-load limit means that coal trains are limited to 670 metres and 200 tonnes per train, and not the optimum 2000 metres and 10,000 tonnes.

5.4.4 Actions Undertaken

The state government has been quick to address issues that are currently affecting the effectiveness of the landside infrastructure that links to the port. It has been especially focused on improving and widening roads in order to increase their capacity. However, with the privatisation of the port, and the boom in the market for coal, more attention is now being given to the capacity of rail.

Road

Upgrade of Key Motorways

Key motorways have recently been upgraded or are in the process of being upgraded, and due to these investments it is expected that road capacity for the port will not re-emerge as an issue until the late 2020's. These upgrades include:

- Gateway Motorway Upgrade: This is a $2.36 billion upgrade, which involved a new duplicate six lane bridge over the Brisbane River and expansion of the then four-lane road to six lanes between Nudgee and Miles Platting Road (10 kilometres north and 14 kilometres south of the port respectively). The project aims to reduce the reliance on the Sir Leo Heilscher Bridge and increase road capacity leading to safer, quicker and easier travel along the motorway and bridges.
- Port of Brisbane Motorway Upgrade: This will upgrade a major portion of the motorway from two to four lanes and allowing trucks to travel north, south or west for 150 kilometres without encountering traffic lights. It is expected to cost $385 million and be complete in 2013. Before these upgrades, the Port of Brisbane Motorway was a two-lane road, with 900 vehicles per hour per lane using it during peak hours (21% of vehicles were heavy vehicles). With these upgrades, vehicles per hour per lane are expected to halve.
- Pritchard Street/Export Street to Lucinda Drive: The upgrade of the final 3.2 kilometres of this public road is expected to cost $200 million. On this road the peak hour traffic volume is 664 of which 35% is heavy vehicles. PBPL is funding this major project through a cost recovery Port Access Charge.

Rail

None of the issues with the Citytrain network are set to improve, rather a recent extension of the passenger network on the Ipswich line has resulted in more passenger train services, resulting in greater interaction between passenger and freight services, and more delays. However, actions are being taken that may assist rail efficiency, while other proposals to increase the capacity of rail between the port and the coalmines are under consideration.

Cross River Rail Service

Plans are currently afoot to develop a Cross River Rail service, involving a new tunnel under the Brisbane River and an underground line north to south through the CBD. This will disentangle passenger and freight lines, reducing their interaction and alleviating some of the constraints facing freight services.

Expanding Coal Capacity

Due to the issues faced on the rail network, the port is only forecasting a capped 10 million tonnes of coal exports for the future. However, the following investments have been considered to expand capacity to service coal growth:

- Passing Loop: Capacity on the Citytrain network will be increased by adding a passing loop on the existing freight line. It could increase rail capacity to 14 million tonnes.
- Western Line / Toowoomba Range Upgrades: This project would cost between $1.3 and $1.7 billion.
- Construction of the Southern Freight Rail Corridor Line: This project would cost between $1 and $1.2 billion connecting the Western Rail Line near Rosewood to the interstate railway north of Beaudesert. The most rapid growth in freight movement across the state in the next 10 years is expected from South East Queensland. The freight corridor will accommodate the future growth of rail freight in South East Queensland.[99]
- Proposed Eastern Freight Line Bypass: This would cost between $1.2 and $1.6 billion. It would link from Kagura to the existing freight line near Murarie, increasing capacity by bypassing the Citytrain network and being of standard gauge instead of narrow gauge. Plus, it will have sufficient corridor width to enable ample passing loops and also have sufficient height to allow for double stacking of containers to Acacia Ridge and beyond.

5.4.5 Concluding Remarks

It is most unlikely that the current rail infrastructure and network constraints affect the flow of containers to and from the port. Billions have recently been spent to improve road access, and regulatory and technological changes have led to the development of innovative high productivity vehicles to take advantage of the improved infrastructure.

However, the future lack of capacity of the freight rail network connecting to the Port of Brisbane is indicated by the cap of 10 million tonnes of coal exports per annum that is currently in place. There are clearly gaps within the transportation network that need to be amended if the Port is going to profit to the maximum extent from the current growth of coal demand.

Major deficiencies exist in the Port's plans to grow trade through the port and a need for dedicated rail freight infrastructure has been identified. Dedicated rail transport infrastructure is one method to address capacity, time and service quality issues and also, through allowing for longer trains, double staking and greater economies of scale, reduce the cost differential with road. Brisbane may provide the test case for dedicated freight infrastructure, albeit as a by-product to the main emphasis of moving large volumes of coal to the port. This opens up the issue of whether a purely intermodal rail network could pay for the required infrastructure. This is a matter we consider further in our case study of the Port of Brisbane's proposal to build dedicated rail transport infrastructure.

A by-product of this new railway would be that multi-modal trains would have a new dedicated freight line to the port. It would be in place around the time in the late 2020's when the current road

[99] Queensland Government, *"Southern Freight Rail Corridor"*, www.tmr.qld.gov.au, accessed 10 April 2012

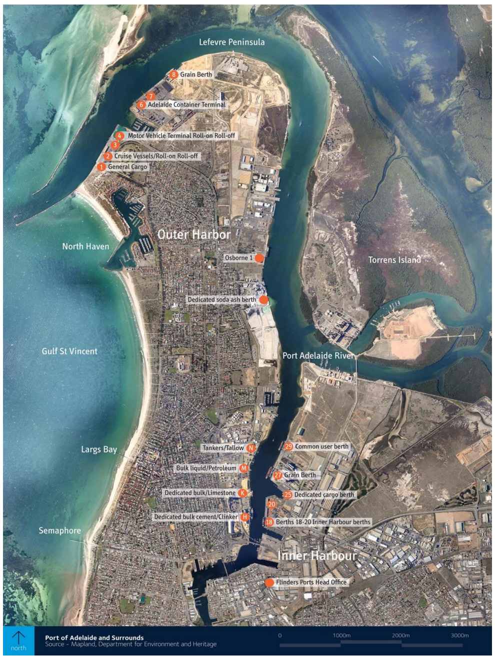
capacity could become a problem. Timing of the new train system for coal could be a significant issue for the proposal as the window for coal may be limited due to erosion in the current high prices and carbon emission concerns.

5.5 Port of Adelaide

The Port of Adelaide is located 14 kilometres north west of the city of Adelaide. In 2010/11 over 12.72 million tonnes of cargo were moved through the Port, with 5.08 million tonnes imported (including 2.349 million tonnes of petroleum) and 7.64 million tonnes exported, mainly cereals. Furthermore, during the same year, 297,701 containers were serviced by the Port of Adelaide, 8.5% more than in the previous year.

As Adelaide does not attract many of the mainline ships servicing the east and west coasts of Australia, many containers for the state are moved by rail through Melbourne.[100]

Figure 4: Map of the major facilities in the Port of Adelaide.



Source: Flinders Ports.

5.5.1 Port Capacity and Growth in the Freight task

It is expected that container volumes will grow at 5.6% per annum over the next 20 years, reaching approximately 838,000 TEU by 2030.[101]

5.5.2 Landside Infrastructure

Road

It is estimated that approximately 90% of the Port's container volume travels to and from the port via road. Nearly all the road transported containers are destined for metropolitan Adelaide. The major transport connections to and from the Port for road freight are Port Road, Grand Junction Road, and the Port River expressway; each having four lanes.

Port Adelaide is strategically located close to the national highway. The national highway enters Adelaide from the North East (from the Sturt Highway) and ends on South Road (also part of the national highway). South Road is a designated freight corridor that runs the length of Adelaide (North South running to the west of the city).

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[100] For example Patrick rails 52,000 TEU a year from Adelaide to its dock in Melbourne

[101] BITRE 2011 movement's data, 2007 Meyrick Associates growth forecast rates

For road freight access to Port Adelaide (and the surrounding precincts), local regulations allow access along dedicated routes (including some local roads) for road trains up to 36.5 metres in length.

Rail

Approximately 10% of the port's container volume travels to and from the port via rail. There are no metropolitan rail terminals and no services to intermodal terminals to or from the port. All rail freight originates in the North from Port Pirie and Balaclava and comprises mainly containerised lead and hay, approximately 30,000 TEU a year. Currently, it comprises two trains a week with empty containers out and full containers in. There are two corridors to the Port through Adelaide. Both lines are connected to wharves in the Inner and Outer Harbour.

For rail-based access to the port there is only limited shared transport infrastructure. The standard gauge freight rail network is currently on a different gauge to the broad gauge commuter network. As such, shared access with city passenger rail is not currently a major issue although conflict points do occur where lines cross.

5.5.3 The Potential for Productivity Gains

South Australian Government representatives have indicated there are no major issues (current or foreseen) that will impact freight access to Port Adelaide. However, they are aware of some minor issues, which they will consider in future planning.

Urban Encroachment

Local and state planning has not been coordinated with transport requirements in the past. There have been cases where land use changes were approved in locations that could conflict with port use. The matter is being addressed through greater coordination between agencies.

Road

Truck Queuing

A minor issue within the outer harbour port area where trucks can be waiting for up to an hour to unload/load.

Rail

Rail Freight Movement Curfews

Close proximity of residents to the main transport road/rail links on the Northern Peninsula may lead to pressure to introduce curfews on port access.

At Grade Railway Crossings

There are minor conflict points where freight rail interrupts road users at 6 at-grade crossings.

5.5.4 Actions Undertaken

The importance of efficient transport links to the Port, along with improved access to the rest of Adelaide has been the focus of significant local and State planning.

Road

Northern Connector Project

This project is currently being planned and includes a road component which involves a new 15 kilometres multi-lane motorway linking the Northern Expressway to the top of South Road and the Port River Expressway. It will link major transport routes and enable unimpeded journeys from Port Wakefield, the mid north, the Barossa Valley and the Riverland to the Port of Adelaide or the length of the corridor to Old Noarlunga. The Northern Connector project will meet the forecast traffic volumes from the north currently relying on Port Wakefield Road. The road will serve as a new national road link to Perth, Sydney and Darwin.[102]

Vehicle Management System

An enhanced booking system has been introduced to improve truck waiting times. Should truck demand continue to grow, staged responses such as the construction of a second gate and expansion of the yards are being considered.

Rail

Northern Connector Project

This project is currently being planned and includes the construction of a new 31 kilometres freight rail line which will connect Dry Link to Waterloo Corner (to the north). It will be used by freight trains as well as the Ghan and Indian Pacific. Travel times for both road and rail will improve. At-grade crossing issues will be alleviated with four rail bridges separating rail freight travelling at 115km/h from road vehicles. The rail will reduce interaction between freight and passenger services. The project will serve as an important link to freight paths between Perth and Melbourne.

Upgrades to Goodwood and Torrens Junctions

The state government has proposed upgrades to the Goodwood and Torrens Junctions where conflict points currently exist for freight and passenger rail services. This upgrade could involve a grade separation of the two lines in order to resolve the conflict between passenger and freight services, reducing delays.

5.5.5 Concluding Remarks

Adelaide is a small port and the road and rail infrastructure is essentially adequate for the task. Some minor issues remain, but they are being addressed. Projects have been proposed to remove at-grade rail crossings and reduce truck waiting times as well as disentangle freight and passenger rail services. This should ensure that the infrastructure has the ability to handle port-related traffic growth.

A remaining issue is the potential for curfews due to poor land use planning in the past which did not consider freight transportation.

The small size of the Port, the fact that the main roads leading into and out of the Port are dual carriageway roads and that the rail system is underutilised, together mean that Adelaide does not have major congestion issues that may lead one to consider dedicated freight Infrastructure.

[102] Government of South Australia, *"Northern Corridor"*, www.infratructure.sa.gov.au, accessed 10 April 2012

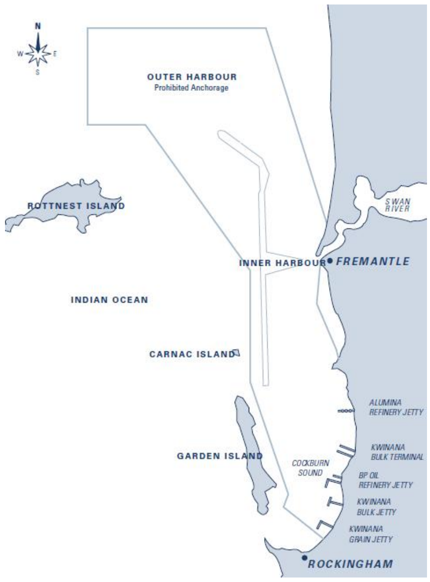
5.6 Port of Fremantle

Fremantle Port is located approximately 18 kilometres south of the Perth CBD. The main Fremantle port is known as the “Inner Harbour”. The “Outer Harbour” consists of five jetties approximately 20 kilometres south of the Inner Harbour.

The Inner Harbour handles containerised freight, motor vehicles, live animals, large machinery and cruise ships. In 2010/11, container trade through the Inner Harbour totalled 598,534 TEU.[103] Containers are estimated to make up 94% of the freight moving through the Inner Harbour.[104]

A total of 74% of exports and 94% of imports are destined for or come from the metropolitan area. Most containers head either east or south, with a small proportion heading north.

Figure 5: Map of the Fremantle Port



Source: 2011 Fremantle Port Authority Annual Report p145

5.6.1 Port Capacity and Growth in the Freight Task

The Port anticipates a growth rate of around 6% per annum.[105] If so, by 2035, the port will handle approximately 2 million TEU per annum.

The Port has a rail siding within the North Quay and nine empty container parks with 13,150 TEU capacities. Based on the current activity at the port and anticipated growth, it is expected that the inner harbour will reach capacity in 2020-2025.

5.6.2 Landside Infrastructure

Of the 598,534 TEU of containers, 12% (68,000) were transported in or out of the port by rail and 88% (530,534) by road.

Road

Access to the container facilities in the North Quay is provided by two main roads, Tydeman road and Port Beach road. Tydeman Road is the main route into the port and handles traffic with origins or destinations in the south and east. Port Beach Road handles the remainder of traffic, with origins or destinations in the north. Heavy vehicle traffic comprises less than 15% of the traffic on these roads.

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[103] 2011 Fremantle Port Authority Annual Report p139
[104] 2007 Urban Corridor Strategy p9
[105] Meeting with FPA on 6 March 2012

Rail

The Inner Harbour is connected to a rail freight network. The network runs south to Kwinana and east to the Kewdale/Canning Vale area. The network is a dedicated freight line, with the exception of the Fremantle Rail Bridge, which is shared with passenger rail services. Currently, four services a day run into the harbour.

The rail network plays a key role in allowing Fremantle port to grow without putting undue pressure on the road network. At present, there is a $43/TEU subsidy for movements by rail. The price is based roughly on achieving parity in pricing between the road and rail networks.

There are currently three intermodal terminals servicing the Inner harbour, one each in the key industrial areas of Kewdale and Kwinana and an intermodal terminal in the north quay of the inner harbour.

5.6.3 The Potential for Productivity Gains

While Fremantle is a relatively small port, it has some issues that cause the port's landside infrastructure to be less productive than it could.

Road

Road Congestion

The Inner Harbour operates on a two shift roster, and is moving to a three shift roster (24 hour operation) but the wider supply chain does not. The destinations of containers (the premises of importers and exporters), typically operate on standard business hours. As such, the hours in which truck movements are concentrated are the standard business hours. Consequently, there is an intermingling of passenger, other business and freight traffic.

Approximately 96% of landside traffic movements in or out of Container Terminals occur on weekdays, concentrated between 0700 and 2100, the same periods when passenger movements are highest.[106]

Buffer Zones around Freight Areas

The road network has issues with urban encroachment, particularly around the Stirling Highway and High Street intersection. The ability to increase numbers of lanes for key sections of the freight network is limited as it requires resumption of properties. Furthermore, a key project for the port has been the extension of Roe Highway from the intersection of the Kwinana freeway to Stock Road (Roe Highway Extension 8). There has been significant community opposition to this project as it passes through environmentally sensitive wetlands.

Productivity of the Road Network

Out of the total number of trucks that leave or enter the port, 45% of them are either empty or carrying only one TEU. Reducing this will improve road capacity.

Rail

The ability of rail to compete directly with road is exacerbated by several factors:

Train Length, Double Stacking and Number of Lifts

Currently the rail siding at the North Quay terminal is 400 metres long, which limits train length to 400 metres or 600 metres if the train is split. Due to height limits on the route from Fremantle to Kewdale, trains cannot be double-stacked. Also, movements by rail require a minimum of four lifts as opposed to two for road.

[106] Fremantle Ports Landside Container Study , 2011, p5

Buffer Zones around Freight Areas

There are a number of buildings within 50 metres of the freight line, and planned development in the suburb of Cockburn will be close to the rail corridor. This may limit the ability of trains serving the port to run after hours.

Shared Rail Transport Infrastructure

The rail freight line is largely dedicated. However, there is a small section of track shared with passenger trains. Passenger trains take priority over rail freight trains. As a result, freight services are unable to operate during peak hours (0700-1000 and 1600-1900).

Single Track Lines / Lack of Passing Loops

The dedicated rail freight line, for the most part, is a single track and there are limited passing loops in the system. This limits the line's capacity and achievable service frequency.

Distance of Freight Movements

As indicated above, 74% of exports and 94% of imports are destined for or come from the metropolitan area. Over such short distances, rail is not cost effective.

5.6.4 Actions Undertaken

The state government is attempting to increase the productivity of the landside logistics of the port. There is a long-term plan to cap Inner Harbour container movements at 1.2 million TEU and for rail to handle 30% of container movements. The 1.2 million TEU cap is based on the capacity of landside infrastructure. The Inner Harbour capacity on the waterside is understood to be substantially higher following dredging of the Inner Harbour.[107]

Road

Incentives for Back-loading

The Port sought from the Australian Competition and Consumer Commission exemptions from the Trade Practices Act to allow it to give preferential treatment to truck carriers engaging in back-loading. This would enable the same amount of freight to be transported with fewer trucks. However, this proposal did not proceed due to high implementation costs.

Stirling Highway / High Street Intersection

The intersection between the Stirling Highway and High Street is a key intersection for the movement of freight east and southwards. The current layout of the intersection is considered unsafe. The proposal to upgrade is meant to increase safety and efficiency. However, the project has been put on hold, in part due to community opposition as it requires resumption of housing or of a nearby golf course.

Roe Highway Extension

Together with the Reid Highway, the Roe Highway constitutes a ring road around the inner areas of Perth that passes through a number of key industrial and freight areas. Without the proposed Roe Highway extension, freight traffic has no option other than to use South Street and the Leach Highway to reach the port. High congestion and stop-start conditions at multiple intersections on both roads impede freight transport operations. The extension would help accommodate population growth (2.8% per annum in the suburbs of South West Perth, and 1.1% in the remaining metropolitan areas) as well as industrial, commercial and residential developments that are expected over the next twenty years.[108]

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[107] Meeting with FPA, 6 March 2012
[108] Main Roads WA, *"Roe Highway Strategic Review"*, Western Australia, October 2009

Rail

The ability of the rail network to handle 360,000 TEU is dependent on several upgrades to the rail infrastructure.

Increased Rail Siding Length

There are plans to increase the length of the siding to 750 metres, which would allow longer trains to use the facility. This is expected to be complete by 2014.

Passing Loop in Spearwood

In 2011/12, the construction of a passing loop in Spearwood is expected to commence. This is designed to increase the capacity of the line by allowing multiple trains to operate in the same line.[109]

New Intermodal Terminal in Kewdale

A second intermodal terminal (T2) is planned for the Kewdale area, which is already connected to the port by the freight rail network. A second intermodal terminal would increase the capacity of the rail network to receive and load trains, increasing the capacity of the overall network. It is planned for completion by June 2014, but this is a tight timeline.[110]

Dedicated Rail Bridge

The Fremantle traffic bridge is the sole section of the freight line shared with the passenger rail network. It requires replacement due to age. The replacement infrastructure could incorporate a dedicated freight crossing, to remove this interaction between freight and passenger rail. This would allow the port to have a completely dedicated freight rail line. It should be noted that this would not be necessary for the rail network to handle the 360,000 TEU goal. If built, this upgrade would enable the rail line to handle in excess of the target.

5.6.5 Concluding Remarks

Plans are in place for the current land infrastructure to be able to cope with Fremantle port increasing its container flow from 0.5 million TEU today to 1.2 million TEU between 2020 and 2025. Then it is anticipated that additional container facilities at the outer harbour at Kwinana will handle growth beyond that figure. Modelling has been conducted on the rail transport infrastructure to confirm that a 30% rail target out of 1.2 million TEU cap is feasible. This equates to 360,000 TEU being carried by rail.

A key factor in achieving this target is that fact that, uniquely in the Australian context today, the WA State Government is prepared to subsidise rail by $43 per TEU for short-haul trips. While other operational and customer service issues with rail exist, it is significant that the government has addressed the key competitive disadvantage of cost. With the current strategies in place, it appears the Fremantle is relatively well placed with the infrastructure it currently has.

[109] *Ibid p6*
[110] *Ibid p6*

6. Case studies for further investigation

Using the framework together with the literature review, examination of Australian port supply chains and stakeholder consultations, we were able to identify potential case studies to be examined in stage two.

This section discusses the potential case studies, providing an overview of the potential for productivity gains as well as the indication of what each potential solution would involve.

Case studies have been identified for the ports that seem to have inadequate infrastructure or planning in order to efficiently handle the proposed growth in container throughput. The ports of Brisbane, Sydney and Melbourne all appear to have deficiencies with their landside infrastructure:

- Brisbane has identified major deficiencies in its plans to grow trade through the port, particularly because of the growth in coal exports. It has identified a need for dedicated rail freight infrastructure.
- In Sydney, freight congestion issues are caught up with general congestion. Both are becoming critical and there may be potential to use dedicated or priority freight infrastructure to help solve them.
- In Melbourne, the port's location at the edge of the CBD means there is a great deal of mixing of freight and passenger traffic, which could be alleviated with dedicated or priority freight infrastructure.

As such case studies have been identified for each of these ports:

- At the Port of Brisbane, a new and upgraded dedicated freight line from prospective coal fields 300 kilometres away to the port has already been proposed by the port. This will also provide a first class dedicated freight rail line for intermodal trains
- At Port Botany, a range of possibilities has been considered such as using the widened M5 for truck lanes, double stacking of trains and the Eastern Creek Intermodal Terminal.
- In Melbourne, a proposal for a truck action plan is being reconsidered, and the Port of Melbourne – West gate Freeway direct freight connection is another option.

6.1 Port of Brisbane Dedicated Rail Freight

6.1.1 Introduction

The Port of Brisbane was privatised in late 2010 as part of the Queensland Government's strategy to reduce debt. The port was bought by a consortium of four long-term infrastructure funds.

Its new owners and management have reviewed the growth prospects of the port and have identified coal as the commodity most likely to provide the greatest growth prospects. At the same time, they reviewed all of their infrastructure and operations and found that the greatest risk they faced was not on the sea side of their operations, or the on-port operations, but more their connectivity with the hinterland that supplies their exports and receives their imports.

The road network between the port and its catchment area is generally excellent, with recent multi-billion dollar investments increasing capacity in all directions. In the short to medium term, the port will not have any major issues with road transport infrastructure. It was rail where the port saw its greatest problem.

Background

The port has identified a possible catchment of 50 to 60 million tonnes of coal per annum, well above the capacity of the existing rail infrastructure. The system is in parts antiquated and also has to compete with passenger trains to gain access where it transits the Brisbane Citytrain network. On the Western network, from which the coal originates, the line has to navigate a steep range, the Toowoomba Range, which has light 15.75 tonne axle load limits, tight corners and small tunnels. The final 35 kilometres to the port is a dedicated line. But this line has to cross over passenger lines and thus is subject to peak-hour passenger train curfews.

Given these finite capacity constraints, the port is only able to handle around 10 million tonnes of coal per annum, which would rise to 14 million tonnes with expenditure of several hundred million dollars to increase capacity on the line from Acacia Ridge to the port.

Black coal is currently (early 2012) going through a boom in Queensland in reaction to high prices and high demand from India and China. Multi-billion dollar investments are being considered for the coalfields of Central Queensland as new areas, such as the Galilee Basin, are opened up and new dedicated rail and port infrastructure is built.

In order to access the higher volumes of up to 60 million tonnes, the Port proposes to fund or manage the construction of a new and upgraded railway from the prospective coalfields 300 kilometres away, to the port. The line would have three sections, for which preliminary analysis has started:

- Western Line/Toowoomba Range upgrades – $1.3 - $1.7 billion
- Southern Freight Rail Corridor line – $1.0 – $1.2 billion
- Eastern Freight Rail Bypass – $1.2 – $1.6 billion

Together these represent a total cost estimate of between $3.5 billion and $4.5 billion. The first two of these sectors have been studied for a number of years. Toowoomba Range crossings have been analysed for over ten years, separately and as part of the Melbourne–Brisbane Inland Rail Line. The Southern Freight Rail Corridor is also part of the larger Melbourne–Brisbane project and was studied in the late 2000s. Currently, the corridor and alignment have been identified and the project currently is recognised in planning schemes.

The Eastern Freight Rail Bypass is a new proposal that connects the point where the southern freight corridor meets the Sydney – Brisbane line with the existing freight line near Murarie. It would follow part of the Logan and Gateway Motorway corridors. Hence, it would bypass the Citytrain network completely via the southern corridor and the eastern bypass.

The Port sees the project as having positive spin-offs for its container trade. The line will allow for long trains, double staking and a much improved transit time for rail-borne containers, thus improving rail's competitive position in relation to road. The Port will have a connection to the existing intermodal terminal at Acacia Ridge and also to a proposed terminal at Bromelton, approximately 90 kilometres from the Port. The project is timed to be completed when the roads used to access the port are likely to approach critical levels of congestion. Hence the rail line should provide access for large proportions of the port's short haul container trade.

Case Study Proposal

The Port of Brisbane has already undertaken preliminary market demand analysis and engineering analysis of its proposal. The proposal does not envisage government funding, but would require planning and environmental clearances, which could cover some sensitive issues concerning urban amenity and protection of wildlife. Haulage of coal will fund the proposal. Particular issues we will focus on are:

- How will the container trade at the port benefit from the proposal?

- While the infrastructure will be first class, what other constraints need to be overcome to make rail-borne containers commercially competitive for short haul trips to intermodal terminals?
- Is reliance on a large volume bulk commodity, such as coal the only way for first-class new rail infrastructure to be funded without a requirement for government subsidies?
- What governance, regulatory and access issues arise for a private owner of major rail infrastructure in a capital city?
- How do the financial markets view the proposal in terms of bankability and the veracity of the ports future market demand forecasts?

The case study will have relevance to the main container ports we have considered, the central issue being, can a new dedicated railway with or without a major export commodity such as coal be financially sustainable, or if not, what level of government subsidy is required?

6.2 Port Botany Eastern Creek Intermodal Terminal

Introduction

An intermodal terminal (IMT) is a facility set aside for freight to be transferred between road and rail. Linked to the rail network, it includes a yard and possibly warehouses. Shipping containers are bought to the IMT by rail and stored for short periods, with goods then being taken away by trucks or continuing on by rail for distribution to other locations[111].

Sydney has the most extensive urban IMT network in Australia, including four significant terminals within a 50km radius of Port Botany. Total capacity provided by these IMT's per year is approximately 120,000 TEUs. The IMT at Minto is being developed to cater for 200,000 TEUs per annum while the Yennora terminal is projected to expand its capacity to 200,000 TEU.

In the future, the freight IMT network system in NSW will comprise the super hub IMTs at the Port of Botany; complemented by a number of IMTs of capacities between 50,000 and 500,000 TEU per annum located along the fringe of Sydney CBD to serve growth areas; IMTs located close to the Port of Botany to serve interstate cargoes; and IMTs in regional NSW to receive local produce for export and goods for distribution to regional NSW.

Background

Container trade in Sydney is expected to grow to between 3.15 million and 3.81 million TEUs by 2020. However, none of the existing facilities has sufficient expansion potential to provide for longer trains and the anticipated increase in demand[112]. In Sydney, daily truck trips are expected to more than double from 2,900 movements in 2010 to 6,270 movements by 2021, which is expected to significantly increase road congestion issues. It is noteworthy that the road network is already under pressure due to general traffic, a complex and narrow arterial road network and high urban densities.

Provided the new and existing IMTs can be effectively designed and operated, they will improve the landside efficiency of Port Botany and significantly reduce the contribution of container truck movements to road traffic congestion and environmental impacts.

Around 85% of cargo handled at Port Botany is generated or destined for locations within a 40km radius from the port.[113] The port is serviced by a freight line that includes some dedicated sections. It has the capacity to handle 500,000 TEUs per year, but is currently handling only 50% of that number. The road network currently handles more than 750,000 TEUs per year. Because rail freight needs to be split between stevedores, trains arriving and departing the port need to be broken in the port yard, causing delays and adding operational complexity.

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[111] Dept of Finance and Deregulation, *"Information Paper: Moorebank Intermodal Terminal Project"*, Moorebank, 2011
[112] Dept of Transport and Regional Services, *"North South Rail Corridor Study: Detailed Study Report"*, Sydney, 2006
[113] Gilfillan (2011)

Recognising the significance of rail freight performance in managing road congestion, the NSW government aims to move 28% of containers in and out of Port Botany by 2020[114]. However, rail currently only carries 14% of these containers.

Due to the high concentration of freight origins and destinations within metropolitan areas, in order to achieve the rail target:

- Growth will need to come from short-haul urban train shuttle services.
- There needs to be a growth in imported containers carried by rail, relative to exported containers because Port Botany services twice as many import containers than export containers, yet 70% of containers transported by rail are exports.

If a 28% mode share on rail could be achieved, rail would handle between 0.9 and 1.1 million TEUs by 2020. As the forecast capacity of existing IMT's by 2020 is 720,000 TEUs, extra capacity of between 180,000 and 380,000 TEUs will be required from new intermodal facilities. The NSW Government's Metropolitan Plan outlines a proposed network of additional IMTs and supporting infrastructure in the central-west, south-west and west of metropolitan Sydney to meet predicted demand. Facilities are proposed at Enfield, Moorebank and Eastern Creek.

Case Study Proposal

To service the growing Western Sydney region, a potential IMT in Eastern Creek was identified by the Freight Infrastructure Advisory Board (FIAB) to cater for at least 500,000 TEUs annually. The proposed IMT would have a number of elements to meet the required freight logistics task[115]:

- There would be direct rail links to Port Botany.
- Road transport will provide and deliver containers and goods to destinations within the catchment area.
- The inclusion of warehousing and freight support services within the site would reduce the number of large truck movements within local communities.

However, the remoteness of Eastern Creek puts it at a disadvantage, as it would likely require the construction of a new 18km dedicated freight line linking the terminal with the Southern Sydney Freight Line. It would also require significant land acquisition and construction costs. Present rail deficiencies pose threats to service certainty and hence the viability of this terminal[116]. An additional critical factor that would determine its future economic and construction viability is effective corridor preservation.

6.3 Including Truck Lanes in the Proposed M5 Upgrade

The M5 transport corridor is the main passenger, commercial and freight route between Sydney Airport, Port Botany and South West Sydney. It comprises of two sections;

- M5 West, a 22km tolled surface road with two lanes in each direction between Camden Valley Way, Prestons, and King Georges Road, Beverly Hills, operated by Interlink Roads.
- M5 East Freeway, a 10km road that connects the M5 South east with General Holmes Drive, close to the port.

The M5 corridor is one of the most heavily constrained roads in Sydney:

- On average 91,000 vehicles use the M5 West Motorway per day.[117]

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[114] The previous government target had been 40%

[115] Sydney ports Corporation, *"Port Freight Logistics Plan"*, Sydney, June 2008

[116] Shipping Australia Limited, *"Metropolitan Intermodal Terminal Study,2011"*, Sydney, 2011

[117] Roads & Traffic Authority, *"M5 West Widening: Environmental Assessment"*, NSW Government, September 2010

- Around 7000 vehicles (8%) are heavy vehicles, making the M5 West Motorway one of the most important freight corridors on the Sydney motorway network[118].
- During the middle of the day, traffic volumes are almost as high as during peak hours.
- Peak hour vehicle trips are anticipated to increase by 50% by 2036.
- The NSW government's planning strategies identify land along the M5 West motorway to be developed to intensify employment. The strategic locations along the corridor include Moorebank, Minto and Campbelltown. As these develop into dense employment areas, they will generate more demand for commercial and freight transport in the corridor.

In the absence of additional capacity, travel times will continue to increase as congestion worsens, and more heavy vehicles will be diverted to local roads.

Widening of the M5 West Motorway commenced in August 2012, with the $400m project funded by Interlink Roads. The NSW government also contributed $50m in funding for noise abatement measures to address community concerns. The project involves widening 22km of the M5 South West motorway from two to three lanes in each direction, from Camden Valley Way at Prestons to King Georges Road at Beverly Hills[119].

Some consideration was given to including truck only lanes in the M5 West upgrade with the aims of keeping goods flowing smoothly, improving overall mobility along the freeway, and improving traffic safety and air quality.

However, after some consideration, it was decided that they were not warranted for the M5 West upgrade. The benefits of dedicated truck lanes would be shorter trip times over the length of the lane provided and support for the increased demand of freight movement, while the negative aspects would include[120]:

- The truck lanes would be heavily underutilised due to the proportion of heavy vehicles comprising the overall traffic mix.
- Overall trip times would not reduce substantially as heavy vehicle trips are usually long and there are other congested links in the arterial and motorway network.

For the M5 East Duplication, planning is still underway on the details and timing of the announced upgrade.

Current plans are for:

- Widening the M5 East Motorway east of King Georges Road to four lanes in each direction.
- Providing four new lanes in a tunnel(s) next to the existing the M5 East tunnel.
- Providing a new four lane arterial road from the M5 East tunnels to the airport, the port and the industrial land uses north of the airport.

Case Study Proposal

Our proposal was to look at a form of prioritised truck lanes on the M5 Motorway, including both the M5 East and West, to be incorporated into the proposed M5 East Duplication.

There are two alternative approaches we could take to this case study. Firstly, we could consider the economic case for Truck Lanes on the M5 West. Since this was considered by the NSW Government, there is likely to be information available to complete this study and it has the potential to deliver valuable information on situations when dedicated or priority freight infrastructure is not justified.

[118] Roads & Traffic Authority, *"M5 West Widening: Environmental Assessment"*, NSW Government, September 2010
[119] Roads Australia News, *"M5 Widening set to start this year"*, Roads Australia, 30 January 2012
[120] Roads & Traffic Authority, *"M5 West Widening; Submissions and Preferred Project Report"*, NSW Government, May 2011

Secondly, we could consider introducing truck lanes on the M5 East. In both cases, we could explore the potential for using high productivity vehicles on the road and into the port, taking into account the cost of minor upgrades at key pinch points around Port Botany.

6.4 Double Stacked Trains on Port Botany Freight Line

Double-stacking is where containers are stacked two high on railroad cars so that freight train of a given length can carry roughly twice as many containers.

On many railroads, special well-cars are used for double stacking to reduce the required vertical clearance and to lower the centre of gravity of a loaded car. In addition, the well-car design significantly reduces damage in transit and provides greater cargo security by cradling the lower containers so their doors cannot be opened.

Double stack trains operate in Australia between Perth, Adelaide, Darwin and Parkes, NSW[121].

Background

Double-stacking increases rail productivity, but it requires at least 6.5 metres of clearance above the rail height. Introduction of double-stacking is limited because construction costs to provide such clearances can be significant. Increasing height clearances has two market drivers:

- Domestic containerised freight has tended to be moved in increasingly tall containers. Small increases in height clearance can allow these taller containers to be moved on a broader range of wagons.
- Increasing single-stack clearances by about 2 metres allows containers to be double-stacked. This offers both efficiency and capacity benefits. Double-stacking and increasing train length offer comparable increases in efficiency for an equivalent increase in containers per day.
- Double stacking makes rail more cost competitive, which shifts more freight from road to rail.

The spillovers internalised by increasing rail productivity will not be taken into account by a commercial investment appraisal which strongly suggests investment by government is necessary[122].

The introduction of new IMTs around Sydney could facilitate the introduction of double-stacking out of Port Botany to metropolitan terminals. However, between Port Botany and the Enfield Logistics Centres there are 26 overhead bridges, which would need to be raised for double-stacking to be possible. In addition, a recently completed vertical grade structure at the port would need to be modified to permit the trains to travel underneath. There are also height restrictions because of proximity to the airport. As a result, introduction of double-stacking would be expensive. Sydney ports representatives have concluded that the rail line between Enfield and Port Botany could not accommodate double stacking at this time[123].

Case Study Proposal

We gave this proposal early consideration, but due to the high potential cost, it would need greatly increased volumes to be viable. It would be more appropriate to focus on lifting rail utilisation towards the NSW Government target of 28% of containers on rail.

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[121] Australian Railway Industry, *"2008-2024 Interstate and Hunter Valley Rail Infrastructure Strategy"*, June 2008
[122] QR Limited, *"Australia's Future Infrastructure Requirements"*, Infrastructure Australia, Oct 2008
[123] Port Botany Neighbourhood Liaison Group, *"Draft Minutes"*, Sydney ports Operations Centre, Nov 2010

6.5 Sydney Port – Tunnel linking Port Botany to the M4

Introduction

The M4 is a 40 kilometre urban expressway running from Strathfield in the inner-west to Penrith at the foot of the Blue Mountains. It enables travel between key regions of western Sydney and services over 100,000 vehicles each day.

In 2010, management of the road was given back to the NSW Government and the toll removed after the tolls had paid for the road's construction costs.

Background

An issue with the M4 is that it finishes at Strathfield without continuing on toward the city or port and airport. Recently, the NSW Government considered a number of options to connect the M4 to the areas closer to the city. Preliminary investigations for the following three tunnel proposals have been undertaken:

- North Strathfield to the Anzac Bridge at Pyrmont.
- North Strathfield to Port Botany and Sydney Airport.
- North Strathfield to Victoria Road east of Gladesville Bridge near Drummoyne.

Our interest is in the second of these tunnel options, linking the M4 from Strathfield to Port Botany. This would give the port direct access to the mid-west of Sydney, the major area for the distribution of containers.

Options are at a very preliminary stage. No decision has been made about whether to proceed with further planning.

Case Study Proposal

Our case study proposal is to look at the M4 extension to Port Botany as including a dedicated or prioritised truck lane within the tunnel. Various options are available. It could give priority to trucks during certain times of the day by applying a toll to other traffic, similar to the Dublin Tunnel discussed in literature search. Or it could be solely for the use of heavy vehicles over a certain tonnage. An important consideration will be the anticipated high cost, as it involves extensive tunnelling in densely populated areas.

6.6 Port of Melbourne – West Gate Freeway Freight Link

Introduction

In discussions with the Port of Melbourne, the idea of a direct link from inside the port, perhaps off Coode Street, linking up with the West Gate Freeway, near the City Link interchange emerged. The result would be an elevated spur road connecting the port with a major road handling much of the ports freight task.

Background

The proposal has had no detailed consideration. No work on its technical feasibility has been undertaken nor on industry views on the idea. Technical issues include where in the port environs to put the starting point, the required gradient given the space available, and where and how it would connect with the West Gate Freeway. It would obviate the need for the Truck Action Plan proposal, as both proposals would have similar benefits to the freight task.

Case Study Proposal

As the Truck Action Plan (the next proposal considered) has received much more analysis and therefore has more data available, we consider that a more appropriate proposal for serious consideration.

6.7 Port of Melbourne –Dedicated Truck Roads through Yarraville

Introduction

The Port of Melbourne ('POM') is Victoria's main container port (with current plans to expand container handling facilities at Port of Hastings) and Australia's largest international container port. Of particular importance is the Port's 'gateway' function for Tasmanian trade and southeast of Australia.

Container trade for the POM is forecast to increase to 3.2 million TEU by 2015, 5.3 million TEU by 2025 and 8.2 million TEU by 2035.[124] Approximately 85% of this will be international container trade, which has to be transported on the Victorian and interstate networks.

Development of the Port is limited by its inner-city Melbourne location, west of the CBD. The Port is bound on all sides by medium to high density residential, commercial and community development. A significant portion of container facilities exist in the western suburbs of Melbourne, accessible from the west via Footscray Road using the suburban streets of Yarraville. These streets are not suited to industrial purposes and heavy truck usage has resulted in strong community opposition.

Significant uncertainty surrounds Victorian port and freight strategy as previous port and freight policies have become obsolete with the 2010 change in government. A number of previously proposed projects are now under review.

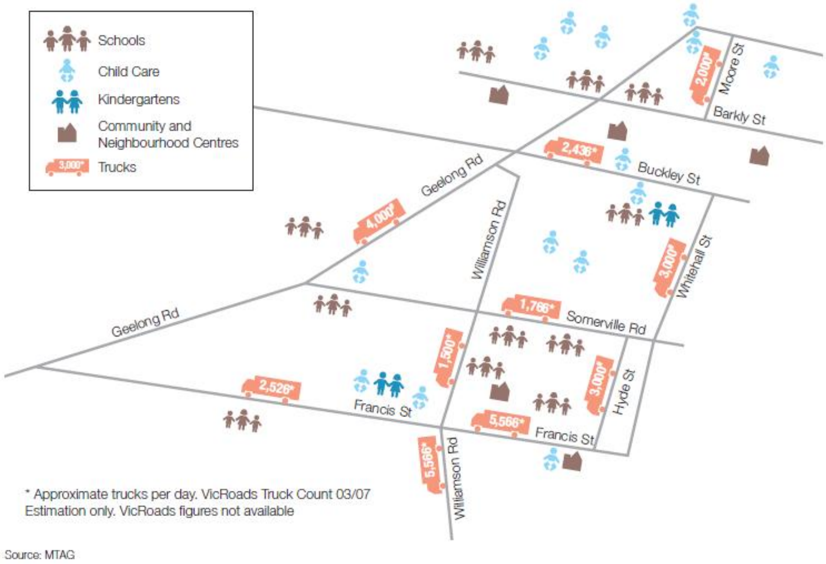
Background

Road links between the Port and the West Gate Freeway have been an ongoing concern for the Port and its surrounding communities, in particular, Francis Street and Whitehall Street, which link the Port to the West Gate Freeway as well as neighbouring container parks. Discontent regarding use of these suburban streets has been building over many years and more recently, strong population growth across Yarraville and Footscray has heightened the issue.

A representation of freight volumes on key inner west suburban roads and the existing community infrastructure assets are depicted in Figure 6 below.

[124] Adapted from "Port Development Strategy: 2035 Vision", Port of Melbourne Corporation, 2009

Figure 6: Community activity and freight movements in the Inner West



Source: "Investing in Transport: East West Link Needs Assessment", 2008.

CityLink presents an alternative route to the Port and bypasses these suburban streets. The toll road runs parallel to the eastern border of the Port and connects with the West Gate Freeway in the south. Use of this connection has been limited for westerly bound port freight due to a toll and a longer journey. The existing suburban road network is a more direct connection to the container parks in the west.

Compounding the issues surrounding Port accessibility is the disproportionate share of container trade that has an origin or destination within metropolitan Melbourne. Origin/destination modelling indicates that 91% of imported full containers transported by road have a destination within metropolitan Melbourne.125

Future truck movements are likely to grow with increasing port trade and any increase in rail usage is not expected to significantly decrease this growth. Furthermore, the following factors may contribute to increased pressure on the Port's transport links:

- Significant population growth in the Inner and Outer West, including proposed residential developments at Fisherman's Bend.
- Proposal to develop Webb Dock for container trade.
- General growth of the Victorian and Australian economies. As the largest international container port in Australia, the POM can be expected to play a key 'gateway' role in meeting increased consumption and production.

Industry consultation has highlighted that access to the Port and its surrounds is an emerging problem. A dedicated road link between the Port to the West Gate Freeway has been suggested as a potential option to reduce the number of trucks passing through suburban streets and create a more direct link to the Port.

These, and other, well-documented issues were summarised in The Eddington Study of 2008. The recommendations of this study included the Truck Action Plan ('TAP'). The TAP has since evolved under VicRoads and is now being reviewed and refined.

[125] "2009 Container Logistics Chain Study", pg. 73, Port of Melbourne Corporation , 2010.

6.8 Case Study Proposal

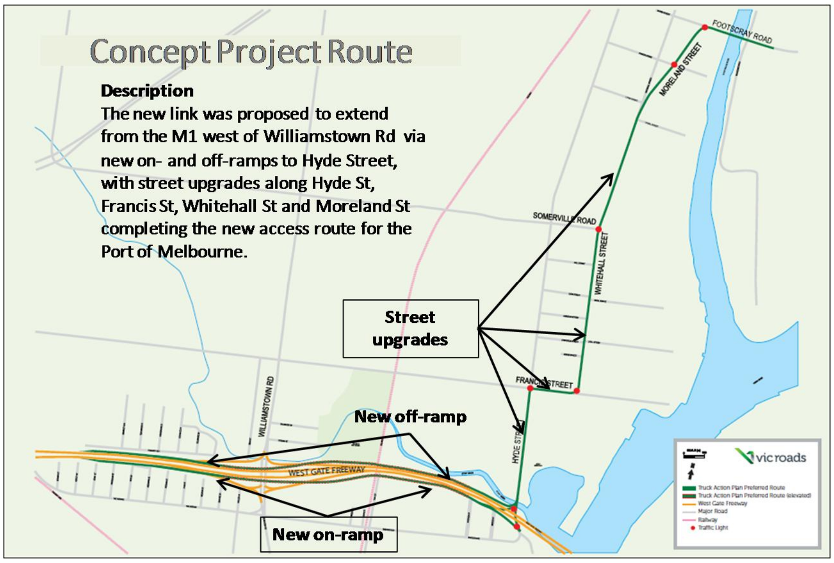
The TAP includes a proposed project for a new route that aims to increase accessibility to the Port and adjacent Port-related activities and to reduce the number of trucks on residential streets. The most recent VicRoads concept project includes:

- A new ramp connecting the West Gate and Hyde Street
- Upgrades to Hyde Street, Whitehall Street and sections of Francis Street and Moreland Street
- Strengthening Shepherd Bridge (which carries Footscray Rd across the Maribyrnong River, a project announced by the previous government in October 2010).

Our proposal is to consider an alteration to the current concept project by making it prioritised in some way for truck traffic only. This could be via several means, such as a curfew or toll for general traffic, or banning trucks from other close by routes.

Figure 7 displays the proposed direct link.

Figure 7: Truck Action Plan – VicRoads update (2012)



Source: "Truck Action Plan", VicRoads, <http://www.vicroads.vic.gov.au/Home/RoadProjects/PlanningAndProposals/Melbourne/TruckActionPlan.htm2012>, Accessed online: 23 March 2012.

Key issues will include:

- How will the container trade at the port benefit from the proposal?
- To what extent would industry be amenable to paying for the benefits it receives?
- Do other constraints exist that will limit the impact of the proposed infrastructure asset?
- Could other existing infrastructure be used instead?
- Is the rationale for Government funding compelling?
- What governance/regulatory/access issues may arise with a private owner of roads in a capital city?
- The Port may need to purchase additional land assets to extend its current boundaries. What issues arise in terms of models of port ownership and governance in Australia?
- How do the financial markets view the proposal in terms of bankability and the credibility of the Port's demand forecasts?

As a part of The East West Link Needs Assessment and development of the Truck Action Plan, significant work has been undertaken regarding the costs and benefits of development. Demographic forecasts, expected settlement patterns and public open space needs were weighed against financial costs and economic benefits of the development. This and updated information from VicRoads forms our core set of data for the case study.

6.9 Evaluation Framework

A qualitative evaluation framework was used for the assessment of the case studies. Central to this evaluation are the principles for dedicated and priority freight infrastructure detailed in Chapter 4. This has been augmented with factors which we have developed specifically for considering what proposals to take forward for full consideration as a case study. These factors are:

1. Cooperation and support for the study by the relevant stakeholders.
2. Availability of data/information.
3. Fulfilling the defintion of a dedicated freight infrastructure project.
4. Subject to study by others, or more appropriatly studied by others.
5. Geographic spread of case studies.

The proposals have also considered as a complementary mix of road and rail infrastructure case studies that have the potential to deliver meaningful analysis on the dedicated and priority freight infrastructure in Australia.

The principles for dedicated and priority freight infrastructure and the criteria above are displayed in Table 11 below.

Table 11: Case Study Assessment Criteria

Case Study Assessment Criteria	Key Elements of the Criteria	Strategic Assessment Issues Considered
Demand Factors	Trade volumes, congestion, distance and other demand factors such as land use, amenity and safety	▶ The current and projected trade volumes to be transported ▶ Levels of congestion resulting from the transport of the trade volumes ▶ Relevance of distance as a factor determining modal choice ▶ Relevance and importance of setting aside land corridors and buffer zones in order to handle future volumes ▶ Amenity and safety concerns through the interaction of the freight task and urban communities and passenger transport modes
Supply Factors	Capacity to handle the task, its cost effectiveness, form and who pays and benefits	▶ The gap between the actual or anticipated freight task the road/rail capacity to meet the task ▶ At a time of financial constraint by governments at all levels, cost becomes of even greater importance ▶ Dedicated freight infrastructure can take many forms, from re-apportioning current infrastructure to building new infrastructure. The form it takes can also vary in the level of priority and form of enforcement ▶ Proposals should be market led, with identifiable benefits to freight users and payment for these. There are also wider economic benefits and direct benefits to other users for which government may have a role in paying for
Cooperation	Of the relevant stakeholders	▶ A necessity for any project, from the political level down to government officials and the privates sector participants
Data Availability	From sources	▶ The readiness of relevant data holders to release the necessary information and data in order for us to undertake the analysis.
Clear case of Dedicated Freight Infrastructure	Is this a dedicated freight project?	▶ Some freight issues are best handled by policy changes or forms of infrastructure investment that may not be totally freight related or dedicated to freight
Subject to study by others	Are others studying it?	▶ Are there other parties in a better position to consider this project?
Geographic Spread	Ensuring wide coverage of ports	▶ Each port has unique characteristics, we want to cover as wide a spread as possible

The evaluation of each of the case studies was undertaken using the three level ranking system outlined in Figure 8 below.

Figure 8: Case Study Assessment Rating

Case Study Assessment Rating	Rating Description
1	Unlikely to meet the case study assessment criteria requirements
2	Partially meets the case study assessment criteria requirements
3	Fully meets the case study assessment criteria requirements

This ranking system is based on a qualitative assessment of the ability of the individual case study proposals to meet the required assessment criteria. The ranking system focuses on identifying the degree to which each criterion is addressed (being unlikely, partially or fully addressed).

Proposed Case Studies

Using the above evaluation framework, the assessment was undertaken of all the case study proposals. This strategic assessment is summarised in Figure 9 and resulted in the identification of the following two proposals for further development, analysis and consideration:

- Brisbane Dedicated Freight Rail Line: Although specifically aimed at coal exports, will also allow for intermodal trains. The Port of Brisbane agreed to our making an assessment of their proposal, providing access to their engineering and market forecasts.
- Melbourne Dedicated Freight Road Link: The concept project outlined in the TAP has been studied and so data is available. We studied a change to the previous proposal by considering various forms of prioritised access for trucks only via a toll on other users, a curfew, or other form of prioritisation.

Figure 9: Case Study Proposal Scorecard and Scores

Case Study Assessment Criteria	Brisbane	Sydney - Port Botany				Melbourne	
	Dedicated Freight Rail Line	Eastern Creek Intermodal Terminal	M5 Truck Lanes	Double Stacked Trains to Enfield	Tunnel linking Port to the M4	Port - West Gate Freight Link	Dedicated Freight Road Link (TAP)
Demand Factors							
Trade volumes, congestion, distance and other demand factors such as land use, amenity and safety present	3	2	3	3	3	3	3
Supply Factors							
Capacity to handle the task, its cost effectiveness, form and who pays and benefits	3	2	3	3	3	2	3
Cooperation							
Of the relevant stakeholders	3	2	2	2	2	1	2
Data Availability							
From sources (to be confirmed)	3	2	1	1	2	1	2
Clear Case of Dedicated Freight Infrastructure							
Is this a dedicated freight project? (Yes=3)	3	1	3	1	3	3	3
Subject to study by others							
Are others studying it or better suited to study it? (No=3)	2	1	2	1	2	1	2
Geographic Spread							
Ensuring wide coverage of ports	3	1	3	3	1	1	3
Overall Ranking	20	11	17	14	16	12	18
Proposal Progress as a Case Study	Yes	No	No	No	No	No	Yes

PART B: Case Studies (2012-2014)

CASE STUDY 1: MELBOURNE

1. Introduction

1.1 Background & Purpose

This case study for Melbourne focuses on a concept project to provide a new road link between the Port of Melbourne (PoM) precinct and the West Gate Freeway.

EY consulted with VicRoads to obtain and analyse data related to the case study. The project analysed in this case study is purely conceptual in order to explore issues in providing dedicated freight infrastructure between the West Gate Bridge and PoM precinct. And while we have drawn on the results of previous work undertaken by VicRoads, we stress that the concept project does not constitute a VicRoads or State Government project.

1.2 Our Approach

This case study aims to enhance our understanding of the conditions that justify the delivery of dedicated freight transport infrastructure to serve Australia's major container ports.

In undertaking the case study, the key tasks included:

- Obtaining relevant project data from VicRoads
- Undertaking an analysis of the potential impacts of the concept project in order to identify and value the benefits of the case study as an example of a priority freight link
- Undertaking a rapid financial assessment in order to evaluate the potential commercial feasibility of the project
- Considering potential commercial and governance models that could be deployed to support the delivery of the infrastructure project
- Gauge the level of market interest and demand for the project, and in particular with respect to contributing to its commercial delivery

Part A of this Report identified a set of principles for considering dedicated and priority freight infrastructure. The study found that there is a range of demand and supply factors that drive the viability of dedicated and priority fright infrastructure.

Principles of demand include:

- The presence of conflicts between freight and other users of the transport network
- The size of the freight task
- Distances that freight movements are required to travel
- General network congestion around ports and other key freight centres
- Land use planning considerations
- Amenity issues
- Safety and environmental concerns
- Industry demand and willingness to pay for infrastructure

Principles of supply include:

- Capacity constraints around ports and other key freight centres
- Cost effectiveness in delivering priority freight infrastructure
- Form of infrastructure and design to address freight issues

These principles were used to inform the selection of case studies and to provide the framework within which to analyse this case study, and to consider whether it is an example of appropriate dedicated or priority freight infrastructure in support of the PoM.

2. Overview & strategic context for the case study

2.1 Introduction

The overview of the case study and strategic context highlight the extent to which the project is designed to overcome congestion and conflicts on the network, and to enhance nearby amenity, in order to drive productivity growth to support the freight task. These represent a blend of the key principles of demand for the potential need for dedicated freight infrastructure. On the supply side, capacity constraints were also identified as a key driver.

This chapter sets the scene by establishing the opportunity for the project as a dedicated freight link, which is to be confirmed or rejected through the economic and commercial analyses presented in subsequent chapters. These latter chapters also help us to understand whether the design and/or expected uses of the project meets the principles or pre-conditions for priority freight infrastructure.

2.2 Overview of the case study

The concept project in this case study contains a range of measures that were developed as a way of ensuring the sustainable growth of the PoM and for improving the amenity and development potential of the inner west of the city. This would be achieved through the provision of a series of network improvements and other measures aimed at providing a direct link between the West Gate Freeway and the PoM in order to improve the efficiency of vehicle movements and to reduce the number of freight and private motor vehicles on residential streets in Yarraville in the inner west of Melbourne.

While not designed specifically as a dedicated freight link, which is the way we have conceptualised the project in this analysis, the project was identified as having the potential to support the continued expansion of the PoM from its current task of around 2 million to over 8 million TEUs per annum by 2035. The efficient functioning of the road network accessing the Port has been considered a key factor in ensuring the PoM is able to process much higher volumes of freight as the Victorian and Australian economies continue to expand, driving significant growth in imports and exports.

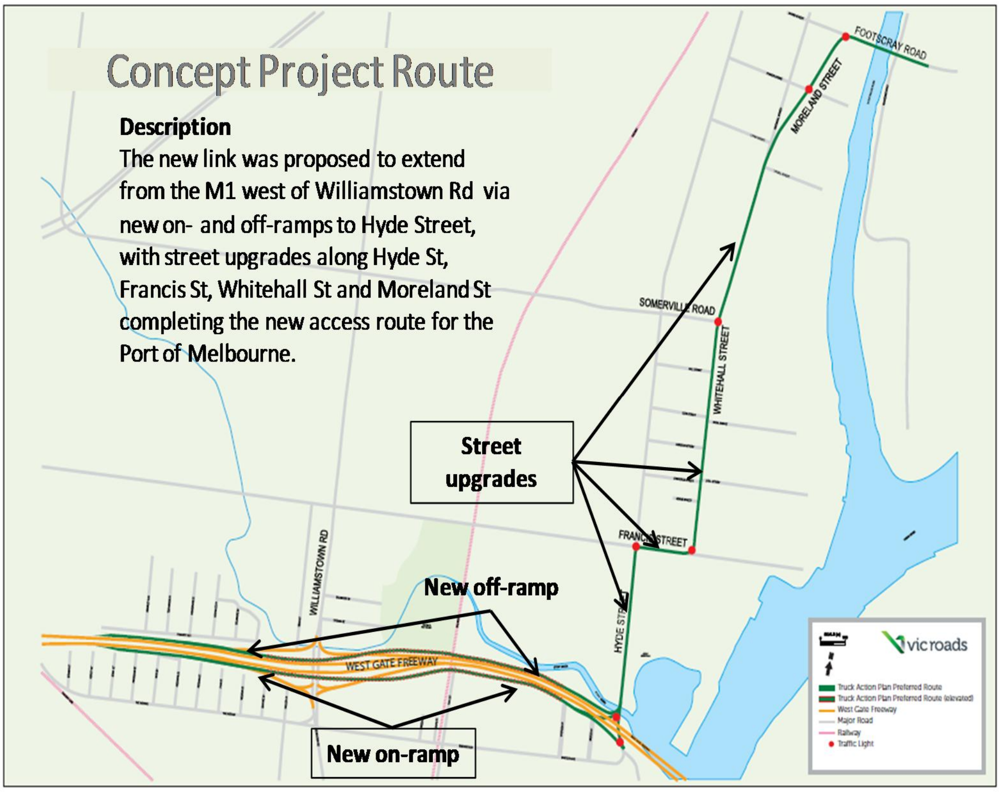
2.2.1 Infrastructure elements of the concept project

This case study involves the following major infrastructure elements:

- A new link, comprising new on- and off-ramps, connecting the West Gate Freeway and Hyde Street
- Upgrades to Hyde Street, Whitehall Street and sections of Francis Street and Moreland Street, as access roads for freight vehicles accessing the PoM
- Strengthening the Shepherd Bridge, which carries Footscray Road traffic across the Maribyrnong River.

This case study considers the possibility of delivering these elements as partly or fully prioritised freight infrastructure in order to test the feasibility of such infrastructure in the Australian context. This could be via several means, such as a curfew or toll for general traffic, and banning trucks from other nearby alternative routes. Figure 10 displays the proposed link.

Figure 10: Case study route



Source: VicRoads.

2.2.2 Project Benefits

Through the provision of this new link, it was envisaged that a significant proportion of the freight and other vehicles currently accessing the Port from the west through the streets of Yarraville (particularly Francis Street and Somerville Road) would switch to the new access route.

Depending on the effectiveness of the project in diverting freight and other traffic from Francis Street and Somerville Road, the concept project could be expected to deliver a series of benefits, including:

- More efficient freight flows owing to reduced travel times between facilities in the west and the PoM precinct
- The ability for higher capacity (HPFV) road freight carriers to access the PoM directly from the West Gate Freeway
- A general increase in network capacity for heavy vehicle traffic
- Improved social and environmental amenity in the inner west

The last of these benefits has important dynamic characteristics. For example, after removing a large proportion of freight vehicles from the inner western suburbs, the presence of nearby residential areas would be less likely to restrict the future development of the Port.

Similarly, the removal of freight vehicles could enhance the development potential of these areas. This may be of benefit given the proximity of the area to central Melbourne, which may be experiencing general constraints on development. As such, increasing development in these areas could enhance overall job and population densities in Melbourne, creating longer term agglomeration benefits.

A key question for this study is whether the concept project can provide an effective way of mitigating the conflicts between cars and heavy vehicles, and between residential and commercial land uses, while also promoting growth in port freight activity.

2.3 Current Situation

2.3.1 Project context

Located in the inner-west of Melbourne, the Port covers an area at the mouth of the Yarra River. At present, the Port relies heavily on road access via the surrounding freeways and roads in order to transport containers and other commodities between the Port and other areas of Melbourne and beyond. For example, one study indicates that 80% of imported full containers transported by road have a destination within metropolitan Melbourne.[126] Given this reliance on road transportation, high quality truck access is vital in ensuring that growth targets can be met.

Figure 11 shows the access routes to the Port in relation to the Greater Melbourne Area. These access routes are consistent with the “Principle Freight Networks” that are identified by the Victorian Government in *Victoria: The Freight state*, which is the Government’s vision and a plan for ensuring that Victoria retains its status as Australia’s freight and logistics capital [127]

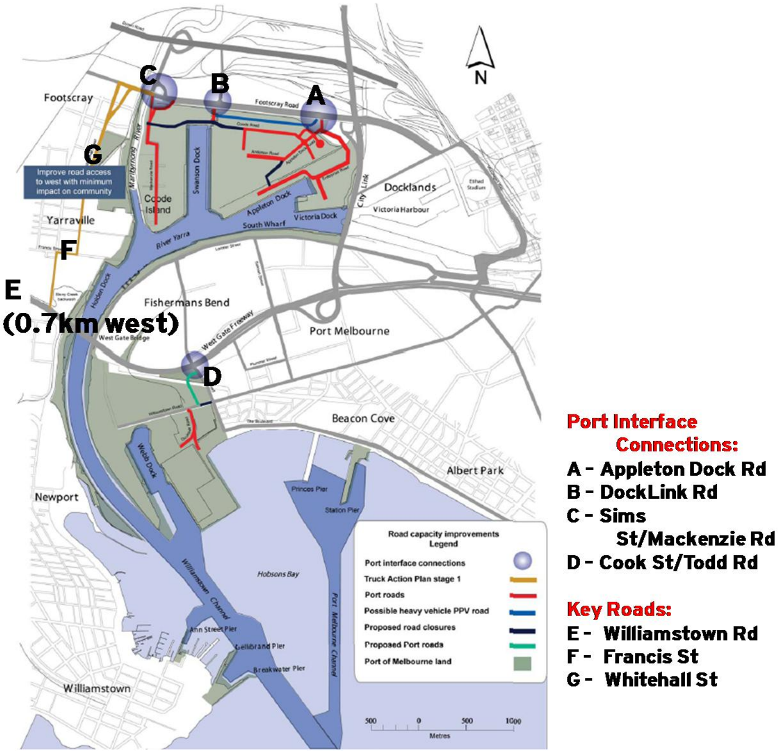
Figure 11: Access routes to the Port within Greater Melbourne

The Port comprises two key areas: the area north of the Yarra bounded by Footscray Road that includes the major facilities at Swanson and Appleton docks, and the area east of the Yarra bounded by Todd Road, which includes Webb Dock.

Figure 12 highlights these areas as well as the principal interface connections, roads and Docks.

[126] “Port Development Strategy 2035 Vision”, pg. 30, Port of Melbourne Corporation, 2009.
[127] “Victoria: The Freight State”, Victorian Government, 2013.

Figure 12: Port of Melbourne area and interface connections



From north of the Port, access is via the CityLink Tollway, with a turn-off point at Footscray Road leading into Appleton Dock Road (A). Access to Swanson Dock is via Dock Link Road (B) or Sims Street/Mackenzie Road (C). From east and south of the Port, access is either via Cook Street/Todd Road (D) for Webb Dock or across the Bolte Bridge to A.

From the west however, access is less clearly defined. Ideally, traffic from the west should cross the Westgate Bridge, turn onto CityLink and cross the Bolte Bridge before turning off at Footscray Road to reach connection A. These roads are better equipped to handle high volumes of truck traffic.

However, a problem is that in order to take a more direct route, and to avoid traffic congestion and the Bolte Bridge toll, trucks from the west are using the residential streets of Yarraville such as Francis Street and Somerville Road to access the Port (at C and B).

According to a VicRoads count, an estimated 20,000 trucks move through the inner-west every day. [128] Of this figure, it is estimated that 60%, or 12,000 of these go to or come from the Port. Note that this figure represents traffic in both directions, and hence accounts for both imports and exports.

2.3.2 Victoria: The Freight state (2013)

This case study has been developed and updated as the Victorian Government developed and released its latest freight and logistics plan – *Victoria: The Freight state*, which was released in August 2013.

The Government's freight and logistics plan has been developed in parallel and as part of a wider metropolitan planning strategy, which was released during early 2014. *Victoria: The Freight state* has an overarching goal to maximise the contribution of the freight and logistics sector to Victoria's productivity and liveability.

[128] http://www.theage.com.au/victoria/boom-port-to-bust-by-2015-20111209-1onu8.html

The following objectives have been adopted to support the delivery of the plan:

- Plan for and deliver capacity at key freight gateways in a timely manner
- Improve the efficiency and productivity of key freight network links
- Ensure future options are secured for key freight network developments
- Progressively decentralise freight activities from central Melbourne to selected outer industrial areas
- Protect and enhance access to markets for regional Victoria and adjoining catchments.

The following objectives have been adopted to support the delivery of the plan:

- Maximise efficiency of freight movements on the transport network
- Maximise the contribution of freight and logistics to overall economic performance
- Ensure continuity of international and interstate gateway capacity
- Ensure integration of freight and logistics activities with other land uses
- Minimise impacts of freight and logistics activity on safety, amenity and the environment
- Maximise affordability and private sector investment.

A number of directions that have been identified in the plan will contribute to addressing some of the issues identified in this case study. For example, there is an emphasis on using spare overnight capacity (Direction 8), providing an efficient freight network that includes major new investments like the East West Link and Managed Motorways (Direction 9), increasing the role of rail freight (Direction 10), and better managing freight delivery in urban areas (Direction 15).

2.4 Baseline Traffic Modelling

In order to understand project drivers and to get a sense of the traffic problems affecting the inner western suburbs, we have analysed the forecast traffic flows as predicted using a traffic demand model.

VicRoads modelled the baseline situation and project options using the Victorian Government's strategic traffic demand model – the Victorian Integrated Traffic Model (VITM). The VITM was used to provide the vehicle volumes and generalised cost changes to support the economic evaluation.

Table 12 provides the modelled truck flows in the AM peak (7-9AM) on two of the key access routes to/from the Port in the inner west of Melbourne – Francis Street and Somerville Road. With over 400 trucks using both Francis Street and Somerville Road in the AM peak in 2011, this equates to around 3,000 to 5,000 trucks per day on each of these roads, depending on the expansion factors applied.

The model predicts truck flows to grow at a steady rate to 2021, with modest growth expected over the following decade to 2031. With around 700-800 trucks expected to use the roads in the peak in 2031, this equates to around 5,000-8,000 trucks per day on each road.

Table 12: Baseline heavy vehicle volumes on Francis Street and Somerville Road as modelled in the AM peak

PoM Access Route	2011	2021	2031
Francis Street	486	764	808
Ave. Growth (% per annum)	-	4.6%	0.6%
Somerville Road	406	555	699
Ave. Growth (% per annum)	-	3.2%	2.3%

Source: VicRoads, EY analysis

We have further investigated the model outputs, using an extraction of link flows and speeds for 2021 and 2031 from the VITM runs used to underpin the Business Case. Table 13 shows the flows and speeds inbound on Francis Street and Somerville Road at the eastern end near Hyde Street, and the West Gate Freeway between Williamstown Road and the Yarra River. Table 14 provides the same view for outbound traffic.

Table 13: Baseline traffic volumes and speeds as modelled in the AM peak (INBOUND)

Traffic Metric	Francis St	Somerville Rd	West Gate
2021			
Private cars	1,229	1,029	14,725
Trucks	349	271	3,988
Average speed	32.0	11.4	8.4
Free flow speed	40.0	36.0	80.0
2031			
Private cars	1,243	952	15,580
Trucks	370	351	5,917
Average speed	31.8	11.0	10.2
Free flow speed	40.0	36.0	80.0
Change: 2021 to 2031			
Private cars (%)	14 (1.2%)	77 (-7.4%)	885 (5.8%)
Trucks (%)	21 (5.9%)	80 (29.7%)	1,929 (48.4%)
Average speed (km/h)	-0.2	-0.4	1.8

Source: VicRoads, EY analysis

Table 14: Baseline traffic volumes and speeds as modelled in the AM peak (OUTBOUND)

Traffic Metric	Francis St	Somerville Rd	West Gate
2021			
Private cars	1,198	703	10,526
Trucks	415	284	3,121
Average speed	31.8	24.8	13.7
Free flow speed	40.0	36.0	80.0
2031			
Private cars	1,357	751	12,258
Trucks	438	348	4,548
Average speed	30.8	20.0	11.5
Free flow speed	40.0	36.0	80.0
Change: 2021 to 2031			
Private cars (%)	159 (13.3%)	48 (6.9%)	1,732 (16.5%)
Trucks (%)	23 (5.6%)	64 (22.7%)	1,427 (45.7%)
Average speed (km/h)	-1.0	-4.7	-2.2

Source: VicRoads, EY analysis

The detailed flow and speed data highlight a number of key points:

- In addition to trucks, there are a large number of cars that use both Francis Street and Somerville Road in the AM peak, suggesting that it is not just truck traffic that is affecting the amenity and safety of the inner west
- The volume of traffic that relies on the West Gate is around 10 times as great as the other roads shown, highlighting the importance of the West Gate in serving east-west flows across the Yarra River
- Average speeds are significantly lower than the free flow speeds, which is particularly the case for the West Gate and Somerville Road. With such high volumes, any measure that improves flow on the West Gate has the potential to drive very large economic benefits (e.g. travel time and vehicle operating cost savings)
- Outbound flows and speeds are comparable to inbound flows and speeds, highlighting the extent of bi-directional flows and congestion in inner Melbourne, which in part is driven by the capacity of facilities such as the PoM, nearby industrial zones and the CBD to generate traffic at all times of the day.

Overall, the analysis of the baseline traffic data confirms the problem statements and the presence of demand-side pre-conditions that warrant consideration of network changes and potentially the delivery of dedicated freight infrastructure as a way of enhancing access to the Port and removing conflicts that exist between freight vehicles and other road users on heavily congested sections of Melbourne's road network.

However, we can also see that these problems are not localised to just one or two road links, but instead affect much of the road network to the west of the Port, as well as the M1 corridor. We also understand that the spread of development across Yarraville, which is a mix of industrial and residential uses, creates a complex pattern of mixed freight and private motor vehicle traffic, which would pose a challenge for the design of successful dedicated freight infrastructure. For example, it may be that the share of traffic in the area that actually uses the Port might not constitute enough of the local transport task to justify the delivery of cost-effective priority links.

3. Traffic impacts & benefits appraisal

3.1 Introduction

The case study we have selected is a concept project to address a number of problems and deliver a series of benefits including enhancing freight efficiency (i.e. lower cost vehicle movements), ensuring the PoM can achieve its container growth targets, and enhancing community amenity in the inner western suburbs of Melbourne.

As the project was initially conceived as a priority freight measure, this chapter first seeks to understand whether it would deliver the planned benefits in line with overall project objectives. We then consider whether the project has the potential to deliver positive traffic impacts and economic benefits as prioritised or dedicated freight infrastructure. From this, we may identify the factors that support or undermine these secondary objectives linked to the principles for dedicated freight infrastructure we identified in the Stage 1 Report.

To do this, we have analysed the expected impacts of the project using the traffic modelling results. We then examine the evaluation of project benefits that was previously completed by VicRoads. Using this work as a baseline, we then consider the impact of moving to a scenario involving freight priority.

3.2 Traffic modelling results

The VITM was used to model the impacts of the new ramps on network traffic flows at 2011, 2021 and 2031. The expected impacts of the project on car and truck flows on Francis Street, Somerville Road and the West Gate during the AM peak in 2021 and 2031 are shown below in Table 15 and Table 16.

Some key observations from these results are:

- The model predicts that the case study project would have a significant impact on the level of truck traffic using both Francis Street and Somerville Road, with volumes reduced by around 30-40% in the 2021 model, and by around 30% in the 2031 model.
- The addition of the new link attracts both heavy and private vehicle traffic away from Francis Street and Somerville Road. This highlights that the new link would not be expected to operate as a priority freight link unless some other supporting measures were put in place. These measures could include vehicle access restrictions and/or differential tolling measures.
- The large reductions in traffic on both Francis Street and Somerville Road, on the sections between Williamstown Road and Whitehall Street, result in significant speed increases on Somerville Road and only modest increases on Francis Street. This probably reflects the greater divergence from the free flow speed in the baseline situation for Somerville Road, which gives greater scope for travel time savings
- The introduction of the project is only expected to have a small impact on flows and speeds on the West Gate. Rather than improving the operation of this key arterial motorway, the project is instead providing a bypass for congested lower level roads.

Table 15: Impact of the project on traffic volumes and speeds in the AM peak in 2021 (INBOUND & OUTBOUND)

Traffic Metric	Francis St	Somerville Rd	West Gate
Baseline			
Private cars	2,427	1,731	25,251
Trucks	764	555	7,109
Average speed	31.9	17.2	10.6
Free flow speed	40.0	36.0	80.0
Project Case			
Private cars	1,905	1,442	25,117
Trucks	486	374	6,991
Average speed	32.4	22.5	11.2
Change			
Private cars # (%)	522 (-21.5%)	289 (-16.7%)	134 (-0.5%)
Trucks # (%)	278 (-36.4%)	181 (-32.6%)	118 (-1.7%)
Average speed (km/h)	0.6	5.4	0.6

Source: VicRoads, EY analysis

Table 16: Impact of the project on traffic volumes and speeds in the AM peak in 2031 (INBOUND & OUTBOUND)

Traffic Metric	Francis St	Somerville Rd	West Gate
Baseline			
Private cars	2,601	1,704	27,839
Trucks	808	699	10,465
Average speed	31.3	15.1	10.8
Free flow speed	40.0	36.0	80.0
Project Case			
Private cars	2,073	1,481	27,742
Trucks	580	489	10,302
Average speed	32.3	23.0	11.2
Change			
Private cars # (%)	528 (-20.3%)	223 (-13.1%)	97 (-0.3)
Trucks # (%)	228 (-28.2%)	210 (-30.1%)	163 (-1.6%)
Average speed (km/h)	1.0	7.9	0.4

Source: VicRoads , EY analysis

We have also analysed the conditions on sections of the new route as modelled in VITM (see below). The model predicts that around 1,800 private vehicles and around 900 trucks would use the new link between the West Gate Freeway and Hyde Street in the AM peak in 2021 (inbound and outbound), with average speeds of around 70-75 km/h (with free flow speeds assumed to be 100 km/h on this part of the new route).

While congestion increases on the other parts of the new route (i.e. along Hyde Street and Whitehall Street in particular), the spare capacity on those parts of the network means that average speeds do not significantly deteriorate compared to the base case situation.

Based on these observations we would expect the economic benefits of the project to be driven by the large speed increases and resultant travel time savings for cars and heavy vehicles that either switch onto the new link, or remain on inner western roadways and enjoy the decongestion benefits there. The impact on West Gate flows appears relatively minor and would not be expected to drive the estimate of economic benefits.

However, the fact that large volumes of cars and trucks would be expected to remain on the streets of Yarraville calls into question the potential for the project to deliver significant amenity benefits for local residents. As noted in the previous chapter, this reflects the complex patterns and land use and traffic flow in that part of Melbourne and the difficulty in expecting one link to be able to cater to the diverse needs of local transport users.

3.3 Results of the economic evaluation

VicRoads also previously completed an economic evaluation of the concept project. This applied conventional techniques for estimating user benefits, changes in externalities and the residual project value. VicRoads also estimated the potential wider economic benefits (WEBs) using evaluation approaches that are applied in the UK but not yet formally recognised in Australian evaluation frameworks. The evaluation framework also identifies additional benefits that could flow from improved amenity and societal benefits for the affected areas in the inner west, although these benefits were not quantified in the evaluation.

The suite of benefits estimated by the project team is presented in Table 17.

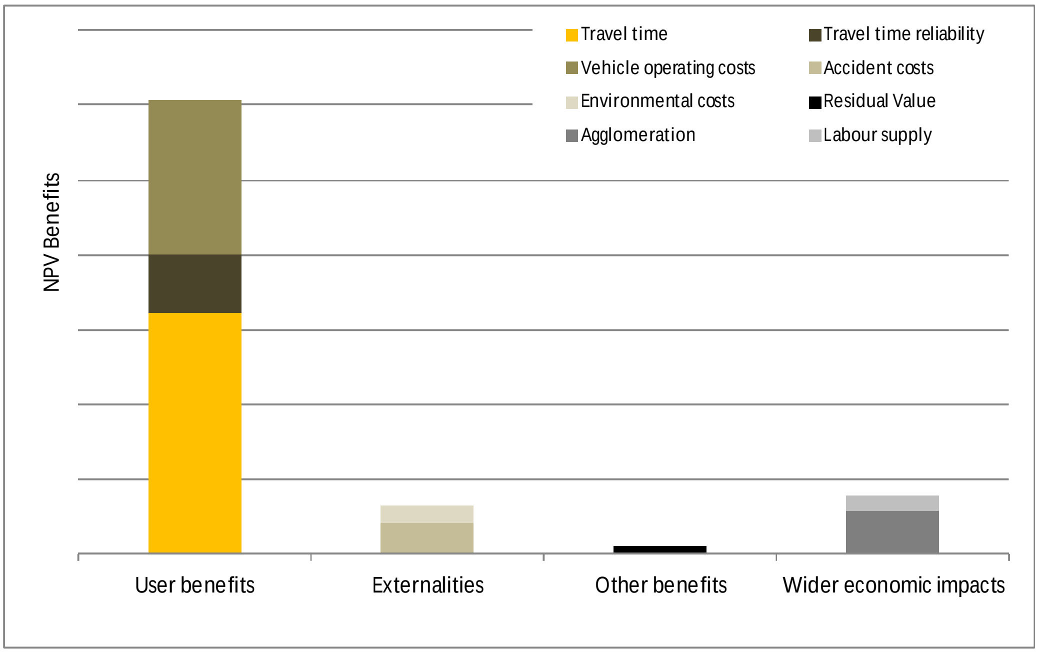
Table 17: Benefits included in the economic evaluation

User benefits	Externalities	Wider economic benefits	Additional benefits
► Travel time savings ► Vehicle operating cost savings ► Travel time reliability	► Accident cost savings ► Environmental cost savings	► Agglomeration ► Imperfect competition ► Increased labour supply	► Residual value ► Amenity (not estimated) ► Societal benefits (not estimated)

Source: VicRoads, June 2010

Figure 13 provides the relative breakdown of economic benefits that were estimated across the four broad groupings including user benefits (travel time, reliability, and vehicle operating costs), externalities (accident and environmental costs), other benefits (residual values) and WEBs (agglomeration, labour supply and productivity impacts).

Figure 13: Source and value of project benefits



Source: VicRoads ,June 2010

User benefits from reduced journey times and operating costs provide the majority of the economic benefits for the project. This result is consistent with the analysis of the impact of the project on modelled link flows and speeds.

However, our analysis in the previous sections showed that private motor vehicles would be around two thirds of the traffic on the new link. Based on this, and by comparing the different values of time and vehicle operating costs for private and freight vehicles, we can assume that the distribution of benefits is approximately evenly spread across both freight and private vehicles. This limits the potential promotion of the project as a priority freight measure without restrictions on access for private motor vehicles. However, this would erode much of the economic benefits of the project. The good performance of the link in the peak period undermines the need for it to be delivered as a priority freight link (i.e. the project removes some of the key pre-conditions for dedicated freight infrastructure, highlighting that an approach of implementing general network improvements is a more appropriate response).

A further issue relates to the effectiveness of the project in removing heavy vehicles from the inner suburban streets of Melbourne, which would provide amenity and safety benefits to local residents, and could potentially induce land use change in the form of greater urban infill and densification in the inner west. Our analysis shows that even with the introduction of the new link, there are still large numbers of trucks and private vehicles that would continue to use residential through-routes such as Francis Street and Somerville Road at higher speeds than in the base case, taking advantage of the decongestion benefits, or for accessing nearby areas that are not suited to the new link. While it may be possible to mandate that trucks use the link (which we consider in Chapter 4 as a cost recovery scenario), this would only apply to freight traffic with origins and destinations outside of Yarraville, and due to the proximity of other industrial land uses in the areas surrounding the Port, we understand that many freight movements in the area are not related to the Port.

As a final consideration, while the project would make accessing the Port more efficient, it is difficult to ascertain whether it would contribute much to ensuring that the PoM can operate effectively at all times of the day in order to achieve its future growth of 8 million TEU by 2030. It may be that there are more effective ways to deliver new access capacity to the PoM from the west of Melbourne.

3.3.1 Implications of delivering a priority freight link

A question for this study is whether it makes sense to deliver the infrastructure as a priority or dedicated freight link in order to deliver an enhanced scenario for the freight industry.

An important consideration in this context is the modelled performance of the new link under the open access scenario. If providing open access means that conflicts between car and freight users persist, resulting in poor travel speeds for freight vehicles, then options to prioritise freight flows could be justified.

The table below provides modelled flows and link speeds on sections of the concept route, combining inbound and outbound flows. This shows a large volume of private vehicles on the route, including the new link between the West Gate and Hyde Street. However, it also shows that average speeds on the new link are high relative to those modelled for the West Gate and other parts of the road network. Average speeds are also comparable on the other parts of the concept route, suggesting that the capacity of the link is more than adequate to cater to this additional traffic.

Table 18: Modelled traffic volumes on the new route in the AM peak in 2021 (INBOUND & OUTBOUND)

Traffic Metric	New Link (West Gate to Hyde St)	Hyde Street (New Link to Francis Street)	Whitehall Street (Francis Street to Somerville Road)	Moreland Street (north of Somerville Road)
Private cars	1,875	4,961	4,298	5,234
Trucks	914	1,324	1,390	1,586
Modelled average speed	74	18	25	24
Modelled free flow speed	100	36	40	36

Source: VicRoads, EY analysis

In this scenario, motor vehicles are not interfering with Port access for heavy commercial vehicles.

However, if we were to pursue the delivery of the new link as a priority freight link, there are different ways in which it could be achieved, with each having different impacts on the operation of the link and the nearby road network.

At one end of the spectrum, the project could be fully dedicated to the carriage of freight vehicles (i.e. 100% prioritised), with private vehicles having to continue to use alternative routes through Yarraville. Another alternative is to use pricing or other regulatory measures (e.g. curfews, etc.) to restrict the flow of private vehicles during key access times for freight vehicles (i.e. limited priority).

Delivering the project as a dedicated freight link by restricting flows on the new link between the West Gate and Hyde Street would re-direct almost 2,000 private motor vehicles back onto the other parts of the road network. Tables 15 and 16 above show that around 520 private vehicles would flow back onto Francis Street during the AM peak in 2021, increasing to around 530 private vehicles in 2031 (inbound and outbound). Similarly, this form of delivery would send around 290 private vehicles back onto Somerville Road during the AM peak in 2021, and around 220 private vehicles in 2031 (inbound and outbound).

Diverting traffic back onto the nearby parts of the road network would erode the speed increases and eliminate much of the time savings for private motor vehicles and freight traffic on the local road network. This would significantly reduce the estimates of economic benefits in the project evaluation (perhaps by as much as 25-50%).

An alternative option would be to restrict access to private motor vehicles during other times of the day (i.e. during the inter-peak period, when private motor vehicle traffic is reduced and freight activity increases). This would preserve much of the benefits for users of private motor vehicles (given these benefits mostly accrue during peak periods) and provide a near ultimate level of service for the freight sector. However, given the lower levels of car traffic during the inter-peak and off-peak periods, it is likely that the operational performance of the new link would not be affected by excessive car traffic, weakening the need for the link to be provided as a priority freight measure during those times of the day.

These considerations demonstrate that through the implementation of the case study project as an open access road link, some of the key pre-conditions for dedicated freight infrastructure are being addressed. For example, the proposal would:

- Reduce the extent of conflicts between freight and other users of the transport network
- Reduce general network congestion around the Port
- Improve community safety by reducing the number of heavy vehicles that are required to travel through nearby neighbourhoods
- Make the delivery of freight to/from the west of Melbourne more cost effective.

The effectiveness of the new ramps and street upgrades as demonstrated by the modelling results and CBA reduces the need for further measures to prioritise the new road link for freight vehicles.

A further consideration in determining the merits of providing the project as a dedicated freight link is the potential impact on financial cost recovery through tolling or other cost recovery measures. This is explored in Chapter 4.

3.3.2 Relation to other planned major projects

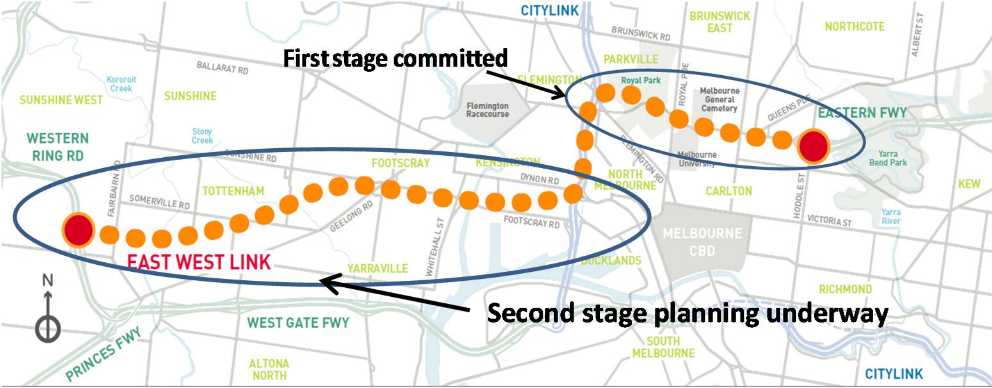
We have also considered how the case study project relates to the key planned major project for the west of Melbourne – the East West Link (EWL). This is an important consideration as it may highlight whether some of the problems to be addressed by the case study project could be addressed by the delivery of EWL or other projects.

The East West Link is a cross-city road connection extending across Melbourne from the Eastern Freeway to the Western Ring Road. The Victorian Government has committed to the delivery of the eastern section of the project (Eastern Freeway to CityLink), with construction due to commence in late 2014.

The Victorian Government has identified the western section of East West Link as the next priority project to improve freight efficiency by providing a new major connection between the Port and key industrial centres in the west. This is anticipated to also reduce noise and air pollution in the western suburbs by providing a motorway option for trucks, and contribute to urban renewal in the west by providing a safer environment for pedestrians and cyclists.

The Government has announced that detailed planning for the western section of the East West Link will be underway in 2014, with early works expected to be commenced by the end of 2015.

Figure 14: East West Link



Source: Linking Melbourne Authority

Consistent with the general approach to traffic modelling for all major transport projects, model runs have been carried out to test the impact of the case study in combination with East-West Link West. The results are presented in the table below for heavy vehicles.

Table 19: Impact of the project and East West Link West on heavy vehicle traffic in 2011, 2021 and 2031 (INBOUND + OUTBOUND)

PoM Access Route	Francis St (between Williamstown & Hyde)		Somerville Road (between Williamstown & Hyde)	
Model Option	Trucks	Change	Trucks	Change
2011				
Base	486		406	
Base + Case Study Project	284	-42%	213	-48%
Base + East West Link	316	-35%	215	-47%
Base + Case Study Project& East West Link	223	-54%	148	-64%
2021				
Base	764		555	
Base + Case Study Project	486	-36%	374	-33%
Base + East West Link	342	-55%	314	-43%
Base + Case Study Project& East West Link	281	-63%	163	-71%
2031				
Base	808		699	
Base + Case Study Project	580	-28%	489	-30%
Base + East West Link	321	-60%	311	-56%
Base + Case Study Project& East West Link	279	-65%	154	-78%

Source: VicRoads

The model predicts that East West Link West would have a significantly larger impact on truck volumes in 2021 (45-55%) and 2031 (55-60%) than the case study project. This suggests that if the western part of East West Link is pursued by the Government, as current indications suggest would occur over the longer term, then the case for also investing in the case study project and prioritising the link for freight vehicles would be further diminished. However, it is also noteworthy that investing in both would lead to a further reduction in truck volumes.

3.4 Summary findings

Our analysis of the traffic model results has shown that:

- The addition of the new link attracts both heavy and private vehicle traffic away from Francis Street and Somerville Road. This highlights that the new link would not be expected to operate as a priority freight link unless some other supporting measures were put in place. These measures could include vehicle restrictions and/or tolling measures
- The large reductions in traffic on both Francis Street and Somerville Road result in significant speed increases on Somerville Road and only modest increases on Francis Street.
- The introduction of the new link is only expected to have a small impact on flows and speeds on the West Gate. Rather than improving the operation of this key arterial motorway, the project is instead providing a bypass for congested lower level roads.
- We would expect the economic benefits of the project to be driven by the large speed increases and resultant travel time savings for cars and vehicles that either switch onto the new link, or remain on inner western roadways and enjoy the decongestion benefits there. The impact on West Gate flows appears relatively minor.
- The fact that, with surrounding land uses and freight movements to service business needs, large volumes of cars and trucks would be expected to remain on the streets of Yarraville calls into question the potential for the project to deliver significant amenity benefits for local residents.
- Analysis of the performance of the new link shows that volumes are low compared to modelled capacity. As such, the case for making this a dedicated freight link is difficult to justify and risks eroding the benefits of the project. More moderate restrictions on private motor vehicle access could preserve much of the benefits, although they are also not necessary given the good performance under the open access scenario.

Our analysis of the evaluation completed by VicRoads demonstrates that:

- User benefits from reduced journey times and operating costs provide the majority of the economic benefits for the project. This result is consistent with the analysis of the impact of the project on modelled link flows and speeds.
- However, the distribution of benefits is approximately evenly spread across both freight and private vehicles, reflecting the mixed use of the new link. This limits the potential promotion of the project as a priority freight measure without restrictions on access for private motor vehicles. This could potentially erode much of the economic benefits of the project and the good performance of the link in the peak period undermines the need for it to be delivered as a priority freight link.
- Even with the new link, there are still large numbers of trucks and private vehicles that would continue to use residential through-routes such as Francis Street and Somerville Road, taking advantage of the decongestion benefits that the project would provide, or for accessing nearby areas that are not suited to the new link. While it may be possible to mandate that trucks use the link (which we consider in Chapter 4 as a cost recovery scenario), this would only apply to freight traffic with origins and destinations outside of Yarraville, and we know that many freight movements in the area are not related to the Port.
- Given these issues, it is difficult to ascertain whether the project would make a material contribution to ensuring that the PoM can operate effectively at all times of the day in order to achieve its future growth targets of 8 million TEU by 2030. It may be that there are more effective ways to deliver new access capacity to the PoM from the west of Melbourne. It is envisaged that the directions outlined in the Victorian Government's freight and logistics plan, supported by national port and freight strategies and investments, will make a meaningful contribution to addressing these needs.

We have considered the potential impacts of delivering the project as a dedicated freight link:

- This would re-direct almost 2,000 private motor vehicles back onto the other parts of the road network in the AM peak, including around 500 cars on Francis Street and around 300 cars on Somerville Road.
- Diverting traffic back onto the nearby parts of the road network would erode the speed increases and eliminate much of the time savings for private motor vehicles. This would significantly reduce the estimates of economic benefits in the evaluation (perhaps by as much as 25-50%).
- An alternative option would be to restrict access to private motor vehicles during other times of the day (i.e. during the inter-peak period), when private motor vehicle traffic is reduced and freight activity generally increases across the network. However, it is likely that the operational performance of the new link would not be significantly diminished during the inter-peak and off-peak periods under open access operating arrangements, further weakening the need for the link to be provided as a priority freight measure.

Finally, we considered the relationship of the project to the planned East West Link. This highlighted that many of the perceived problems could also be addressed by that project, diminishing the need for the case study project over the longer term.

Overall, while the underlying project could be expected to deliver strong user benefits, it is difficult to see how it could be delivered as a priority freight measure without undermining these benefits.

This could reflect a number of factors:

- The patterns of demand in the inner-west of Melbourne are diverse and involve a number of origin-destination flows that are not related to the Port, meaning that it is not possible to disentangle these flows and target freight demand.
- The design of the project was not initially conceived to prioritise freight flows, and perhaps a different design linked to these objectives could prioritise demand and preserve the wider benefits of the project.

A further consideration is whether it would be possible to deliver the project with a level of cost recovery from users. This is explored in the next chapter.

4. Financial assessment

4.1 Introduction

The purpose of this assessment is to provide an indication of the commercial feasibility of the case study project. The outputs of this analysis would also inform which types of commercial delivery models have the potential to efficiently deliver the project objectives and to align with the State's preferred risk allocation for this type of project.

This analysis assumes that either the State or a private investor (or investor group) funds the capital costs and charges users for road access in order to recover those costs. It is further assumed that the project is funded on a standalone basis (i.e. this assessment ignored financing cash flows). The analysis does not consider any cash flows or strategic benefits that may derive from integrating the project with other parts of the wider network.

In order to generate a measurable outcome this assessment is underpinned by a set of assumptions in relation to costs and revenue.

Cost assumptions are sourced from VicRoads. Revenue assumptions were generated by analysing traffic modelling data provided to EY for the region immediately surrounding the project.

We have used that data to construct and analyse a hypothetical scenario whereby the project is tolled and a curfew on commercial vehicles is applied to the local streets in the Yarraville and Footscray region in order to redirect trucks to the new link or to an alternative route to the north. We then take the analysis a step further by considering the implications of restricting access to private motor vehicles through the delivery of a dedicated freight scenario.

The cost and revenue projections we have developed are for the purpose of this case study scenario and carry a number of limitations. The cash flow model has been developed in good faith and in the belief that the information provided to us was not false or misleading. We have relied upon the inputs and assumptions provided to us. We have not audited or reviewed any of the inputs or assumptions provided to us. Accordingly, we express no opinion as to the accuracy, adequacy, completeness or reasonableness of the assumptions upon which the model is based. We note that it is usually the case that some events and circumstances do not occur as expected or are not anticipated. Therefore, actual results will almost always differ from the forecasts and such differences may be material.

4.2 Revenue assumptions

4.2.1 Introduction

The case study project includes the provision of a series of network improvements and other measures aimed at reducing the number of freight vehicles on residential streets in Yarraville in the inner west of Melbourne.

The traffic modelling and benefits analysis concluded that the project would benefit both private and commercial vehicles through travel time and vehicle operating cost savings.

On that basis, the analysis assumes that to recover some (if not all) of the capital expenditure and operating costs incurred, the users of the new link (i.e. private and commercial vehicles) will be charged. This section describes the revenue assumptions we have applied.

4.2.2 Curfew assumption

The project route is designed to remove trucks from Yarraville and Footscray. Previous work by VicRoads nominated the extension of the current truck curfew in the inner west to maximise the utilisation of the new route by commercial vehicles (i.e. so that the curfews apply at all times of the day and apply to all heavy vehicles).

The current truck curfew arrangements in Yarraville are as follows:[129]

- Francis Street: 8PM to 6AM – Monday to Saturday, 1PM to 6AM – Saturday to Monday
- Hyde Street: 24 hours a day, 7 days a week
- Somerville Road (Geelong Road to Hyde Street): 8PM to 6AM – Monday to Saturday, 1PM to 6AM – Saturday to Monday

In line with the previous work by VicRoads, we have assumed that these curfews would be extended across the whole day in order to test the financial viability of the case study project.

4.2.2.1 Curfew impact

Inbound traffic

Inbound traffic refers to vehicles coming from the west and entering the project route via a ramp coming off the West Gate Freeway and driving towards the PoM precinct.

It is assumed that given the project objectives, the curfew would only apply to non-local commercial vehicles. As such a residual number of trucks will still be circulating on Francis Street and Somerville Road (and other local roads) to service local businesses' needs.

On that basis the inbound traffic assumed in this financial assessment is based on the traffic modelling for the new link (i.e. without a curfew being applied) plus a proportion of the truck traffic that model predicts would remain on routes such as Francis Street and Somerville Road.

Table 20 presents the estimated impact that the Curfew would have on inbound traffic volumes on the new link during the morning peak (7-9 AM). Our assumptions in relation to expansion of demand from peak to daily and annual estimates are based on car factors used in recent projects. We acknowledge that freight movements are different from private vehicle movements and require the development of unique demand expansion factors. However, for the purpose of this assessment, we think that the factors that we have applied provide a sufficient daily and annual traffic profile.

[129] VicRoads, http://www.vicroads.vic.gov.au/Home/Moreinfoandservices/HeavyVehicles/RouteInformation/TruckCurfews.htm

Table 20: Traffic curfew impacts – inbound (AM peak)

	2021		2031		
	Private cars	Trucks	Private cars	Trucks	Note
Project traffic (without curfew)	505	254	489	365	1
Additional vehicles due to curfew		421		528	
Project traffic (with curfew)	505	675	489	893	
Daily project traffic	3,467	4,636	3,358	6,132	3

Source: EY calculations and assumptions and Traffic modelling

1. Based on the traffic modelling data received from VicRoads
2. It is assumed that 75% of the commercial vehicles joining Whitehall St from Francis St and Somerville Rd in the project case will be directed to use the new link due to the curfew, with the remaining commercial vehicles seeking alternative routes.
3. The traffic modelling data is assumed to reflect the two-hour morning peak. This figure has been multiplied by 6.87 to estimate the total daily traffic. The daily traffic has been multiplied by 345 to estimate the total annual traffic on the new route (source: NSW appraisal guidelines).

Outbound traffic

Outbound traffic refers to vehicles coming from the Port of Melbourne precinct and heading west using the new route to reach the West Gate Freeway via a ramp coming off Hyde Street.

In line with the inbound traffic, the financial assessment is based on forecast traffic modelling for the new route in 2021 and includes a proportion of the traffic currently forecast to use Somerville Road and Francis Street to reflect the curfew applied to non-local commercial vehicles circulating in this area.

The table below presents the estimated impact that the Curfew would have on outbound traffic volumes on the new link.

Table 21: Traffic curfew impacts – outbound (AM peak)

	2021		2031		
	Private cars	Trucks	Private cars	Trucks	Note
Project traffic (without curfew)	1,371	661	1,212	746	1
Additional vehicles due to curfew	0	168	0	156	2
Project traffic (with curfew)	1,371	829	1,212	906	
Daily project traffic	9,414	5,693	8,325	6,221	3

Source: EY calculations and assumptions and Traffic modelling

1. Based on the traffic modelling data received from VicRoads
2. It is assumed that 75% of the commercial vehicles joining Whitehall St from Francis St and Somerville Rd in the project case will be directed to use the new link due to the curfew, with the remaining commercial vehicles seeking alternative routes.
3. The traffic modelling data is assumed to reflect the two-hour morning peak. This figure has been multiplied by 6.87 to estimate the total daily traffic. The daily traffic has been multiplied by 345 to estimate the total annual traffic on the new route (source: NSW appraisal guidelines).

Summary

The enforcement of a curfew has the potential to direct a significant amount of commercial traffic onto the new link.

In the AM peak in 2021, the curfew would add around 420 trucks inbound and around 168 trucks outbound. In 2031, an additional 528 inbound trucks and 156 outbound trucks are estimated.

This new level of traffic represents the potential market for the new link. The next section considers the level of tolls that could be applied for private and commercial vehicles.

4.2.3 Tolling assumptions

The project provides improved truck access between the west and the PoM, providing scope for growing freight vehicles to access the Port from the west 24 hours a day. Chapter 3 showed how these benefits would translate into travel time savings and reduction in operating costs for freight operators and private vehicle owners.

Reflecting the benefits flowing to the users of the project, it is assumed that a toll could be charged to recover some (if not all) of the capital expenditure and operating costs incurred.

An important consideration in relation to travel time savings and users' willingness to pay to achieve them is the relativity of the travel time saving to the overall journey time. In the context of a longer trip, a given time saving is less significant than on a shorter trip. Also on a longer trip, small fluctuations in the reliability of travel time are more easily managed.

A hypothetical toll tipping point value has been calculated based on the time savings achieved on the project link compared to the best free alternative route.

The table below presents the estimated cost saving (both in time and distance) the project would generate for commercial motorists. In accordance with industry guidance, an estimated value has been applied both to time and distance savings in order to compare the cost of travel using the project and the best free alternative route.

Based on this comparison, the hypothetical maximum toll value would be around $5.50 for commercial vehicles. Due to the uncertainties in estimating accurate marginal toll levels, we have taken the conservative approach of assuming a toll of $5.00 for commercial vehicles.

Table 22: Tolling assumptions

	Commercial	
	Project route	Alternative Route^
Peak hour travel time^^(minutes)	15	26
Distance (kms)^^	8.1	8.0
Estimated value of time per min* ($, 2010)	$0.45	$0.45
Estimated value of time per min** ($, 2013)	$0.50	$0.50
Total	$7.55	$13.08
Difference	$5.54	

Source: EY calculations and estimates

^Alternate route utilising Millers Rd and Geelong Road
^^ Assumptions based on free flow conditions

* Source: "Guide to Project Evaluation – Part 4", Austroads Report, 2012. A lower end average value of freight time (i.e. for a 4 axle-articulated truck) has been used (Table 3.4, page 21) $27.09/hour as of June 2010

**Source: June 2010 value indexed to March 2013 using PPI index as per Australian Bureau of Statistics website. Series ID A2314058K

At a tolling level of $5.00 for commercial vehicles, it is assumed commercial motorists would prefer to use the project instead of diverting onto alternate routes such as Millers Road and Geelong Road.

While the project is intended to be of greater benefit for commercial vehicles, it is anticipated that private vehicles will also use this route to avoid congestion and enjoy reduced travel times. In order to manage the influx of private vehicles onto the new route a toll charge of $1.00 per trip has been included in this assessment. At this price level, it is estimated that 95% of modelled traffic volumes would use the route. A simple sense-check that assumes an average car journey saves around 5 minutes, which equates to around $1.20 in average user value of time, confirms that this toll level and assumed level of reduction is reasonable.[130]

4.2.4 Traffic volume assumptions

The table below reflects the annual traffic volumes on the project link based on the combined curfew and tolling scenarios. The annual growth rate applied is consistent with the profile implied by the 2021 and 2031 traffic modelling results.

Table 23: Assumed project use – Combined curfew and tolling scenarios

Assumed project use	FY17 traffic	Compound Annual Growth*	FY21 traffic	FY31 Traffic
Private inbound traffic	1,150,889	-0.3%	1,136,323	1,100,710
Private outbound traffic	3,240,909	-1.2%	3,085,453	2,728,660
Commercial inbound traffic	1,429,994	2.8%	1,599,288	2,115,473
Commercial outbound traffic	1,898,671	0.9%	1,964,201	2,146,202

Source: EY Calculations and estimates

* Based on FY21 and FY31 traffic modelling data.

[130] Value of time source: "Guide to Project Evaluation – Part 4", Austroads Report, 2012. $13.17/hour as of June 2010

4.3 General assumptions

The following additional assumptions underpin the estimated revenue and cost forecast:

- ► All revenue and cost estimates have been escalated for inflation by 2.5% per annum
- ► Construction period will start in FY14 and end in FY16. Operation period will start in FY17 and last 25 years
- ► Toll collection costs are equivalent to a flat rate of 10% of revenue collected
- ► The standard discount rate of 7% (real) has been applied, which equates to 9.50% (nominal)
- ► In calculating the Net Present Value (NPV) of the options, all future cash flows have been discounted back to 30 June 2013.

4.4 Summary of findings

4.4.1 Baseline scenario

The financial assessment shows that although the project will generate a wide range of economic benefits, the level of cost recoverability is likely to be limited.

Under the curfew and tolling scenario, the project would make an operating profit. However, this will not be substantial enough over the 25 year operating life to repay the initial investment and earn a positive NPV.

The two drivers limiting the financial viability of the project are:

- ► The high capital cost of the project ($449m in nominal terms)
- ► The expected traffic volumes on the new link, which is estimated to be approximately eight million private and commercial vehicles in its first year of operation, does not result in sufficient revenues to recover the initial up-front capital investment.

The table below presents the financial impacts of constructing the case study project and implementing the curfew and the tolling scenario:

Table 24: Financial impact under the Curfew and Tolling Scenario

FY13 dollars (millions) NPV	Real	Nominal
Revenue	229	947
Operating costs	(36)	(140)
Operating surplus	193	808
Capital expenditure	(372)	(449)
Financial impact	(179)	359

Source: EY Calculations

4.4.2 Cost recovery under a prioritised freight scenario

This section takes the analysis a step further by considering the implications of implementing a priority freight scenario.

Given the scenario outlined above already performs poorly from a cost recovery perspective, any measures to restrict access to private motor vehicles and limit cost recovery from those users would further undermine the cost effectiveness of the project. Also, Chapter 3 showed that the performance of the link would be good when access is provided to both cars and trucks, which means that preventing cars from using the link would provide little upside in user benefits for heavy vehicles.

The table below presents the financial impacts of constructing the case study project and implementing the priority freight scenario. This confirms the poor scope for cost recovery for the project to be provided as a dedicated freight link.

Table 25: Financial impact under the Curfew and Tolling Scenario

FY13 dollars (millions) NPV	Real	Nominal
Revenue	190	801
Operating costs	(36)	(140)
Operating surplus	154	662
Capital expenditure	(372)	(449)
Financial impact	(219)	213

Source: EY Calculations

4.4.3 Other sensitivity analysis

This section looks at specific scenarios and sensitivity analysis to support the financial analysis.

4.4.3.1 Indicative breakeven analysis – toll pricing

A key driver in the commercial viability of the project is the revenue generation from tolling. To assess this, a breakeven analysis has been conducted that indicates the degree to which tolls would need to be adjusted beyond the assumed baseline level linked to the analysis of the tolling tipping point. In this test we have used a simplified scenario where the change in toll level does not affect traffic levels. Table 26 presents these results and shows that commercial vehicle tolls will need to more than doubled or private vehicle tolls be increased tenfold in order to reach breakeven based on the current traffic volume forecast. In reality, the toll increases would need to be much higher once the likely reduction in traffic is also taken into account. [131]

Table 26: Breakeven tolling analysis

FY13 dollars (millions)	Commercial toll	Private toll	NPV $
Assumed toll	5.00	1.00	(179)
Breakeven point (on a standalone basis)	10.76	-	0
Breakeven point (on a standalone basis)	-	10.41	0
% impact	*215%*	*1041%*	

Source: EY calculations

While this analysis provides an interesting perspective on what would be required to achieve full cost recovery from either user group, the tolls levels are unrealistically high and, if implemented, would be expected to result in significant diversion and under-utilisation of the new link.

However, if there was evidence that freight values of time were significantly higher (i.e. up to double the current estimate as referenced by the national guidelines), then these higher toll levels might be feasible.

[131] The breakeven analysis has been conducted on a standalone basis i.e. an increase in commercial vehicle tolls only and an increase in private vehicle tolls only.

4.4.3.2 General sensitivity analysis

The following table presents a standard range of sensitivities of the financial analysis based on a number of operating variables that may impact the project.

It shows that NPV remains negative under all scenarios and that the results are also sensitive to variations in capital cost of the project and forecast demand.

Table 27: Sensitivity analysis

Sensitivity scenarios	NPV $ (millions)
Current NPV	(179)
Opex + 10%	(183)
Opex - 10%	(176)
Capex +10%	(217)
Capex -10%	(142)
Demand +10%	(156)
Demand -10%	(202)

Source: EY Calculations

4.4.4 Key findings

The outcome of this assessment suggests that the project would not generate sufficient revenue from tolling to recover capital expenditure on a NPV basis. This problem would be exacerbated should the project be delivered as a priority freight link. As we showed in Chapter 3, doing this would also undermine the wider public benefits of the project by diverting traffic back onto the streets of Yarraville, making it difficult to justify a subsidy from Government to fund the project.

5. Market views and potential participation

5.1 Introduction and Scope

A key component of this stage of our study on dedicated freight infrastructure involves gauging the potential level of market interest from the private sector in delivering the project, as well as understanding the potential to involve users and other project beneficiaries in funding the project.

Organisations identified as market participants in the supply of infrastructure can be considered as those that provide goods and services and those that provide finance. The former represent the designers, builders and operational and maintenance service providers that contribute to the project. The latter group include debt, potential project sponsors and equity financiers. More traditional methods of procurement will often involve a combination of private goods and services, with the public sector funding the project. Alternative methods of financing infrastructure projects utilise private sector debt and equity, such as Public Private Partnerships (PPPs).

Other important market participants include the potential customers that will want to use and benefit from available infrastructure. As we have seen from the analysis above, this includes the freight sector, and, in particular, those using heavy vehicles in the movement of containers and other freight to/from the PoM. Private vehicle owners are also important market participants if tolling scenarios are to be considered.

Understanding the benefits that a project will provide to its customers is an important consideration when evaluating their potential willingness to pay for infrastructure use. For example, if benefits are low and there are alternative options they can use, then the scope for cost recovery through user charges would be limited. A further consideration relates to any potential operating restrictions, such as curfews or other measures that restrict the choices of infrastructure users. Unless the benefits of the project can be demonstrated, the industry may resist or undermine its implementation.

Other beneficiaries of the project could also include those that do not actually use the infrastructure. For example, in this case study project, nearby residents would receive the benefit of having fewer trucks on local streets, and the businesses that rely on the efficient and growing operation of the PoM over the longer term could benefit through the connectivity the project would provide and the reduced conflict with residents.

Given the context (above), the scope of our analysis includes:

- a general discussion of the key factors that influence the market's appetite for participation and investment in major transport infrastructure projects;
- the market's current views and perspectives regarding those key factors based upon EY's involvement in a range of formal and informal market sounding exercises over the last 12 to 24 months; and
- how the freight industry may perceive the project and the issues associated with the provision of funding support to private investors and/or government.

Based on these considerations, we then outline some conclusions for the case study project and its potential to be delivered through alternative delivery and funding models.

5.2 Private Finance and PPPs

A primary consideration for the delivery of priority freight infrastructure is whether there is scope for it to be provided in full by the market or whether there is a role for PPPs in achieving better outcomes in infrastructure delivery.

As we have seen from the previous analysis, the case study would not be something that could be implemented and funded through user charges alone, and it is difficult to see how the market would want to provide the project on its own. The potential for it to deliver welfare benefits beyond those that would accrue to the users of the project suggest that some level of government intervention is justified, potentially in partnership with the private sector. A further consideration is whether alternative funding models involving a wider mix of project stakeholders could be found, such as with the PoM and/or the local community. These could be pursued if those beneficiaries would be willing to pay to receive the benefits the project would deliver.

5.2.1 PPP value drivers

The utilisation of private sector finance is suited where the project represents a significant upfront cost to the State (which may ordinarily be budget constrained), combined with achievable efficiencies, optimal risk allocation and value for money through adopting a whole-of-life approach to costing. PPP delivery is typically more appropriate for projects that require service delivery that extends beyond the completion of asset construction.

The Infrastructure Australia National PPP Guidelines provide an outline of the key value for money drivers of the PPP model. Projects that may be suitable for delivery incorporating private sector finance will typically exhibit value when compared to a public sector delivery of a project via some or all of the following characteristics:

- Complex risk profile and opportunity for risk transfer
- Whole-of-life costing
- Innovation
- Measurable outputs
- Asset utilisation
- Better integration of design, construction and operational requirements
- Competitive process.

Based on the consideration of these value for money drivers, it is difficult to identify the ways in which a PPP model would be of significant benefit for the case study. The project does not constitute an overly complex infrastructure investment compared to other transport projects that are delivered using the PPP model. There also appears to be little scope for innovation in operations and whole of life costing.

However, should the government pursue the delivery of the project as a tolled link, then there may be scope to deliver it through an ‘availability PPP’ where a private entity is compensated for the upfront investment costs through a mix of toll revenue and an availability payment regime provided by government.

5.2.2 Factors affecting market interest

The private sectors’ interest in public transport infrastructure projects will be guided by their assessment of risk and achievement of an appropriate return commensurate to those risks.

In relation to the interest of the private sector to invest in public transport infrastructure under PPP models, EY's interactions / soundings with the market have identified the following recurrent factors which influence the market's appetite to participate in procurement processes and invest:

- Risk Transfer (Demand)
- Market Capacity
- Financing – Size and Terms
- Quality of Government Interaction and Planning
- Procurement Process Investment (Time and Cost)
- Political Risk.

The remainder of this section provides our high level assessment of market perspectives on these key factors.

5.2.2.1 Risk transfer (demand)

The market's appetite in taking demand risk on toll road projects can only be assessed on a case-by-case basis which will be underpinned by the market's assessment of traffic forecasts, project cost / complexity, the ability for toll revenue to recover construction, operating and financing costs and the extent of risk sharing offered by the State.

There is a heightened concern at present, amongst financiers and others in the toll road development sector, concerning the transfer of traffic risk to the private sector. This concern has arisen due to the significant financial losses flowing from recent toll roads in Sydney and Brisbane that have not met traffic expectations.

The financial assessment suggests that toll revenue would not be sufficient to recover all of construction and operating costs. As such full risk transfer based on acceptable toll price would not be viable under a standard BOOT model. We expect that private sector would seek a more proven demand profile in order to accept some demand risk.

Based on market perspectives, an availability PPP may be more suitable for the case study project should the State wish to involve the private sector.

5.2.2.2 Market capacity

We expect the market to have adequate expertise and capacity to construct and maintain this project.

The size of project packages has been a key issue in the market in recent years. However, the current cost estimate for the case study suggests that most of well-established and reputable organisations have the capacity to undertake this Project.

5.2.2.3 Financing – size and terms

At a construction cost of approximately $449 million (May 2013) the finance market should be able to raise finance (if the project is deemed to be bankable). However, should the State elect to toll the new link, the size of financing offered by the private sector would have to be commensurate with the potential tolling revenue.

5.2.2.4 Quality of Government Interaction and Planning

The Victorian Government and its related road transport agencies have a strong track record of procuring complex road infrastructure with the private sector across a range of procurement models.

We expect the market would be interested in a procurement process managed by the Victorian Government.

5.2.2.5 Procurement Process Investment (Time and Cost)

We expect potential market participants would request that all (or part) of bidding costs would be reimbursed based on recent projects that have set precedents (e.g. North West Rail Link, New Zealand PPPs).

5.2.2.6 Political Risk

The current Victorian Government has shown a preference for the East West Link project as a means to relieve congestion in Melbourne and enable improved access to the Port of Melbourne precinct. As such the lack of political support for the project may have a negative impact on the market's perception of this risk.

5.3 Freight industry perspectives

The relevant participants in the freight industry that would be affected by the implementation of dedicated road freight infrastructure include the Port of Melbourne Corporation (PoMC), as developer and manager of the Port, and the array of road freight operators that deliver containers between the Port, the west of Melbourne and beyond.

5.3.1.1 Port of Melbourne Corporation

PoMC is responsible for the sustainable development and management of the Port. In striving to fulfil its role of growing the economic prosperity and social and environmental wellbeing, the PoMC has identified a series of goals to guide its actions. Their high level goals are to achieve:

- Efficient and high quality facilities and services within a competitive environment
- Integration of the port with land transport systems
- Trade and trade-related business facilitation and expansion
- Sustainable financial performance
- A shared port-city vision for sustainable growth and prosperity.

In line with these goals, the PoMC is taking an increasingly active role in recent years in supporting the strategic planning and integration of the Port with the planning for the State's transport network. The Port also played a lead role in the channel deepening project and is responsible for managing the interfaces with nearby land uses.

Given this, we would anticipate that the PoMC would be supportive of proposals aimed at enhancing access to and from the Port gate. A key consideration for the PoMC is the extent to which any proposal is seen to meet the objective of a better connected Port.

In addition, while the Port is becoming more integrated with State transport planning activities, we are yet to see it take a direct role in identifying and funding landside transport infrastructure proposals such as the proposed concept project. Instead, the Port has been able to share the benefits of the State's ongoing program of improvements to the strategic road and rail networks, which is enhanced by the Port's proximity to the city's CBD. However, as transport congestion continues to grow, we may be reaching the point where the Port takes a more direct role in infrastructure development so that the Port can continue to exist in its current location without excessive conflict with nearby land uses and complex patterns of transport congestion.

However, for this case study, there are questions around the capacity of the project to deliver sufficient value to the Port.

5.3.1.2 Road freight operators

Road freight operators play a critical role in connecting supply chains to/from the PoM. As we have seen, the majority of freight that is moved through the Port is linked to destinations in and around Melbourne, making it highly suited to road haulage instead of rail.

The case study project has the potential to improve the efficiency of freight movements between the Port and the western parts of Melbourne and beyond, which would be of significant value for the industry.

However, using approaches to delivering and funding the case study project that claw back some of that industry value (i.e. through user charges or other funding mechanisms), could risk losing the industry's support for the project and, if tolls are excessive, undermine the effectiveness of the project in meeting its objectives for industry growth.

The example we have provided in this case study includes a toll on heavy and private vehicles, and the imposition of a curfew on Yarraville streets for heavy vehicles accessing the Port. In doing this, we have attempted to set the tolls at a level commensurate with the user benefits of the project. However, that may not be how the tolls are perceived by users.

5.4 Key findings – Implications for the Case Study Project

The market's interest in delivering this project would be dependent upon how the State structures and procures the project. Based on our understanding of the market, three procurement models appear to be suitable for the Project. These models are as follows:

- State Funded Design and Construct - We consider that the construction market would show strong interest in this procurement model. We assume a State Government authority such as VicRoads would undertake maintenance.
- Availability Style PPP – While we consider the market would respond positively to the State retaining patronage risk under this model, the market's interest may be tempered by the high bidding costs relative to the value of the project (considered small by comparison to recently procured road PPP projects). In addition, in this instance, a PPP is unlikely to demonstrate value for money from the State's perspective.
- Availability Style PPP followed by a sale of tolling rights – The market's interest is uncertain at this stage and would be dependent upon traffic demand and its assessment of risk and likely returns. However, this type of model is currently being tested by the Queensland government under the Legacy Way project and recent market sounding processes suggest this model has the potential to attract interest from the market.

The views of the freight industry, including the PoMC and road freight forwarders, would depend on the benefits the project provides, set against the scope of any cost recovery measures such as user tolls or direct contributions. As the benefits of the project are spread across different users and to landowners in nearby suburbs, the industry would not support fully funding the delivery of the project. Dedicating the link to heavy vehicles could alter that position to some degree, but as we have shown, the level of demand for the link would not provide enough toll revenue to pay for its construction.

6. Key findings of this case study

6.1 Our approach

This case study is being developed to enhance our understanding of the conditions that justify the delivery of dedicated freight transport infrastructure to serve Australia's major container ports.

The Stage 1 Report identified a set of principles for considering dedicated and priority freight infrastructure. The study found that there is a range of demand and supply factors that drive the viability of dedicated and priority fright infrastructure.

Principles of demand include:

- The presence of conflicts between freight and other users of the transport network
- The size of the freight task
- Distances that freight movements are required to travel
- General network congestion around ports and other key freight centres
- Land use planning considerations
- Amenity issues
- Safety and environmental concerns
- Industry demand and willingness to pay for infrastructure.

Principles of supply include:

- Capacity constraints around ports and other key freight centres
- Cost effectiveness in delivering priority freight infrastructure
- Form of infrastructure and design to address freight issues.

The case study features a project designed to overcome congestion and conflicts on the network, and to enhance nearby amenity, in order to drive growth in productivity to support the freight task. These project objectives represent a blend of the key principles of demand for the potential need for dedicated freight infrastructure. On the supply side, capacity constraints are also identified as a key driver for the project.

6.2 Key findings from the analysis

The analysis of the baseline traffic data confirms the problem statements and the presence of demand-side pre-conditions that warrant consideration of dedicated freight infrastructure as a way of enhancing access to the Port and removing conflicts that exist between freight vehicles and other road users on heavily congested sections of Melbourne's road network.

However, we also observe that these problems are not localised to just one or two road links, but instead affect much of the road network to the west of the Port, as well as the M1 corridor. We also understand that the spread of development across Yarraville, which contains a mix of industrial and residential land uses, creates a complex pattern of mixed freight and private motor vehicle traffic, which poses a challenge for the design of effective dedicated freight infrastructure. For example, it may be that the share of traffic in the area that actually uses the Port might not constitute enough of the local transport task to justify the delivery of cost-effective priority links.

Our analysis of the project shows that the addition of the new link would attract both heavy and private vehicle traffic away from Francis Street and Somerville Road. This highlights that the new link would not be expected to operate as a priority freight link unless some other supporting measures were put in place. These measures could include vehicle restrictions and/or tolling measures.

The large reductions in traffic on both Francis Street and Somerville Road result in significant speed increases on Somerville Road and modest increases on Francis Street. However, the introduction of the new link would have a small impact on flows and speeds on the West Gate. Rather than improving the operation of this key arterial motorway, the project would instead provide a bypass for congested lower level roads.

User benefits from reduced journey times and operating costs provide the majority of the economic benefits for the project. This result is consistent with the analysis of the impact of the project on modelled link flows and speeds. However, the fact that large volumes of cars and trucks would be expected to remain on the streets of Yarraville to service surrounding land uses calls into question the potential for the project to deliver significant amenity benefits for local residents. It is envisaged that the directions outlined in the Victorian Government's freight and logistics plan, supported by national port and freight strategies and investments, will make a meaningful contribution to addressing these needs.

Analysis of the performance of the new link shows that volumes are low compared to modelled capacity. As such, the case for making this a dedicated freight link is difficult to justify and risks eroding the benefits of the project. In effect, the project eliminates many of the pre-conditions for dedicated freight infrastructure when provided with open access to all users.

In any case, we have considered the potential impacts of delivering the project as a dedicated freight link. This would re-direct almost 2,000 private motor vehicles back onto the other parts of the road network in the AM peak, including around 500 cars on Francis Street and around 300 cars on Somerville Road.

Diverting traffic back onto the nearby parts of the road network would erode the speed increases and eliminate much of the time savings for private motor vehicles. This would significantly reduce the estimates of economic benefits in the evaluation (perhaps by as much as 25 to 50%).

An alternative option would be to restrict access to private motor vehicles during other times of the day (i.e. during the inter-peak period), when private motor vehicle traffic is reduced, as a way of providing a near-ultimate level of service for the freight sector. However, it is likely that the operational performance of the new link is even better during the inter-peak and off-peak periods when general traffic levels are reduced, further weakening the need for the link to be provided as a priority freight measure.

Our financial and commercial analysis has further underlined the difficulty of delivering the project as a priority freight link on a commercial and/or cost-effective basis. Tolling scenarios would fall short of full cost recovery, meaning that the Government would be expected to be a major financial contributor to the project.

6.3 Overall conclusion

While a range of demand and supply pre-conditions appear to be in place for a priority freight link to support the operation of the PoM and ensure it is better integrated with priority freight links in the west of Melbourne, the project as defined does not constitute a suitable form of dedicated freight infrastructure.

This could be due to a number of demand and supply factors, including:

- The size of the freight task, while large, may not justify investment in priority infrastructure given the extent of other traffic types in the area (demand).
- The patterns of demand in the inner-west of Melbourne are diverse and involve a number of origin-destination flows that are not related to the Port, meaning that it is not possible to disentangle these flows and target freight demand through a single infrastructure investment (demand).
- The existence of alternative routes to access the Port from the M1 corridor via CityLink and other strategic connections, reduces the criticality of improving connections to the west.
- The form of design has not been developed with the aim of prioritising freight infrastructure, and if this was an overarching objective, then the design solution might be better targeted at addressing PoM access issues (supply).
- The nature of the existing road layout and other barriers (natural or otherwise) may limit the opportunity to develop cost effective solutions on the west side of the Port (supply). This recognises that there may be an access problem on the west of the Port, but that there may be insurmountable barriers to developing suitable dedicated freight infrastructure.

While each of these causes are possible, the case study also highlights that the need for dedicated freight infrastructure would be limited when alternative network modifications provide a feasible way of addressing the perceived problems. It is only when there is a lack of alternative network options available that the case for investing in dedicated freight infrastructure is strengthened. In this example, it might be when congestion on the M1 corridor reaches a certain level and spills over onto the new route that it becomes imperative to restrict access to private motor vehicles in order to prioritise freight flows.

Should this occur, and as the size of the PoM freight task continues to grow, we may reach a point where the market, including road freight operators and the PoMC, may start to demand and be willing to pay for a tailored infrastructure solution to strengthen the connection between the Port and key transport links in the west of Melbourne.

CASE STUDY 2: BRISBANE

1. Overview

1.1 Background & Purpose

This case study for Brisbane focuses on a concept project to provide a new rail link between the Port of Brisbane and the Surat Basin to the south west of the city. The details of this project are provided below.

This concept project in this case study is derived from preliminary investigations by the Port of Brisbane for a dedicated freight rail line to the Port. EY consulted with Port of Brisbane Pty Ltd during 2012 to obtain and analyse data related to the case study. EY also obtained independent analysis of trade and economic data to support an overall economic assessment of the concept project.

Since that time, the Port has carried on the development of the project, and has made formal submissions to the Federal Government, including through a submission to Infrastructure Australia for a *Dedicated Freight Rail Corridor project* in November 2013.

While the concept project described in this case study is broadly consistent with the project proposal submitted to Infrastructure Australia, this case study has not been updated to reflect the different assumptions and information used in that later submission. The Port of Brisbane has been refining the project in consultation with key stakeholders in the development of its submission. The stated aim of the Port is to identify a sustainable and balanced transport solution that, following the completion of a pre-feasibility study that is currently underway, will demonstrate the commercial, social and environmental viability of dedicated rail from the Surat Basin to the Port of Brisbane.

In light of these developments, the project analysed in this case study is purely conceptual in order to explore issues in providing dedicated freight infrastructure between the Port and the region to the south west of Brisbane under certain conditions. It is not a comprehensive feasibility assessment of the case study project or similar proposals for a dedicated freight rail link connecting the Port with the Surat Basin. It is important to recognise that the findings of this case study are driven by the data and assumptions used, and it is acknowledged that a full investigation into the project proposals reflecting the latest project definition and market conditions could reach different conclusions.

To support the case study, further information is provided on the revised Port of Brisbane proposals. However, recognising the confidential nature of the submission to Infrastructure Australia, the specific details about the project have not been included.

1.2 Our Approach

1.2.1 Overview

This case study aims to enhance our understanding of the conditions that justify the delivery of dedicated freight transport infrastructure to serve Australia's major container ports.

In undertaking this case study, the key tasks we have followed have included:

- Obtaining relevant project data from Port of Brisbane Pty Ltd
- Undertaking an analysis of the potential impacts of the concept project in order to identify and value the benefits of the case study as an example of a priority freight link
- Undertaking a rapid financial assessment in order to evaluate the potential commercial feasibility of the project
- Considering potential commercial and governance models that could be deployed to support the delivery of the infrastructure project

- Gauge the level of market interest and demand for the project, and in particular with respect to contributing to its commercial delivery

Part A of this Report identified a set of principles for considering dedicated and priority freight infrastructure. The study found that there is a range of demand and supply factors that drive the viability of dedicated and priority fright infrastructure.

Principles of demand include:

- The presence of conflicts between freight and other users of the transport network
- The size of the freight task
- Distances that freight movements are required to travel
- General network congestion around ports and other key freight centres
- Land use planning considerations
- Amenity issues
- Safety and environmental concerns
- Industry demand and willingness to pay for infrastructure

Principles of supply include:

- Capacity constraints around ports and other key freight centres
- Cost effectiveness in delivering priority freight infrastructure
- Form of infrastructure and design to address freight issues

These principles were used to inform the selection of case studies and to provide the framework within which to analyse this case study, and to consider whether it is an example of appropriate dedicated or priority freight infrastructure in support of the Port.

1.2.2 Data collection

This case study was developed in 2012 using the data available at that time. We acknowledge that Port of Brisbane and its partners have undertaken significant new investigations and data analysis in developing its submission to the Federal government. Any findings in this report are not reflective of these recent developments.

2. Overview and strategic context for the case study

2.1 Introduction

The Port of Brisbane was privatised in late 2010 as part of the Queensland Government's strategy to reduce debt. The port was bought by a consortium of four long-term infrastructure funds, giving them a stable shareholder base and an enhanced ability to plan long-term. The port's management has been radically re-organising with a large reduction in the workforce and extensive repricing of port services to reflect commercial realities. As a result, a new ethos pervades the management, with an outward focus on maximising the opportunities available to the company.

As part of this process, its new owners and management have reviewed the growth prospects of the port and have identified coal as the commodity that can provide the volume growth that will most likely provide the greatest revenue stream to fund a new rail line to the Port. Coal volumes have grown by 68% from 2002 to 2012, currently approaching 10 mtpa. The port has identified the potential for 50 mtpa from the Surat Basin, to the west of Brisbane. At the same time they have reviewed all of their infrastructure and operations and found that the greatest risk they faced was not on the sea side of their operations, or the on-port operations, but more their connectivity with the hinterland that supplies their exports and receives their imports. Hence, it is promoting the idea of building a new dedicated railway from the coal areas to the west of Brisbane to the port. At this stage, it is proposed that the project be totally private sector funded, with no government funding required. It is upon this basis that we have modelled it. A by-product of the railway is that it would also provide a first-class railway for the movement of containers from the port to intermodal terminals to its south.

The focus on coal by the port reflects its unique character and geographic position. Of the total trade of 33 million tonnes in 2010/11, only 8.2 million tonnes, or 25% was containerised. If the port can unleash its coal volume potential, this percentage will decline precipitately. The port would become one of the top ten export coal ports in the world, a quite remarkable prospect for a major city port.

2.1.1 Road Network

The road network between the port and its catchment area is generally excellent, with recent multi-billion dollar investments increasing capacity in all directions. This includes $1.8 billion to expand the capacity of the Gateway Motorway to three lanes each way for a major portion of its route, and to construct a duplicate bridge across the Brisbane River. Another $380 million of government funds has been spent on the Port of Brisbane Motorway that links the Gateway Motorway to the port, turning a substantial portion of it from a single lane road to a dual carriageway.

The Queensland and Commonwealth governments have also committed to construct the Toowoomba Second Range Crossing (TSRC), which will be approximately 41km in length, running from the Warrego Highway at Helidon in the east to the Gore Highway at Athol in the west via Charlton. The Queensland Government has committed $321.25 million to the project, with the Commonwealth Government providing $1.285 billion.

These expenditures are contributing to substantial productivity benefits for the trucking industry. A-double trucks capable of carrying four TEU (or two FEUs) can travel 200km from beyond Toowoomba to the port without going through a traffic light. The increase in capacity of the trucks has in part resulted from heavier road/bridge standards and changes in the regulatory regime. The move to a Performance Based Standard (PBS) for assessing heavy vehicles has resulted in innovations that have increased the size and carrying capacity of the heavy vehicles. The focus of the change is on how well the vehicle behaves on the road through a set of nationally agreed safety and infrastructure protection standards, rather than how big and heavy (length and mass) it is.132 This is combined with the Intelligent Access Program (IAP), which gives a GPS fix on the vehicle, giving road managers the required confidence that the heavy vehicle is travelling on the stipulated road.

A-double trucks with two high mass FEU's have had a dramatic effect on vehicle productivity. They travel from Toowoomba to the port with containerised grain and have resulted in a 50% improvement in capacity, compared with previously, when mass limits restricted grain to one FEU on a semi-trailer. This means a halving of the number of trips to deliver the freight task. Anecdotally, the Port of Brisbane told us that the number of trucks of this type has gone from 0 – 40 in twelve months.

The combination of large capital expenditure and regulatory reforms has increased road's competitive position compared to rail. Rail, with constraints on the Toowoomba range that severely limit its carrying capacity, is losing market share to road.

The road improvements on the Gateway Motorway are expected to be sufficient until the mid to late 2020's after which a combination of ITS (Intelligent Transport System) initiatives such as variable speed measures, ramp metering and lane control and further, expensive capital improvements will be required. But in the short to medium term, the port need not have great concerns with the road transport infrastructure it relies on. It was rail where the port saw its greatest problem in accessing its hinterland.

It is this issue that is driving the port to consider a dedicated freight railway, which forms the basis of this case study, from the port to the Surat Basin area in south-east Queensland. The rail would ostensibly be for carrying coal, but also carry containers.

2.1.2 Rail Constraints

Rail currently faces serious constraints for both the carriage of bulk products such as coal and grain and for containers. It currently carries 57,000 TEU (2010/11 figure), mainly made up of boxes from regional areas to the north and west of Brisbane. Volumes have been stuck around this figure for a number of years and there are no shuttle services to the main intermodal terminal at Acacia Ridge, 37km away. Such services have been looked at by logistics companies, but found to be non-commercial. For the 37 kilometres to the port, the line would be a dedicated freight line. But this line has to cross over the passenger lines and thus is subject to peak-hour passenger train curfews. Slow freight trains, with low acceleration capability are not allowed to even traverse the passenger lines at the peak due to reliability issues and zero tolerance of delays.

Coal and other freight trains originating to the west of Brisbane face more constraints. Firstly they have to traverse the shared Citytrain network from near Acacia Ridge to Rosewood on the Ipswich line. Again, curfews apply during the morning and afternoon peaks and, at all other times, the passenger trains have priority. They then have to travel over the Toowoomba range, a large hurdle, with steep grades, sharp corners, limited passing loops and small tunnels. All rail on this line is rated at 15.75 tonne axle load. This, combined with small tunnels, limits the capacity of the coal or grain wagons. This is most explicitly shown by the amount of net coal per train on the western network (1,920 tonnes per train), compared with best practice on the central Queensland coalfields (10,000 tonnes per train).

Beyond Toowoomba, the western line runs on fairly level ground though the towns of Oakey, Dalby, and Chinchilla to Miles and beyond, in the southern reaches of the Surat Basin. Unfortunately much of the soil out west is black soil, which is weak structurally and requires large quantities of ballast to support the steel rail. Hence at the moment it only supports 15.75 tonne axle load. It would be expensive to go beyond this in terms of the formation needed.

It is the Citytrain network that is the crucial problem for the port going into the future. Freight will always be competing for access with passenger trains. In recent years, new Citytrain network

[132] Queensland Government Department of Transport and Main Roads, "Information Bulletin "Performance based Standards (PBS) Scheme in Queensland"

extensions such as to Richlands, off the Ipswich line have reduced the amount of utilised space on track that was previously available to freight. These trends are set to increase in the future, with moves afoot to go to a 15 minute off-peak service.

The previous State Government had plans for Cross River Rail, an expensive tunnelling exercise that, as well as providing additional capacity across the Brisbane River to Yeerongpilly, would also provide a new underground service through the heart of the city. With the new Government in power since March 2012, this is being reviewed, and its draft review has recently been published. The project, in order to save costs has been shortened and whereas the earlier proposed Cross City Rail would have freed up some capacity for freight services between Yeerongpilly and Dutton Park, It is not clear yet whether this reduced version of it will provide the same, albeit limited, benefit.

The number of rail paths over the Toowoomba range, combined with restrictions on the Citytrain network, limit the western network to 10 million tonnes per annum (mtpa). In recent years, increasing amounts of this capacity have been taken up by coal trains. At the moment the system is at capacity with the potential to incrementally increase capacity on the Citytrain network by adding a passing loop on the freight line, where it crosses the passenger line. This is awkward but may be possible as part of a grade separation. No accurate costs are available at this time, but indications are that the total project cost would be several hundred million dollars. This has the potential to increase freight/coal capacity to 14 million tonnes. But there is no scope on the current network, to meet the demand the port is now forecasting. Without massive expenditure running into many billions, and involving at the same time a comprehensive reorganisation of the Citytrain network, sufficient capacity could not be created on the current corridor.

2.1.3 The Concept Project Proposal

In order to access the higher volumes of up to 50 million tonnes, the Port proposed to promote and oversee the construction of a new and upgraded railway from the prospective coalfields 400 kilometres away, to the port[133]. At the time of the preliminary proposals, the Port is working on a timeframe of five years of approvals from 2012 to 2017 and then five years of construction till 2022, when a service could commence[134]

The line has four sections, for which preliminary engineering analysis has started:

- Western Line upgrades
- Toowoomba Range
- Construction of the Southern Freight Rail Corridor line
- Proposed Eastern Freight Rail Bypass

A total cost estimate of $7.0 billion, including an allowance for contingencies was provided for the project. The first two of these sectors have been studied for a number of years. Toowoomba Range crossings have been analysed for over ten years, separately and as part of the Melbourne–Brisbane Inland Rail Line. The Southern Freight Rail Corridor is also part of the larger Melbourne–Brisbane project and was studied in the late 2000s. Currently, the corridor and alignment have been mapped out and the project currently sits as being identified within planning schemes.

The Eastern Freight Rail Bypass is a new proposal that connects from near where the southern freight corridor meets the Sydney – Brisbane line to then connect with the existing freight line near Murarie. It would follow part of the Logan and Gateway Motorway corridors, hence bypassing the Citytrain network completely via the southern corridor and the eastern bypass. It is the most

[133] At this early stage, the port advises that while it itself would not be an investor in the railway, some of its shareholders could. This fits with their focus on long term steady infrastructure investments.
[134] We have chosen to use a 35 year timeframe for our modelling (till 2057) representing one single depreciation cycle of that length (we note that the ATC National Guidelines recommends 50 years for rail projects)

expensive part of the capital cost, at $3 billion, and highlights the fact that this project, with its high cost, will be a challenge financially and economically.[135]

The Port envisaged the project as having positive spin-offs for its container trade. The line will allow for double staking and a much improved transit time (unimpaired) for rail borne containers, thus increasing rail's competitive position with road. It will have a connection to the existing intermodal terminal at Acacia Ridge and also a proposed terminal at Bromelton, approximately 70 kilometres from the Port. The project was timed to be completed in 2022 when the roads used to access the port are likely to approach critical levels of congestion. Hence, the Port considered its rail line as being able to access large proportions of its short haul container trade.

The Port of Brisbane undertook preliminary market demand analysis and engineering analysis of its proposal. The proposal is for dedicated freight infrastructure for a major container port. However, the Port of Brisbane is unique in many respects. It is very much a multi-purpose port with large volumes of oil products, coal, grain, oil and break bulk products. Its proposal is not considered to require government funding, but will require planning and environmental clearances, which could cover some sensitive issues concerning urban amenity and protection of wildlife. Coal will fund the proposal.

2.1.4 The *Dedicated Freight Rail Corridor project* (November 2013)

Since the initial period of consultation with the Port of Brisbane and the development of this concept project case study, the Port has continued to develop the project in consultation with key stakeholders, including the Federal and Queensland governments. The ultimate plan is to secure the delivery of a dedicated freight rail line linking the Port with trade export corridors west of Toowoomba and the proposed Inland Rail Project.

In November 2013, the Port presented a submission to Infrastructure Australia on the Dedicated Freight Rail Corridor (DFRC) project. The proposal is broadly consistent with the scope of the concept project, with key components of the corridor including:

- A new Eastern Freight Rail Bypass (EFRB) – extending from the existing Fisherman Islands rail line for 37 km to the Interstate Standard Gauge Rail Line (ISGR)
- Upgrading the ISGR for 25 km from Larapinta to Kagaru
- Developing the planned Department of Transport and Main Roads' Southern Freight Rail Bypass (SFRB), extending for 55 km from Kagaru to Rosewood on the Western Lines
- A new Toowoomba Range crossing of around 97 km
- Upgrading the existing Queensland Rail Western Line, approximately 260 km from Oakey to Wandoan.

As part of updating its proposals, the Port of Brisbane has also reworked and refined its estimates of capital costs, with a focus on identifying efficiencies and other cost savings. This information is currently confidential and forms a critical input to the Port's discussions with governments and other stakeholders.

The Port of Brisbane has identified several benefits of the DFRC for the Queensland economy and local communities, including:[136]

- Removal of approximately 4,000 trucks per day from South East Queensland's road network by 2045; which equates to an average saving of 186 million truck kilometres per annum.

[135] Unfortunately a map of the proposed rail line could not be obtained.
[136] http://www.portbris.com.au/news-media/item/?release=/News-and-Media/Momentum-builds-for-dedicated-freight-rail-to-the

- Improvement in air quality, with the project generating an annual reduction of 460 tonnes of carbon emissions by 2045.
- A significant reduction in accidents and road maintenance costs
- Better travel times for road users, which are predicted to reduce by an average of 15 minutes for trips from Toowoomba to Brisbane.
- Removal of all freight trains from Ipswich and Toowoomba city and approximately 60,000 20-foot freight containers from the Brisbane metropolitan passenger rail network each year.
- Creation of 5,000 construction and operational jobs for Queensland.
- Improved amenity for the Brisbane metropolitan rail network.

The Port of Brisbane intends to work closely with government and industry stakeholders to develop a detailed business case by 2015 to demonstrate the commercial, economic, social and environmental feasibility of the project.

3. Demand analysis for the concept project

3.1 General approach

This chapter outlines the demand analysis that was undertaken for the concept project that is the focus of this case study. This demand analysis has not been updated for changes to the project concepts that are currently subject to a pre-feasibility study by the Port of Brisbane.

It is expected that the demand for the freight only railway would be made up of five separate commodity and geographic groupings:

- Coal
- International containers – to/from Acacia Ridge and Bromelton
- Other Western Queensland freight to/from the port
- Inland Rail domestic freight from/to Melbourne/Brisbane on the Inland Railway assumed to be built for commencement in 2030
- South and Western Australia and Northern Queensland freight travelling on the Inland Railway

The following sections of this chapter outline recent trends and analysis for each market segment and presents forecasts used for the purpose of this concept project.

3.2 Coal

3.2.1 Historical coal exports

Coal exports through the port of Brisbane have grown dramatically in the last decade. The table below shows a rise from 3.1mtpa to 9.6mtpa over 9 years.

Table 28: Coal Exports through the Port of Brisbane: 2003/04 – 2011/12, (millions)

	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12*
Exports	3.1	3.7	4.1	4.2	5.2	6.3	6.3	6.6	9.6
Growth Rate		19%	11%	2%	24%	21%	0%	5%	45%

* POB Estimate

This ramp-up is part of a wider coal boom affecting Queensland, with multiple proposals to develop mines in the Galilee Basin in the north of the state with concomitant rail and port expansions. Further south, planning is well advanced to close the 'southern missing link" rail line between Wandoan and Banana to allow coal to exit on the Moura system to a new coal terminal at Wiggin Island in the Port of Gladstone. Wandoan is roughly half way between Gladstone and Brisbane ports at 380km and 403km respectively.

3.2.2 Forecast coal exports

The Port of Brisbane (POB) has had coal consultants Wood McKenzie undertake a study to identify the prospective coal resources that are significantly closer to their port rather than Gladstone. The current limit in distance they are working on is Yan Coal's mine at Cameby Downs 380kms from the port and 583km from Gladstone. The table below contains the Wood McKenzie forecasts and distances from Brisbane and Gladstone. The Wood McKenzie report also looks at worldwide demand and supply of thermal coal (used to generate electricity) and forecasts that sufficient demand exists for the 50 mtpa coal resource to be moved through the Port of Brisbane.

Table 29: Coal mines, annual tonnages and port distances of prospective mines

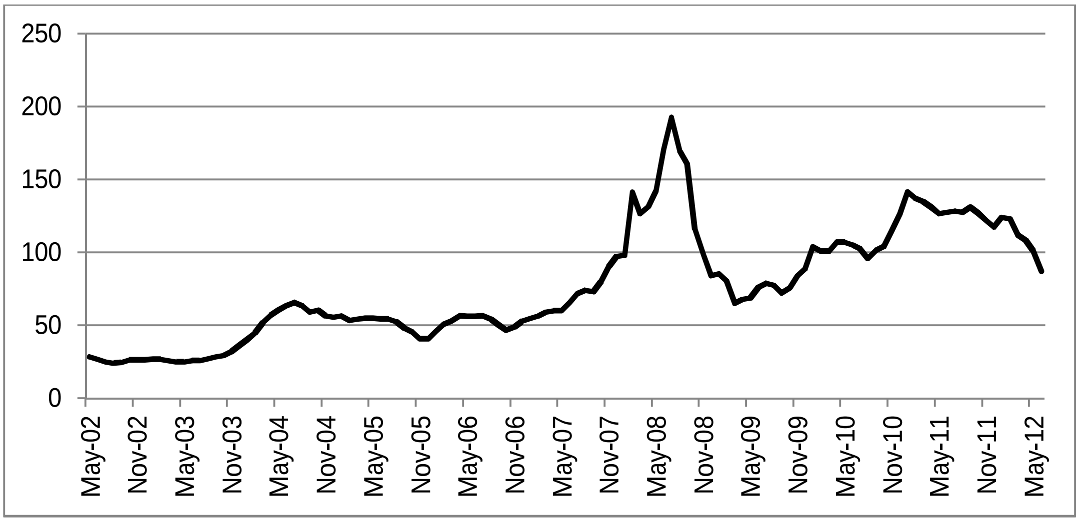
Company	Mine	Tonnes (mtpa)	Distance to Brisbane (km)	Distance to Gladstone (km)
Yang Coal	Cameby Downs	10	380	496
Peabody	Wilkie Creek	10	293	583
New Hope	New Acland	10	227	649
New Hope	Jeebropilly	0 closed by 2022	82	N/A
New Hope	New Oakleigh	3	82	N/A
OGL	Ebenezer	2	82	N/A
Other – Metro, Blackwoods, CSE	Various in Wandoan and West Moreton Fields	15	250 avg	620 - 750
	Total	50		

Source: Port of Brisbane

At the time this case study was developed, (mid-2012) considerable uncertainty existed as to the health of the world economy, with particular issues in Europe and, to a lesser extent, China. The latter is of major importance to the Australian economy and its exports of coal and iron ore.

As shown by the ten year price trend as of 2012 in the figure below, (in US dollars) prices for thermal coal fell significantly during the preceding months, but were still at high rates compared to periods only ten years earlier. However, the cost of production for many coal mines were also climbing perceptively and if prices were to trend below US$45 it was considered that many Australian mines would become uneconomic[137].

Figure 15: Ten year monthly Australian thermal coal prices in US$



Source: http://www.indexmundi.com/commodities/?commodity=coal-australian&months=60

While acknowledging the high degree of uncertainty involved, for the purposes of this case study EY has used the forecasts of the Port of Brisbane and their consultants and has not undertaken any analysis beyond what they contain.

Work on the Port's proposal has not advanced to the stage of forecasting the actual ramp up in production of the mines it has identified. Therefore the Port and EY have made the assumptions in table 30.

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[137] See Australian Financial Review, Friday 4 May 2012, page 23, "Plenty of fish in the mining sea"

Table 30: Coal tonnages by year

Year	2022	2025	2030	2035	2040	2045	2050	2057
Mtpa	20	30	50	50	50	50	50	50

Source: Port of Brisbane and EY assumption

The table shows a rapid ramp up from 20 to 50 mtpa over eight years from the commencement of the railway in 2022. While this is rapid, it is possible given the long lead time the mines would have after the commencement of the railway. Most of the mines listed in Table 29 above are either in production or at an advanced stage of planning. Much of the required mine development will involve scaling up of current production.

3.2.3 International containers – to/from Acacia Ridge and Bromelton

The second major commodity group considered for the new dedicated railway and the one central to the theme of this study is the carriage of containers to and from the port on the new railway. Up until now, only a small quantity of containers, (in 2010/1, 57,000 TEU which represents 6% of the Port's container flows) is being carried on the existing railway. Moreover, none of these containers are destined for, or originate at, Acacia Ridge, the major intermodal terminal in Brisbane's main industrial centre. The Queensland Government, unlike other state governments in Australia, does not have an active policy to encourage shipping containers on rail. The current road network, particularly since the recent large investments, comfortably handles the port's truck traffic. In part, this is because Brisbane is not a port so close to the city centre (like Melbourne) or another major traffic generator such as an airport (like Sydney) to have major interaction with passenger traffic. This is despite it being reliant on the busy Gateway Motorway for access. Recent expansion of this route, including additional bridge capacity with a combined eight lanes of traffic have given Brisbane some breathing room compared to the major roads around Melbourne and Sydney.

There are three aspects that support an argument for a radical change in the historical situation with containers on rail to short haul destinations such as the current and planned intermodal terminals. These are:

- The increasing level of congestion on Queensland's strategic road network, particularly the Gateway Motorway which by the mid to late 2020s would be reaching a peak flow of around 2000 vehicles per hour per lane thus falling into the outer levels of E and F on the Level of Service (LOS) scale.[138] All traffic will be travelling slower, increasing trucks' journey times.
- The potential that by the mid to late 2020's there may be some form of mass-distance-location road pricing in place, particularly for heavy vehicles. Road user charging policies are currently under scrutiny as part of the Road Reform Program at the Council of Australian Governments (COAG) level. While progress has been slow, we are allowing them to be in place in ten years' time. They are expected to increase the direct costs for trucks competing with short-haul rail in heavily congested areas. Short haul rail currently has a major structural cost disadvantage in requiring an additional pick-up and delivery (PUD) leg and also high fixed cost access charges for short rail journeys as rail owners seek to cover their costs over a short component of their network.
- The separation of freight and passenger train movements, where current conflicts are considered to be a major impediment for prioritising freight movements, increasing delays and reducing reliability.

[138] The 2000 figure is calculated in Excel from base figures and growth rates supplied by Queensland Motorways Ltd, the owner. For higher levels of precision in forecasting, sophisticated transport modelling software is used which takes into account multiple variables. This analysis is not based on modelling, but rather on historical trends, with some allowance for tailoring off to reflect higher congestion levels and motorists choosing other routes. The 2000 vehicles per hour per lane figure is commonly registered as a high level of congestion. In this analysis, it includes 187 heavy trucks which have a passenger car equivalence (PCU) of three.

- ► The potential to double stack containers on the new rail freight line[139]. This will give far greater efficiency and reduce per unit costs for rail, thus further improving its competitive position compared to road.

It is a combination of these factors that lie behind our forecasts of how many shipping containers will travel on the new railway.

The modal share for containers though the port assumed in the model is as per Table 31 below

Table 31: Port of Brisbane container flows and road and rail market share assumptions

Year	Containers (millions) TEU	Rail share %	Road Share %	Rail share (million)	Road Share (million)
2022	2.1	10%	90%	0.21	1.89
2025	2.7	13%	87%	0.35	2.35
2030	3.3	32%	68%	1.06	2.24
2035	3.9	36%	64%	1.40	2.50
2040	4.4	42%	58%	1.85	2.55
2045	5	44%	56%	2.20	2.80
2050	5.5	48%	52%	2.64	2.86
2057	6.2	48%	52%	2.98	3.22

Sources: Container forecast – Port of Brisbane, land transport shares EY and Port of Brisbane assumptions

In terms of millions of tonnes for the railway, based on a calculated average of 8.83 tonnes per TEU, for all TEU (full and empty) though the port in 2010/2011, we have calculated the net tonne figures as follows (Table 32 below):

Table 32: Port of Brisbane container flows on new railway in tonnes

Year	Volume (million tonnes)
2022	1.75
2025	2.92
2030	8.80
2035	11.70
2040	15.40
2045	18.33
2050	22.00
2057	24.80

Source: Calculation from POB 2010/2011 figures

For modelling purposes we are assuming that the destination of the rail flows will be as follows in Table 33 below:

Table 33: Origin/Destination of additional rail containers

Origin/Destination	Share %	Distance (km)
Acacia Ridge	52%	37
Bromelton	31%	82
Toowoomba	7%	195
Dalby	3%	275
North coast (not on new railway)	7%	600+

Source: POB Origin and Destination study 2007, plus EY and POB assumptions

Bromelton is a new location in this mix, which is otherwise substantially based on a 2007 study the Port undertook looking at the source and destination of its containers. Bromelton is located further

[139] See Section 3.2 below for the operational requirements to make double stacking a reality

south of Acacia Ridge near the East coast railway line from Sydney to Brisbane. It is also near the junction point for the Inland Rail from Melbourne to Brisbane. Land has been set aside for an intermodal terminal. There is some discussion in freight circles in Brisbane as to whether it will take over from Acacia Ridge as part of a chain of intermodal terminals 80 – 90 kilometres from the port. Acacia Ridge is in an area subject to a small amount of urban encroachment and with sub-optimal road access along suburban streets. But it is at the heart of the main destination of containers from the port. For the purposes of our model, we have assumed the beginning of a movement out to Bromelton (with the other sites under discussion being Ebenezer to the west and Landsborough to the north), but with Acacia Ridge still the major destination point for rail containers.

3.2.4 Other Western freight to/from the port

Toowoomba and further out west in the Darling Downs are important agricultural areas for both the domestic and international markets. Apart from coal, grain volumes are an important export through the Port of Brisbane as is cotton. For this study we drew on ARTC's 2009 study on the Inland Rail from Melbourne to Brisbane. This was an in-depth study for which all reports are available on the ARTC's website and it informs the demand identified from the west and from Melbourne and other parts of Australia. For other Western freight the ARTC study identified the following in 2008:

Table 34: Commodity types, 2008 rail market share/volumes and growth rate

Commodity Type	Total Volume (million Tonnes)	Rail share	Rail Volumes (million Tonnes)	Growth rate
Manufactured products	1.20	20%	0.24	2.8%
Agricultural products	1.00	75%	0.75	2.2%
Grains and oilseeds	2.00	75%	1.50	2.2%
Timber and Timber products	0.85	30%	0.26	2.8%
Non-metallic minerals	0.50	40%	0.20	2.8%

Source: ARTC Inland Rail Alignment study WP# 1, Demand and Volume Analysis and Final report, July 2010

Using the data from this table, we have calculated the volumes of other freight that would be available for the railway in 2022 as follows:

Table 35: Other Western freight volumes on the new railway

Year	Volume (million tonnes)
2022	4.07
2025	4.37
2030	4.91
2035	5.51
2040	6.20
2045	6.96
2050	7.83
2057	9.22

We have assumed that all this freight, bar the manufactured products will travel from the hinterland to the Port of Brisbane. The split for origin we have used is as follows:

Table 36: Origin points for Western freight on the railway

Geographic origin point	% of freight
Toowoomba	40%
Oakey	20%
Dalby	20%
Chinchilla	10%
Miles	10%

EY model assumption

3.2.5 Inland Rail domestic freight from/to Melbourne/Brisbane

The inland rail project from Melbourne to Brisbane has been studied in depth for at least the last ten years, with the latest study been a comprehensive one by the ARTC in 2009/10. The economic modelling to date has shown it to have a negative present value (NPV). The Port of Brisbane railway does open opportunities for the Inland Rail. The ARTC report showed that 44% or $1.625 Billion of the $3.7 Billion capital costs would be consumed by the work from Gowrie to Kagaru, covering the Toowoomba range and the Southern Freight Rail Corridor. If these two items were paid for as a part of this project, the capital cost element of the Inland Rail would be reduced dramatically. We have not sought to model this, based on it, we have assumed that the Inland Rail would be built by 2030, eight years after the Port of Brisbane railway[140]. Therefore from Oakey to Acacia Ridge, the traffic forecast in the ARTC 2009 report (minus the coal) would be travelling on the POB railway. The forecasts from the ARTC report are in table 37.

Table 37: Inland Rail freight from Melbourne–Brisbane and return

Year	Volume (million tonnes)
2022	-
2025	
2030	1.56
2035	4.47
2040	5.51
2045	6.77
2050	8.28
2057	10.91

Source: ARTC Inland Rail Alignment study WP# 1, Demand and Volume analysis and p. 49 for mode share

3.2.6 South and Western Australia and Northern Queensland freight travelling on the Inland Railway

The final category of freight is also drawn from the ARTC study and encompasses freight that will as a result of the Inland Railway being built from 2030, travel on the POB railway from Acacia Ridge/Bromelton south from North Queensland or north from South and Western Australia (connecting to the Inland Railway at Parkes). The volumes are as follows:

Table 38: South/Western Australia and North Queensland freight travelling on the railway

Year	Volume (million tonnes)
2022	-
2025	
2030	0.27
2035	0.80
2040	1.00
2045	1.26
2050	1.56
2057	2.12

Source: ARTC Inland Rail Alignment study WP# 1, Demand and Volume analysis

3.2.7 Summary

Combining these five freight demand scenarios and converting the container freight into net tonnes, the forecast total freight volumes sum to just under 100 million tonnes of freight on the railway, at the end of our model period of 2057, as shown in Table 39 below.

[140] We understand ARTC is looking at 2035 for the start of the Inland Rail, a time when, among other things, the coastal rail will be at capacity. For our model, we have bought this forward to 2030.

Table 39: Total freight volumes in millions of tonnes on the Port of Brisbane railway

Year	Volume (million tonnes - net)
2022	55.82
2025	57.29
2030	65.54
2035	72.48
2040	78.11
2045	83.32
2050	89.67
2057	97.05

Taking the 2030 figure of 65.54m tonnes per annum, Table 40 below shows what sector the freight is on:

Table 40: Freight by sector on the POB railway for 2030

Sector	Commodity Type	Volume (mtpa) 2030
Western Areas - Port of Brisbane	Coal	50
Western Areas - Port of Brisbane	Grain and General freight	4.91
Oakey - Acacia Ridge	Inland Rail freight	1.83
Port of Brisbane to/from Acacia Ridge/Bromelton	Containers	8.80
Total		65.54

4. Cost estimates and other key assumptions

In this section we cover some of the major assumptions that require some discussion. This includes key capital and other cost assumptions for the concept project and the potential impact on future Citytrain and road network costs, and other assumptions that are required for the economic appraisal.

4.1 Capital costs

4.1.1 Concept project cost estimates

The total length of the proposed new railway is 380km, stretching from the port to Miles in the South western Queensland. For planning purposes the port has split it into four sectors as follows:

- Metro – Eastern Freight rail bypass – 65km
- Southern Freight Rail corridor line – 60km
- Toowoomba Range – 70km
- Western line – 185km

Table 41 below contains the capital costs provided by the Port of Brisbane for the construction of the new railway at the time that the concept project was developed. These are preliminary costs that were developed for the Port by its technical advisor. At the time, the Port advised that the costs for the first two sections of the route, as set out in table 41 below, are accurate to within +/– 15%.

Table 41: Port of Brisbane railway capital costs, in billions, 2012 dollars

Sector	Construction 2017 - 2022	Additional Capex 2030	Notes	Source
Eastern Freight Rail Bypass	$ 3.00	$ 1.00	Stage 1: single track plus 6 passing loops 2.5Km long, Stage 2: all track duplicated	POB from preliminary engineering study
Southern Freight Rail Corridor	$ 0.78		Single track plus 4 passing loops	POB from preliminary engineering study
Toowoomba Range - Gowie to Rosewood	$ 1.20		Single track plus passing loops	ARTC figure, no update available yet
Western Line - Gowie to Miles	$ 1.50		Single track plus passing loops	Western Coal User group study. No update available yet
Contingency	$ 0.52			
Total	$ 7.00	$ 1.00		

As noted above, the Port's engineers had not yet costed the Toowoomba range or Western line to Miles. This is unfortunate from our point of view as we cannot be sure that the costs for these sectors took into account the volume of freight now to be moved. For example, the ARTC study assumed that the Toowoomba range would, under their traffic assumptions, require 18 train paths a day. With the far greater volume of coal, we are now considering up to 33 paths as being required a day.

The actual distance covered by the Toowoomba range section is only 70km, but because of the issues with the local geography, it is one of the most expensive portions of the line and the ARTC costing includes two tunnels of 5km and 500 metres each. A back of the envelope calculation of the number of available train paths used by train controllers, suggests that 40 trains could be achieved with up to one 2.5km passing loop, it is not clear whether this is included in the ARTC costing[141]. Based on this we have therefore allowed for it in the contingency amount of $0.52 billion. The major cost is in the bulk earthworks, formation and tunnelling, which would be covered under the original amount.

The amount set aside for the Western line is $1.5B for 185km of duplicated track. This works out as $8.1m per kilometre, which compares reasonably with estimates EY has cited for duplicated rail in the Galilee Basin of $7.7M per kilometre. The area is notorious for its black soil, thus requiring substantial earthworks and formation. Of note is Surat Basin Railway, a planned 60km railway to fill the missing link between Wandoan and Theodore, which is costed at $4.7m per kilometre in 2009 dollars and runs on similar geology.

For maintenance costs for the new railway, we have relied on costs provided by the ARTC report for new track at $30,000 per track kilometre for the first 15 years and $35,000 per year per kilometre beyond that.

4.1.2 Updated DFRC project cost estimates

Since the development of the case study, the Port of Brisbane has continued to review and refine the DFRC project with the support of its technical advisors in consultation with key government and industry stakeholders.

While this work is ongoing, the Port of Brisbane considers that it has identified various means by which to significantly reduce the capital cost estimates for each of the DFRC segments costed above.

4.2 Additional Costs to allow for double stacked containers

As noted in Section 3.1.3, certain other events have to occur before the railway could be used to run efficient double stacked container shuttles between the port and Acacia Ridge and, to a lesser extent, Bromelton. The first section of the POB Railway runs from the port, along the alignment of the Gateway and Logan Motorways before turning south to Kagaru where the next sector, the Southern Freight Rail corridor, commences. At the point where the sector turns south away from the Logan motorway, the East Coast line from Sydney runs 14 km further north to Acacia Ridge. This 14 kilometre stretch needs investment in order to allow for double stacking. Most particularly at Learoyd Road, just south of the terminal, the vertical and horizontal clearances would need to be lifted in order to allow for double staking.

The cost of this upgrade, plus other works could be paid for as part of a Queensland Government plan to run a suburban line from Salisbury, north of Acacia Ridge, to the south. This is along the same corridor, from Acacia Ridge to Kagaru, as the East Coast railway and the planned POB railway. It then becomes a question of which project occurs first, as the current State Government's plans include the lifting of the vertical clearances to allow for electric overheads and for two separated freight lines. The total works are estimated to cost $1.6 billion in 2010 dollars. The basis for the Government's plans is the development of a large new town at Flagstone, just north of Beaudesert. This is planned to have over 125,000 people timed to occur in the next 10 – 20 years. The new suburban train line would work in with the development. While much needs to happen, for the purposes of our model, we are assuming that the rail line is built and paid for by Government by 2027, 15 years hence. At that date, with the POB railway connected to the upgraded line, double

[141] This back of the envelope calculation takes time in a day (1440 minutes), divide it by the time taken to traverse the longest single track portion (we have estimated 30 minutes on a 70 km section), multiply it by a redundancy factor (we have allowed by 80% for delays), then divided by the amount of track available as a ratio of the distance (we have allowed for one passing loop of 2.5km plus the track distance of 70km), therefore 72.5/70 = 1.03 This results in 40 train paths a day. This method is used by Queensland Rail Ltd train controllers as an indicator. Further precision would require specialist modelling.

stacking could commence[142]. In our model, in 2027, containers on rail increase by 100% from 0.39m to 0.78m due to the commencement of double stacking from the port to Acacia Ridge.

As highlighted in Section 3.1, rudimentary calculations of track capacity indicate that the railway, as planned, will have the capacity required to handle the specified train consists and tonnages. This applies particularly to the Eastern Bypass section that would be duplicated in 2030. This is the portion of track which most containers use.

4.3 Reductions in Queensland Rail Ltd's Citytrain network capacity requirements

Building the new dedicated freight line removes freight trains from the Citytrain network releasing capacity for more suburban trains. Our discussions with QR Ltd, the track manager, have identified the benefits, mainly on the Ipswich line, where the freight and passenger trains compete for space on one of the busiest lines in the network. The savings identified here are estimated at up to $1billion as a result of not being required build an additional two tracks from Darra to Ipswich and not undertake an extensive redevelopment of Ipswich station to accommodate the additional lines. While delays in construction costs would not normally be included in a CBA, these have been taken as a proxy for the decongestion benefits that would be achieved on the Citytrain network due to the removal of current and planned freight movements.

A related aspect of the removal of the freight trains is impact on maintenance costs. Freight trains are considerably heavier than passenger trains and so cause extra wear and tear. However, due to the significantly greater number of passenger train movements compared to freight train movements, this potential benefit is considered to be immaterial for this study.

4.4 Reduction in road construction and maintenance costs as a result of the new railway

One of the promoted benefits of the new railway is that, by reducing the number of trucks on the road, future needs for capacity enhancements and ongoing maintenance costs would be reduced (or potentially delayed by a significant period).

The potential to include these benefits depends on a number of factors. In the case of future capacity enhancements, any financial benefit associated with a decision to delay an investment would likely be offset by a loss in decongestion benefits for users of the road. It would only provide a material benefit if the government had been over-investing in the affected section of the road network. In this case, we have assumed that the Government of Queensland has been investing in the road network at or near the optimal level.

4.5 Additional port costs to handle up to 50 million tonnes of coal by rail

Table 42 below contains the cost estimates for the additional port infrastructure needed at the port to handle up to 50 million tonnes of coal by rail. The data was provided by the port. In the model we have assumed that 50% of the money would be spent in 2022 and the additional 50% in 2030.

Table 42: Additional port costs for 50 million tonnes of coal

Item	Cost ($, millions)
Ship loader	30

[142] This point highlights a common finding we have found with this project. That is the intertwined impacts it has with other projects. This includes the Inland Rail from Melbourne to Brisbane, this suburban line form Salisbury to Beaudesert and substantial impacts and benefits, discussed in Section 3.3 to the Citytrain network as a result of removing freight trains, currently carrying 10m tonnes of freight a year, from it. It also could have impacts on the subsidies the Queensland Government pays to Queensland Rail Ltd through "Train Service Contracts" (TSC) for below rail on the Citytrain network and for the above and below rail on the Western line.

Stockyard/stackers/reclaimers./conveyers	75
Wharf	40
Rail Inloader	20
Total	165

Source: Port of Brisbane

These additional costs strike us as being small compared to the billions being poured into coal port terminals at Abbot Point and Gladstone Port. However, these ports do require a great deal more formation work, which the port of Brisbane does not need. Port costs are not the focus of the report and have a small effect on the financial and economic costs.

4.6 Train consist assumptions

For the study we have made assumptions on the types of train consists that would run on an efficient rail system. Thus we have had to consult with rail track managers and rail companies to discern the most efficient train configurations they run. This means we have used the same specification for the long container/van trains from Melbourne as those that run on the ARTC-managed line between the East Coast and Perth. The full list of train specifications for each of our identified freight commodity types is displayed in Table 43 below.

Table 43: Train Specifications for the new railway

Commodity	Train Specification	Net tonnes carried/TEU	Source
Coal	3 locomotives, 110 wagons 1,900metres long	10,000	Best practise in Central Queensland coal system
Port Containers	1 locomotive, 120 TEU 650m long, double stacking	120 TEU	Shuttle train concept QR Ltd
Other Western Freight, excl. Grain	3 locomotives 16 106m well wagon racks, 1800m long, double stacking	5,000	ARTC - East - West service
Inland Rail - Melb - Bris	3 locomotives 16 106m well wagon racks, 1800m long, double stacking	5,000	ARTC - East - West service
Other Inland Rail freight	3 locomotives 16 106m well wagon racks, 1800m long, double stacking	5,000	ARTC - East - West service
Grain trains	3 locomotives, 72 wagons,1650 metres long	3,950	Pacific National - most efficient consist in NSW/Victoria

4.7 Other key assumptions

Table 44 below summarises the main assumptions used in the economic and financial models.

Table 44: Other key model assumptions

Assumption	Details	Notes
Analysis period	Through to 2057	This represents 35 years from commencement, which coincides with the depreciation period. This allows us to depreciate the assets to zero in the financial model, except for the additional $1 billion in capital expenditure in 2030. This leaves a residual value.
Construction period	five years 2017 - 2022	Provided by the Port of Brisbane, based on estimated time to receive approvals of 5 years from 2012
Cost base year	2012 – unless specified	Some cost information dates from earlier periods and is noted as such
CPI	2.5%	Reserve Bank mid-range figure
Economic model discount rate	7%	Discount rate as recommended by the Office of Best Practice, Federal Department of Finance
Financial model discount rates	15% before tax	Based on vanilla target rate used by railways

5. Economic appraisal (rapid cost-benefit analysis)

5.1 Introduction

This appraisal has been conducted in line with the *National Guidelines for Transport System Management* as provided by the Australian Transport Council (ATC) in 2006. We have also used the latest Austroads manual on project evaluation for a number of variables as well as other sources such as the ARTC reports on the Inland Rail from Melbourne to Brisbane, undertaken in 2009/10.

The cost benefit analysis is designed to assess the impacts of the proposed rail line from the point of view of the Australian community. The costs and benefits analysed in this study include only the quantifiable costs and benefits that can also be monetised using available parameters. We have employed a “traditional” cost-benefit approach and have not included Wider Economic benefits (WEB).

The costs and benefits included in the analysis are:

- Delayed and avoided construction costs (i.e. as a proxy for urban rail user benefits)
- Changes in environmental external costs including:
  - Changes in greenhouse gas emissions
  - Changes in noise pollution costs
  - Changes in air pollution costs
- Changes in crash/accident costs
- Changes in maintenance costs
- Changes in vehicle operating costs
- The value of time saved
- The capital costs of the proposed railway.

It should also be noted that this is not an economic impact study and, as such, the potential impacts on employment have not been considered.

A limitation of this study is that we have not undertaken detailed modelling of the impacts on the freight sector and the wider transport network. Detailed modelling is beyond the scope of this study and would be part of a formal feasibility study and/or business case.

5.2 General assumptions

The following table shows the general assumptions which have been applied for the economic analysis. Assumptions related specifically to a certain benefits or costs have been addressed in the relevant section.

Table 45: General economic assumptions

General assumptions	Assumption	Rationale/Source
Completion of construction	2022	Advised by POB
End of analysis period	2057	30 years of operation of railway
Historic CPI	Based on ABS data for the relevant periods	ABS
Future CPI	2.50%	Midpoint of RBA target range
Social discount rate	7%	Required by the Federal Office of Best Practice Regulation
NTKs transferred from road to rail	616 million in 2022, increasing thereafter	Economic model outputs
Reduction of NTK on urban roads	138 million in 2022, increasing thereafter	Economic model outputs
Reduction of NTK on rural roads	386 million in 2022, increasing thereafter	Economic model outputs

5.3 Delayed construction costs

The proposed rail line will delay the need for expansion of the Citytrain network, including increasing to four tracks from Darra to Ipswich. It is envisaged that this expansion would be required in 2022 without this project, but will not be required if this project occurs, as a significant amount of the freight traffic will no longer use this line. The total estimated cost of this expansion is $1 billion in 2010 dollars (based on a 2009 study by AECOM), which equates to an avoided cost of $525 million in NPV terms (2012 prices).

As outlined above, this financial benefit is assumed to be a reasonable proxy for the decongestion benefits for the urban rail network that would result from separating freight and passenger train movements.

5.4 Changes in environmental externalities

This rail project will result in changes in environmental externalities, through changes in greenhouse gas, noise and air pollution. To calculate the impact of these externalities, EY has relied upon Austroads 2012 data and ARTC estimates (in the 2009/10 study of the Inland Rail form Melbourne to Brisbane) relating to the externality costs of urban roads, rural roads and rail. The table below shows the estimates of the costs per NTK for each transport type in 2012 dollars.

Table 46: Environmental externality costs (c/NTK)

Environmental externality costs	Rail	Urban Road	Rural Road
Greenhouse costs (c/NTK)	0.014	0.541	0.541
Noise pollution costs (c/NTK)	0.030	0.406	0.041
Air pollution costs (c/NTK)	0.006	2.432	0.242

Source: Austroads 2012 and ARTC Melbourne–Brisbane Inland Rail Alignment Study Working Paper No. 12 Stage 2 Financial and Economic Analysis

These figures have then been multiplied by the relevant NTK data to arrive at the following reduction in externality costs as a result of the rail project, in NPV terms.

Table 47: Reduction in environmental externality cost (NPV, $ millions, 2012 prices)

Reduction in environmental externality cost	NPV ($m)
Reduction in greenhouse costs	40
Reduction in noise pollution costs	0.3
Reduction in air pollution costs	18
Total reduction in environmental externality cost	58.1

Source: EY calculations

5.5 Reduction in crash costs

It has been indicated that there is a lower incidence of crashes on rail as compared to the same NTK travelling by road. Therefore, as this proposed project would result in a modal shift from road to rail, it will result in lower crash costs. Table 48 below shows the estimates of crash costs on both road and rail in 2012 dollars.

Table 48: Estimates of crash costs per NTK

Crash costs	c/NTK
Rail crash costs	0.042
Road crash costs	0.442

Source: ARTC Melbourne–Brisbane Inland Rail Alignment Study Working Paper No. 12 Stage 2 Financial and Economic Analysis

As for the environmental externalities, these costs per NTK have been multiplied by the relevant NTKs to estimate the reduction in costs as a result of the proposed project. Over the analysis period, this results in a benefit of $29 million in NPV terms (2012 prices).

5.6 Reduction in maintenance costs

Rail is also estimated to have lower maintenance costs compared to road. To estimate the total cost of road maintenance, EY has assumed that the cost is 0.20c/NTK. This figure was derived from the ARTC Inland Rail report and discussions with personnel from the Queensland Department of Transport and Main Roads (TMR). The TMR personnel advised that the ARTC figure of 081c/NTK was significantly higher than the road maintenance costs incurred on the impacted road network in Queensland. This cost per NTK was then multiplied by the reduction in NTK as a result of the proposed project to estimate the total avoided road maintenance costs per annum.

The rail maintenance costs were derived by allocating the total rail maintenance costs to rail traffic which is assumed to transfer from road and all other rail traffic. This allocation was based on the relative NTKs of each type.

Based on these estimates, the proposed project reduces overall maintenance costs by $9 million over the life of the project in NPV terms (2012 prices).

5.7 Reduction in vehicle operating costs

Rail rolling stock and road freight vehicles have different resource operating costs, with rail rolling stick generally being less expensive to operate per unit of freight carried. The different operating costs have been sourced from the ARTC 2009 report, and are estimated at approximately 2.4c/NTK for rail and 5.2c/NTK for road freight in 2012 dollars. Multiplying these figures by the relevant NTK data, EY estimate that the NPV of the reduced vehicle operating costs is approximately $180 million (2012 prices).

5.8 Value of time saved

The proposed project will result in a modal shift from road to rail for some freight. This leads to reduced congestion on the major arterial roads which the trucks would otherwise use. The reduced congestion, as well as resulting in delayed expansion costs, creates travel time savings for the remaining users of the road. The travel time savings will only result on congested roads. The Port of

Brisbane Road shows no serious signs of congestion and so the analysis includes only from the Gateway Motorway onwards. However, the impact on the overall level of congestion is assumed to be minimal from the Beaudesert Road intersection on the Logan Motorway.

Estimating travel times with and without the project along key freight routes that would compete with the proposed railway can be undertaken using simplified speed-flow formulations. A suitable speed-flow relationship has been identified by Austroads in a recent research report, which outlines a function developed by the US Bureau of Public Roads.[143]

For this study, we have used a simplified formulation obtained from the (then) Bureau of Transport and Regional Economics.[144]

The levels of congestion at different points on the Gateway Motorway vary, as does the likely reduction in freight traffic. EY has broken down the impacted road into seven segments, described by the Gateway Motorway's intersection with perpendicular streets:

- Port of Brisbane - Wynnum Road
- Wynnum Road - Old Cleveland Road
- Old Cleveland Road - Mt Gravatt-Capalaba Road
- Mt Gravatt-Capalaba Road - Pacific Motorway
- Pacific Motorway - Compton Road
- Compton Road - Logan Motorway
- Logan Motorway - Beaudesert Rd

5.8.1 Estimation of t_0

For each of these segments of road, EY has estimated the length of the section of road, the time taken to travel the segment assuming a 100km/hr speed limit, and then calculated the time taken to traverse each segment with no impediment. This is represented in Table 49 below.

Table 49: Assumptions to estimate time taken to traverse the road with congestion

Segments of Gateway	Length (km)	Speed limit (km/h)	Time to traverse section of road without impediment (T_0) (in minutes)
Port of Brisbane - Wynnum Road	2.3	100	1.38
Wynnum Road - Old Cleveland Road	3.4	100	2.04
Old Cleveland Road - Mt Gravatt-Capalaba Road	4.8	100	2.88
Mt Gravatt-Capalaba Road - Pacific Motorway	4.3	100	2.58
Pacific Motorway - Compton Road	4.4	100	2.64
Compton Road - Logan Motorway	4.5	100	2.7
Logan Motorway - Beaudesert Rd	2.2	100	1.32

5.8.2 Estimation of VCR

The volume to capacity ratio is simply the estimated volume of traffic divided by the assumed capacity of the road. In line with the assumptions used in the BTRE paper, capacity is assumed to be 2,400 Passenger Car Units (PCU) per lane per hour. The volume of traffic on each segment of road under the scenario without the proposed project is calculated by:

[143] Austroads Research Report AP-R393-11, Speed-flow Relationships: Implications of Project Appraisal, p.11
[144] The Economic Efficiency of Lane Differentiation Policies Staff paper given by Dr Mark Harvey to the 28th Australasian Transport Research Forum, 28-30 September 2005, Sofitel Wentworth Hotel, Sydney. We are here using this formula as proxy as to undertake a full analysis would involve a specialised transport model.

- Taking the assumed peak hourly volume on the Gateway Motorway for a given year, and assumed that the peak period runs for six hours (from 6am – 9am and 3pm to 6pm as advised by to us by Queensland Motorways Ltd.
- Estimating the split of traffic between the six vehicle classes (outlined below)
- Multiplying this by the assumed proportion of the Gateway Motorway each vehicle class uses for each segment to arrive at the number of each vehicle class on each segment of road
- Determining the PCU equivalent for each segment of road.

The assumptions required to undertake these calculations include:

- Total peak hour traffic volume
- Average annual growth rates in peak hour traffic volume
- The proportion of peak hour traffic which is each vehicle class
- Passenger car unit equivalents for each vehicle class
- Number of lanes in each road segment
- Assumed traffic flow of each vehicle class on each road segment.

These assumptions are presented in Table 50 to Table 53.

Table 50: Assumptions to derive vehicle numbers

Input	Assumed value	Source
Total peak hour volume in 2012	900 cars per lane per hour	Port of Brisbane
Annual growth in peak traffic volumes[145]		
2012-2017	5.0%	QML and EY
2018-2022	3.0%	QML and EY
2023-2040	2.0%	QML and EY
2041+	0.5%	QML and EY
Proportion of peak traffic (at segment with heaviest traffic) which are each vehicle class		
Total heavy trucks	12% in 2012 increasing to 19% by 2057	QML
Proportion of heavy trucks which are:		
3 - 6 axle	50%	EY[146]
Rigid (3 axle) + dog trailer (5 axle)	30%	EY
B-Double	20%	EY
Light commercial and medium trucks	10%	EY
Other vehicles	78% in 2012 decreasing to 71% in 2057	EY and QML
Proportion of other vehicles which are:		
Personal cars	78%	ABS[147]
Business cars	22%	ABS

[145] It is assumed that growth rates decline due to growing congestion and the impact of Intelligent Transport System (ITS) measures

[146] These figures are derived from information supplied by QML. As A doubles are a recent innovation they do not form part of the data set of QML. This applies to the four following vehicle classes

[147] ABS *Survey of Motor Vehicle Use*. October 2010

Table 51: Passenger Car Unit assumptions

PCU per vehicle type	PCU	Source
3 - 6 axle	3	BTRE 2005 paper
Rigid (3 axle) + dog trailer (5 axle)	3	BTRE 2005 paper
B-Double	3	BTRE 2005 paper
Light commercial and medium trucks	1	BTRE 2005 paper
Personal cars	1	BTRE 2005 paper
Business cars	1	BTRE 2005 paper

Table 52: Number of lanes for each road segment as at 2012

Segments of Gateway	Number of lanes as at 2012
Port of Brisbane - Wynnum Road	6
Wynnum Road - Old Cleveland Road	6
Old Cleveland Road - Mt Gravatt-Capalaba Road	6
Mt Gravatt-Capalaba Road - Pacific Motorway	6
Pacific Motorway - Compton Road	2
Compton Road - Logan Motorway	2
Logan Motorway - Beaudesert Rd	2

Table 53: Assumptions about proportion of peak vehicles using each segment of road

Segments of Gateway	3 - 6 axle	Rigid (3 axle) + dog trailer (5 axle)	B-Double	Light commercial and medium trucks	Personal cars	Business cars
Port of Brisbane - Wynnum Road	100%	100%	100%	100%	100%	100%
Wynnum Road - Old Cleveland Road	99%	99%	99%	90%	90%	90%
Old Cleveland Road - Mt Gravatt-Capalaba Road	98%	98%	98%	95%	95%	95%
Mt Gravatt-Capalaba Road - Pacific Motorway	40%	40%	40%	90%	90%	90%
Pacific Motorway - Compton Road	40%	40%	40%	40%	40%	40%
Compton Road - Logan Motorway	40%	40%	40%	40%	40%	40%
Logan Motorway - Beaudesert Rd	40%	40%	40%	40%	40%	40%

Source: EY Assumptions

Using the above information, EY has estimated the VCR for each segment of road for each year over the analysis period (2012 – 2057) in the absence of the proposed project.

We have then estimated the number of trucks that the rail line will remove from the road based on port supplied figures of the number of TEUs carried per truck.

Of this total number of heavy trucks, we have assumed that 40% of them would use the Gateway during the peak period. This assumption was based on information provided by TMR in their Traffic Analysis and Reporting System (TARS) Annual volume report for the Port of Brisbane Motorway, at a point prior to joining the Gateway in 2010.

The number of cars and other vehicles using the roads is assumed to remain a constant between the scenario without the proposed project and the scenario with it.

From this information, we estimated the VCR for each segment of road over each year of the analysis period if the proposed project occurs.

5.8.3 Estimation of value of travel time savings

From the information estimated in sections 5.8.1 and 5.8.2 above, EY has been able to calculate the travel time saving on each segment of road from 2022 to 2057.

These travel time savings have then been valued based on Austroads data which is provided in their Guide to Project Evaluation – Part 4: Project Evaluation Data. This guide provides estimates of the value of time saved and vehicle occupancy rates by vehicle class in urban and rural areas, including for private and business car travel, and other commercial vehicle types (e.g. rigid trucks, articulated trucks and combination vehicles). The relevant values are presented in Table 54.

Table 54: Value of time saved

	Non-urban			Urban			Freight travel time	
Vehicle type	Occupancy rates	Value per occupant	Value per vehicle	Occupancy rates	Value per occupant	Value per vehicle	Non-urban	Urban
Cars								
Private	1.7	13.17	22.39	1.6	13.17	21.072		
Business	1.3	42.15	54.80	1.4	42.15	59.01		
Rigid Trucks								
Light commercial (2 axle, 4 tyre)	1.3	23.32	30.32	1.3	23.32	30.316	0.69	1.35
Medium (2 axle, 6 tyre)	1.2	23.62	28.34	1.3	23.62	30.706	1.86	3.68
Heavy (3 axle)	1.0	24.07	24.07	1.0	24.07	24.07	6.39	12.58
Articulated trucks								
4 axle	1.0	24.37	24.37	1.0	24.37	24.37	13.76	27.09
5 axle	1.0	24.67	24.67	1.0	24.67	24.67	17.54	34.55
6 axle	1.0	24.67	24.67	1.0	24.67	24.67	18.92	37.25
Combination vehicles								
Rigid (3 axle) + dog trailer (5 axle)	1.0	24.67	24.67	1.0	24.67	24.67	27.04	
B-Double	1.0	24.67	24.67	1.0	25.79	25.79	27.38	53.93
Twin steer (4 axle) + dog trailer (4 axle)	1.0	24.67	24.67	1.0	25.79	25.79	26.13	
Twin steer (4 axle) + dog trailer (5 axle)	1.0	25.05	25.05	1.0	26.24	26.24	27.86	
Double road train	1.0	25.79	25.79	1.0	26.9	26.9	36.59	
B-Triple combination	1.0	25.05	25.05	1.0	26.24	26.24	37.35	
A B combination	1.0	25.05	25.05	1.0	26.24	26.24	44.98	

Source: Austroads 2012

Based on the information and assumptions contained in section 5.8, EY has estimated that the NPV of the travel time savings as a result of the proposed project is approximately $37 million (2012 prices).

5.9 Summary economic results

The economic results for the concept project are summarised in the table below.

The economic benefits presented are 'net' benefits, meaning that they represent savings in externalities, VOCs and time from using rail in the project case instead of road in the base case. For example, section 5.7 shows how the difference in operating costs across the two modes have been used in determining the overall reduction in vehicle operating costs.

Table 55: Summary economic results (NPV, $ millions, 2012 prices)

Economic benefits	NPV ($m)
Reduced CityRail construction costs	525
Reduction in environmental externality cost (total)	58.1
Reduction in greenhouse costs	40
Reduction in noise pollution costs	0.3
Reduction in air pollution costs	18
Reduction in maintenance costs	9
Reduction in vehicle operating costs	180
Value of time saved	37
Residual asset value (asset life = 50 years)	268
Total economic benefits	1,106
Investment costs (discounted from $7 billion)	4,755
Economic indicators	
Project NPV	-2,811
BCR	0.23

Source: EY calculations

The negative NPV figure is substantially driven by the high capital cost of $7 billion (discounted to around $4.8 billion for comparison with the economic benefits). This suggests that for this concept project to be a success, lower cost design solutions may need to be considered.

While this analysis has identified some significant benefits in terms of forgone expenditure on the Citytrain network, plus savings in value of time, vehicle running costs and the normal range of externalities, the benefits analysed in this case study fall significantly short of the costs on an NPV basis. This suggests that considerable effort is required to better define and value the market opportunities for the Port and railway in order to increase the value for money potential of the concept project.

Advice from the Port of Brisbane is that lower cost options currently are being investigated as part of its pre-feasibility study. This could have a significant bearing on project feasibility considerations. The Port has also been re-thinking and updating its assessment of market potential for the project, and preliminary findings suggest the railway may delivery greater value potential than what has been modelled in this case study.

6. Financial analysis

6.1 Objective

The objective of our financial analysis is to provide an indication of the commercial feasibility of the concept project. In doing this, we have assumed that the project can be delivered through a private sector funding solution. According to the Port of Brisbane, the current market conditions for coal exports provide the opportunity to fund the new infrastructure at no costs to the Government.

In order to attract private sector funding the project must provide investors with a sufficient return on their investment. Generally, funding is only committed when the cash flows required to provide the targeted returns are secured through long-term contracts. The contract arrangements determine the costs of below rail access for the rail users and provide the infrastructure owners with the revenue to meet their costs of capital requirements. On the other hand, mining companies and other rail users would only engage in such arrangements if the access charges for the new rail infrastructure are competitive compared to alternative solution and allow a profitable operation of the entire supply chain.

The proposal would only be feasible if it offers users a competitive and affordable rail solution and simultaneously provides the infrastructure owners with an appropriate return on their investment. On the basis this principle we indicatively calculate the below rail access charges for the potential user groups identified and benchmark them against alternative projects (and current commodity prices). It is envisaged that the result will provide a reference to whether the private sector is likely to fund the project without a government contribution.

6.2 Methodology

Our analysis assumes a private investor or investor group funds the capital costs and charges users for below rail access. It is further assumed that the Project is funded on a standalone basis. This means, the analysis does not consider any cash flows or strategic benefits that may derive from integrating other parts of the supply chain (e.g. port, mine, above rail). The infrastructure owner only receives revenues from below rail access charges. Operations and maintenance for below rail is considered to be passed through to the user at costs.

Although it is unlikely that the new rail infrastructure will become a regulated asset, it is common to use regulated pricing principles to calculate the capital investor's required revenue on a preliminary basis.

The annual revenue requirement is the total amount of access charges an investor must earn to cover its cost of capital (return on capital) and recover its investment over the determined investment period (return of capital).

For pricing purposes it is assumed that the rail asset is depreciated over a period of 35 years on a straight line basis matching the assumed operating period of the Project (2022-2056). The assets may have different useful lives for tax and accounting purposes. It is However, noted that there is evidence that infrastructure owners aim to recover capital over a shorter period to reduce the asset stranding risk. It has also been argued that it is challenging to obtain financing for infrastructure projects of this scale over terms longer than 20 years. As a result proponents price access for new infrastructure to recover the capital costs over periods of 20 years and less. The Queensland Competition Authority has acknowledged these issues by allowing accelerated depreciation for pricing in relation to QR Network's existing regulated assets[148].

[148] QRN Access Undertaking

The Project considers a diverse freight mix and is not solely relying on coal from a limited customer base. Financiers therefore may consider longer capital cycles. A better understanding of the capital market requirements for this particular project would develop from a detailed market sounding at a more advanced stage of the Project.

A detailed market sounding exercise would be particularly useful to approximate the cost of capital requirements as financiers consider a range of parameters that cannot be determined at this stage of the Project. Aside from the market condition, the evaluation of the project risk is the key determining factor when assessing the required return. In particular, financiers assess commercial arrangements between the infrastructure owner and users documented in the contracts. For example, the project risk may significantly vary on the basis of the following parameters:

- Term of contracts
- Characteristics of the contracting parties involved (e.g. financial strength, product and resource portfolio, customer base)
- Securities guaranteeing contract payments (e.g. bank and/or parent company guarantee)
- Risk allocation (e.g. who bears construction risk?)

Since the Project is a preliminary stage and detailed commercial information is currently unavailable for the purpose of pricing access as part of this preliminary assessment, we have considered costs of capital that range between the following two benchmarks:

- The regulated return as determined by the QRN in the 2010 Access Undertaking of 9.96% (vanilla WACC)
- A 15% pre-tax WACC as proposed by QRN in regards to the Wiggins Island Rail Project.

6.3 Annual revenue requirement (ARR)

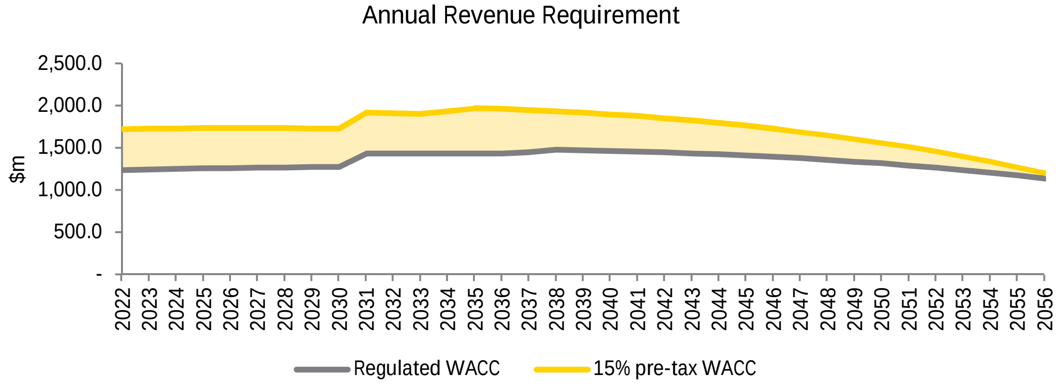
Following the methodology discussed above we have calculated a band for the investor's estimated annual revenue (ARR) requirements. As depicted in figure 16 below it is confined by two lines, which represent the ARR based on benchmark rates of return. The lower bound (grey line) represents the revenue an investor would earn each year under the current regulated pricing regime. The upper bound (yellow line) is calculated on the basis of the 15% pre-tax WACC.

The higher WACC has a large effect on the ARR at the start of the project. As the asset base decreases, the gap between the two estimates narrows due the lower impact of the return on capital component. This is because the returns are calculated as fixed WACC percentages against the depreciated (book) value of the investment.[149]

As outlined in Section 4.1, it assumed that the Eastern Freight Bypass requires a capacity upgrade in 2030 incurring capital cost of $1bn ($ 2012). The capital costs are added to the asset base resulting in an increased ARR.

[149] In theory, you could smooth the revenues to maintain a constant differential between the two over time.

Figure 16: Annual revenue required to service cost of capital

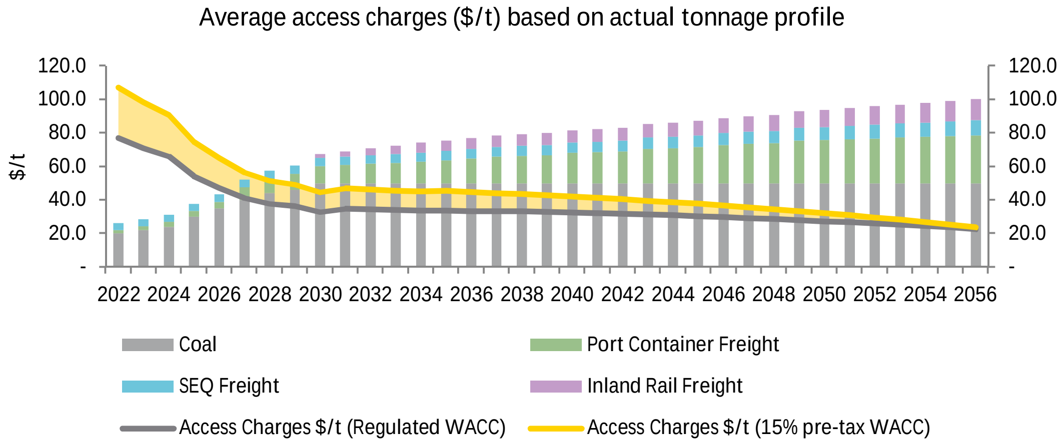


6.4 Below rail access charges

The ARR must be achieved by charging access to the rail users. Usually, the rail customers negotiate a fixed fee for a specific capacity on a take-or-pay basis. As discussed above, due to the early stage of the project there is not sufficient information to model contracted access charges on the basis of contract arrangements. We have therefore calculated the access charges based on the rail freight demand identified in Section 3.2 rather than user-specific contracted tonnage. Hence, the $/t access charges calculated for each specific year are a function of the ARR and the actual tonnage running over the network in the respective period. As depicted in figure 17 below, this results in significantly higher access charges during ramp up. Any increase in throughput instantly decreases the $/t charges as the costs (i.e. ARR) are shared across a higher tonnage.

Figure 17 illustrates the development of $/t access charges on the basis of the assumed tonnage profile. As documented in Section 3 and 4 we have considered a range of assumption in relation to the freight demand and calculated price indications for each of the identified freight categories. The access charges depicted in the overview below represent the average access charges for all categories. The $/t charges are presented as nominal values, i.e. the amount that has to be paid in the respective year.

Figure 17: Tonnages and access charges over a 35 year period



It has been assumed that the rail network would transport multiple products travelling on different segments of the network. The capital cost estimates per rail kilometre are significantly higher for the Eastern Freight Bypass than for the western segments of the network due to the higher complexity of the works in a developed urban environment. In order to assess the access charges specific to the freight category we first have calculated the required total charges (i.e. ARR) for each segment individually, meaning the required charges are only shared between the customers using the particular segment. As the distance travelled on a certain segments and consists used may vary between the different products and users, we further allocate the segment costs on the basis of gross tonne kilometres (GTK) and train paths.

By allocating the costs on the basis of GTK instead of simply using tonnage, we acknowledge the distance a product is transported on the network. GTK also account for the weight of the trains used for the transport of the product and any empty return trips required (e.g. coal).

However, a tariff structure solely based on GTK would ignore the fact that a railway's capacity is mainly limited by the number of train paths available. By also facilitating larger consist that are able to carry higher quantities of product, overall throughput can be significantly increased. We therefore assume that 40% of the costs are allocated based on train paths. However, 60% of the segment costs will be allocated based on GTK to account for differences in distance travelled and the fact that some of the capital costs are incurred to build the rail to the specification (40t axle loads) allowing the use of the larger consists.

Table 56 below summarises the indicative access charges by freight category. As discussed above, the access charges generally decrease over time as result of the continuously increasing demand. We have therefore presented access charges in following years of operation:

- 2022 - Start of operation – low utilisation of rail, coal in ramp up, low rail share of container freight demand, no freight inland rail
- 2031 - Expansion of Eastern Freight Bypass completed – coal fully ramped up, increasing rail share of container freight demand - addition of freight from inland rail.
- 2050 – Non-coal freight almost matches coal throughput.

In an effort to keep the assessment concise and allow a comparison to public available benchmarks, we have grouped the rail users by product:

- Rail charges for coal are shown for products originating from three defined areas.
- Rail costs for container freight between the Port an Acacia Ridge are presented separately to the port containers to and from other QLD locations (e.g. Bromelton, Toowoomba)
- All freight generated by the Inland Rail has been aggregated
- SEQ freight is presented for each product category.

Where freight from and to different locations has been aggregated into a single group we have taken the weighted average of the location specific $/tonne charges.

Corresponding to our indicative calculation of the ARR (Figure 16) and average $4/t access charges, we present the access charges a range representing different costs of capital. The lower figures being calculated using the regulated WACC and the higher figures considering a 15% pre-tax return.

Table 56: Indicative access charges ($/t) by user group for selected years*

Indicative Access Charges ($/t) by user group for selected years	2022	2031	2050
Coal			
Coal - Far West	47 - 65	24 - 32	18 - 21
Coal - Mid West	30 - 43	16 - 22	11 - 13
Coal - Inner West	26 - 36	14 - 19	10 - 12
Container freight			
Port Container Freight to/from Acacia Ridge	24 - 34	13 - 17	8 - 10
Port Container Freight to/from other Qld destinations	57 - 79	18 - 25	12 - 15
Inland Rail Freight			
Between Oakey and Acadia Ridge	n/a	12 - 16	8 - 10
SEQ freight			
Manufactured products	76 - 105	25 - 34	18 - 21
Agricultural products	220 - 306	74 - 99	51 - 61
Grains and oilseeds	220 - 306	74 - 99	51 - 61
Timber and Timber products	76 - 105	25 - 34	18 - 21
Non-metallic minerals	76 - 105	25 - 34	18 - 21

*Note: access charges differ between commodities because they use different segments of the rail line.

6.5 Incremental Port Charges

In order to increase its coal export capacity to 50Mtpa, the Port of Brisbane is required to invest in its port infrastructure. The Port's capital cost estimate has been detailed in Section 4.5.

In the absence of a detailed study we have calculated incremental port charges on the basis of the Port's cost estimate. These incremental charges are shown in the table below.

Table 57: Incremental port access charges

Incremental Port Access Charges ($/t)	2022	2031	2050
Coal	0.7 - 1.0	0.6 – 0.8	0.6 -0.7

It is noted that these estimates do not consider any charges for existing infrastructure. It is therefore noted that the terminal infrastructure charge may significantly exceed the estimate above.

6.6 Benchmark analysis

This analysis compares the required access charges to industry benchmarks and similar rail projects. It further references current commodity prices with the aim to view the rail cost in perspective of the entire supply chain.

6.6.1 Coal

The Queensland Competition Authority (QCA) has determined rail tariffs in its decision in relation to the QRN Access Undertaking. With its 228km the Moura system has a similar size as the average distance between the mine sites considered in our analysis and the Port of Brisbane and is therefore used as reference. On the basis of the 2008 determination, updated for 2012 prices, QRN may charge approximately $3 per tonne for the Moura system. For comparison purposes, we convert the access charges calculated for the Coal Mid-West user group in 2031 into 2012 dollars. Although the access charges are calculated on the basis of a fully ramped up tonnage profile for coal, the range of $10-$13 per tonne significantly exceeds the charges for the Moura system.

However, it is noted that the Moura charges are determined for an existing regulated rail line with a partly depreciated asset base. It is therefore more appropriate to compare the charges to current rail development projects in Central and North Queensland.

The availability of publically available information is very limited. As many proponents are approaching the market and/or are currently in negotiations with potential rail customers, estimates in relation to rail access charges are mainly treated confidentially. However, we refer to a presentation published by GVK in regards to its Alpha coal project, referencing rail costs of $9-$10 per tonnes. In its initial stage the GVK rail line is proposed to transport 60Mtpa over approximately 500km from the Galilee Basin to the Port of Abbot Point. Compared to the rail access charges of $15-$20 per tonne we have calculated for the coal from coal users from the Surat Basin (Coal – Far West; distance of approx. 300-400km; in 2012 dollars) the rail solution to the Port of Brisbane is almost twice as expansive. On this basis, rail users would have a significant disadvantage over their competitors further north and are unlikely to commit to the proposed rail solution.

This is further underlined by the fact that the price for Australian thermal coal has significantly decreased over the last 18 months from $142/tonne in January 2011 to $91/tonne in June 2012. As a result, resource companies have been more cost conscious and are likely to halt projects due to high infrastructure costs. The rail costs calculated above are approximately 20% of the current market price. Given that the coal price also has to cover port access, above rail and most importantly mine development and operating costs, it is unlikely that the rail costs of $15-$20 per tonne would allow a profitable operation of the supply chain under the current market conditions.

The analysis indicates that the potential users sign up to the access charges required to provide the infrastructure owner with the required return. On this basis it can be stated that coal is not able to draw the funds required to finance the Project at it is currently proposed.

6.6.2 Container Freight

The proposal set out that container freight can benefit from the coal volumes as the higher quantities would make the transport of containers to and from the port more viable.

As discussed in Section [6.4] the total rail costs are shared between a range of freight categories. This means container freight is charged for the train paths and GTK travelled over the network. On this basis we have calculated that in year 2031 containers will be charged between $13 and $17 per tonne between the port and Acacia Ridge.

The transport of containers on rail faces significant competition from trucks. In order to increase the market share of rail to the levels assumed in Section 3 the rail option must be competitively priced. The industry-accepted price to transport a TEU on a truck between the port and Acacia Ridge ranges at around $110. Considering that rail would require an additional pick-up and delivery leg to transport the container to/from its actual destination/origin (which is assumed to cost around $50), the rail costs may not exceed the benchmark of $60 per TEU to remain a competitive option. Considering the average weight of a TEU is around ten tonnes, the total rail charge must exceed $6/tonne to be competitive. Our analysis only estimates the below rail costs and does not consider above rail charges. Assuming that the above rail costs for a shuttle operation between Acacia Ridge and the Port are approximately as high as the below rail charges, the below charges may not be higher than $3/tonne to attract customers.

In order to compare the benchmark figure to the nominal access charges calculated in the financial analysis, it is required to escalate the $3/tonne to represent 2031 values. Considering inflation of 2.5% the equivalent benchmark in 2031 would be $4.80. This means the assumed rail solution would be approximately three times more expensive than the level of investment that would be considered a viable transport option for containers.

As discussed in Section 6.6.1, the rail solution is already unviable under the current assumptions, so there is no opportunity to subsidise container freight by allocating more costs to other freight categories.

6.6.3 Summary

The benchmark analysis shows that the proposal is not viable for the two key freight categories, coal and container freight. Our financial assessment therefore suggests that it is unlikely that the private sector will fund the dedicated freight infrastructure project in its current form.

7. Market views and potential participation

7.1 Introduction and Scope

A key component of this stage of our study on dedicated freight infrastructure involves gauging the potential level of market interest from the private sector in delivering the project, as well as understanding the potential to involve users and other project beneficiaries in funding the project.

Organisations identified as market participants in the supply of infrastructure can be considered as those that provide goods and services and those that provide finance. The former represent the designers, builders, operational and maintenance service providers that contribute to the project. The latter group include debt, potential project sponsors and equity financiers. More traditional methods of procurement will often involve a combination of private goods and services, with the public sector funding the project. Alternative methods of financing infrastructure projects utilise private sector debt and equity, such as Public Private Partnerships (PPPs).

Other important market participants include the potential customers that will want to use and benefit from available infrastructure. As we have seen from the analysis above, this includes the freight sector, and in particular those wishing to use heavy rail in the movement of containers and other freight to/from the Port of Brisbane.

Understanding the benefits that a project will provide to its customers is an important consideration when evaluating their potential willingness to pay for infrastructure use. For example, if benefits are low and there are alternative options they can use, then the scope for cost recovery through user charges would be limited.

Given the context (above), the scope of our analysis includes:

- a general discussion of the key factors that influence the market's appetite for participation and investment in major transport infrastructure projects;
- the market's current views and perspectives regarding those key factors based upon EY's involvement in a range of formal and informal market sounding exercises over the last 12 to 24 months; and
- how the freight industry may perceive the project and the issues associated with the provision of funding support to private investors and/or government.

Based on these considerations, we then outline some conclusions for the case study project and its potential to be delivered through alternative delivery and funding models.

7.2 Leveraging the Private Sector (PPPs and Private Rail Projects)

7.2.1 PPPs

State and federal Governments have frequently used the PPP model to deliver large scale transport projects, alleviating the need for government to fund the substantial upfront investment. Costs have been traditionally recouped via a user pays system – tolls are levied on road users or fares levied on rail users. In both cases, top-up payments are often provided by governments, including the provision of 'availability payments' on an ongoing basis for the life of a PPP.

For example, the Peninsula Link project represents one of the first Australian roads PPPs to deviate from this model with the government paying the operator based on a number of key performance indicators relating to the road availability.

Rail infrastructure projects (currently at pre-procurement stage) which may be procured using private finance (under a PPP model) include the Melbourne Metro (Victoria) and the North West Rail Link (NSW).

7.2.2 Private Rail Projects

While the bulk of Australia's below rail infrastructure is government owned, there are a number of cases in which lines have been developed, owned and operated by the private sector. A requirement for the dedicated haulage of commodities to ports has frequently underpinned this investment, supported by the scale of mining operations and export demand for natural resources.

The major ore mines in Pilbara are serviced by owner operated private rail lines extending several hundred kilometres from mine site to export terminals at Port Hedland, whereas the recently privatised QR National runs an extensive rail network in Queensland that is utilised by miners in the region. Also in Queensland, miners are looking at integrated mine – rail and port investments in the Galilee basin, in the northern part of the main coal belt in Central Queensland. The following project summaries provide examples of privately owned and operated rail assets in Australia.

7.2.2.1 Adelaide-Darwin Railway

The Adelaide-Darwin railway line is a significant transport asset in a transcontinental corridor, with rail along the route initially used in the late nineteenth century. In 2000, modern development of the full length of the route began when the Northern Territory and South Australian governments awarded a Build, Own, Operate and Transfer style agreement to the Asia Pacific Transport (APT) consortium. The federal government also provided a financial contribution to the project. After the contract was awarded to the APT consortium, FreightLink was appointed to implement and operate the line. However, after running into financial troubles, the company was subsequently acquired by Genesee & Wyoming[150] (GWA), which remains the current lease owner and operator of the route.

Operations on the line serve both passengers and freight. The corridor is subject to an open access regime whereby above-rail operators have the opportunity to negotiate use of the railway with the owner. Great Southern Railway operates the passenger train *The Ghan* along the route via this arrangement. In addition, GWA operates regular freight services several times a week and maintains relationships with a number of mining companies with operations situated along the route.

GWA is technically the track manager between Darwin and Tarcoola, South Australia. The rail line at Tarcoola splits into an East/West line, with and the North line to Darwin. The Tarcoola to Adelaide section of the journey involves the use of railway lines controlled by the Australian Rail Track Corporation, a company that is wholly owned by the Commonwealth of Australia. Lines under its governance are deemed to be open access, supporting interstate logistics. Access to non-controlled sections is on regular commercial terms.

7.2.2.2 Pilbara iron ore railways

Several railway lines in the Pilbara region in Western Australia are privately owned and operated to service iron ore mines which can be several hundred kilometres from the main export destinations, such as Port Hedland. BHP Billiton, Rio Tinto and Fortescue Metals Group all run private rail networks in the region. The miners are owner/operators of the infrastructure and associated fleet of rolling stock.

Use of the railway networks is governed by the State Agreements Act. While third parties are technically allowed to apply for access on commercial terms, in practice owners have shown resistance to this. Under legislation, the network owners can argue that doing so would result in interference with their existing operations. Fortescue unsuccessfully challenged for access to Rio Tinto and BHP controlled networks before constructing their own.

QR National and Atlas Iron are currently considering the construction of a rail line in the region, owning the under rail infrastructure and likely some above rail stock. The proposed rail network would be effectively open access in that while Atlas would be a foundation customer, anyone would be able to apply for access rights. While the Western Australia government has indicated their

[150] Genesee & Wyoming also controls a collection of railway lines and spurs in South Australia

support for the project, no public funds have been committed given that it is a private sector initiative.

7.2.2.3 Central Queensland Coalfields

With the privatisation of QRN in late 2010, the main rail lines in the coalfields of the Bowen Basin became privately owned, but with specific regulated access regimes. Since then, with the opening of the Galilee Basin to coal mining, the Queensland Government asked proponents to come forward to develop mines and rail infrastructure to Abbott Point, the main coal terminal close to the basin. At this stage, a number of proposals for integrated mine-rail-port development are being proposed, some from a single company owned mine to one by QRN to link a number of mines with a third party coal hauler. All projects will be privately funded.

7.3 Factors affecting market interest

The private sectors' interest in public transport infrastructure projects will be guided by their assessment of risk and achievement of an appropriate return commensurate to those risks.

In relation to the interest of the private sector to invest in public transport infrastructure under PPP models, EY's interactions / soundings with the market have identified the following recurrent factors which influence the market's appetite to participate in procurement processes and invest:

- Risk Transfer (Demand)
- Market Capacity
- Financing – Size and Terms
- Quality of Government Interaction and Planning
- Procurement Process Investment (Time and Cost)
- Political Risk

The remainder of this section provides our high level assessment of market perspectives on these key factors.

7.3.1.1 Risk transfer (demand)

The privately owned Port of Brisbane is the project's sponsor, which has indicated a willingness to attract finance and management of the proposed project (without Government intervention).

This suggests appetite for patronage / demand risk is strong in the market, although this is yet to be tested through any formal financial commitments.

7.3.1.2 Market capacity

Given the significant construction and financing requirement of this project, there is unlikely to be appetite or capacity in the market for a single constructor to deliver the entire project in one package.

7.3.1.3 Financing – size and terms

At a construction cost of approximately $7 billion this project's financing requirement significantly exceeds the market's capacity to finance.

Given the significant size and financing requirement of this project, we consider the market would expect its construction to be staged over a range of packages.

7.3.1.4 Quality of Government Interaction and Planning

Any interaction with the Government will be in the form of stakeholder engagement, obtaining the necessary planning / environmental approvals or negotiating access agreements where interfaces the public system exist.

7.3.1.5 Procurement Process Investment (Time and Cost)

We expect potential market participants would request that all (or part) of bidding costs would be reimbursed based on recent projects that have set precedents (e.g. North West Rail Link, New Zealand PPPs).

7.3.1.6 Political Risk

Given the size of this project, the long construction time frame and potential impact on the community, this project is likely to attract political risk which may take the form of political interference in project scope.

7.4 Summary findings

Given the Port of Brisbane has taken a lead role in developing this project, we consider the market interest to be strong, despite the project being financially unviable at this stage.

The market (constructors, rail operators and maintainers) should have capacity to deliver this project if it is delivered in packages using a staged approach.

Given the significant size of the financing requirement, we consider that any proponent who takes on this project will need to stage construction and financing over a period of time.

8. Key findings of this case study

8.1 Summary of Key Findings

The Port of Brisbane case study raises a number of issues pertinent to this study of the potential for dedicated freight infrastructure.

8.1.1 High Capital Cost

In considering the potential for dedicated freight infrastructure at Australia's container ports, a key issue is whether the problems with congestion on our road and rail networks justify the construction of such infrastructure. Based on the findings of this case study for the Port of Brisbane, there are significant challenges to overcome before such proposals could be justified on economic and commercial grounds.

A central issue with this case study is the high cost of the project compared to its forecast demand and market capacity to pay access charges that would be sufficient to cover the cost of the project. For example, for the Eastern Bypass portion of railway that is the necessary element for wide-scale container flows on rail, the upfront construction cost is estimated to be around $3 billion, with a further $1 billion to be spent in the future to fully duplicate that section. For a 65 kilometre stretch of railway, this equates to around $46 million per kilometre, which increases to around $62 million per kilometre when fully duplicated. This compares with estimates from known coal rail projects in central Queensland that are costed at $4.5 million per kilometre for single track and $7.7 million per kilometre for duplicated track.

Even with volumes growing to just under 3 million TEU by the end of our model in 2057, access charges would need to be so high as to make this uncommercial. This highlights the high costs of tunnelling and land resumption issues in urban areas that affect this case study project. It also highlights how governments at all levels have not had much success in safe-guarding land corridors for future transport infrastructure.

As part of updating its proposals, the Port of Brisbane has been reworking and refining its estimates of capital costs, with a focus on identifying efficiencies and other cost savings. This information is currently confidential and forms a critical input to the Port's discussions with governments and other stakeholders. However, significant cost savings could have a bearing on project feasibility considerations.

8.1.2 Congestion caused by non-freight vehicles

Another issue that this case study highlights is that, in urban contexts such as Brisbane, after investing in dedicated freight infrastructure to remove trucks from urban roadways, the number of trucks removed may not be enough to provide significant benefits to the users that remain on the road network.

It is acknowledged that the results for this analysis are highly sensitive to the data and assumptions used, and generally require detailed traffic modelling to give confidence to the results. For this case study, which did not include detailed traffic modelling, it was estimated that the removal of trucks as a result of the railway would generate travel time savings for continuing users of the network of only $37m[151] (NPV). This is a low figure compared to the cost of the project, and highlights that the estimated number of trucks removed as a percentage of total vehicles did not have a large effect on reducing congestion and average travel times.

While Brisbane does experience significant congestion around its container port, it is in the main not caused by the port related freight itself, but by the commuter and other vehicles using the same roads.

[151] See Section 5.8.3

In light of this, it is unlikely that only focusing on the removal of freight vehicles from our roads will generate enough benefits and/or demand to justify and pay for new infrastructure. Under these conditions, there is likely to be a role for government in supporting (and part-funding) the delivery of such infrastructure.

This also highlights how transport policy could be better focussed on other measures to reduce general traffic congestion on key freight routes and port access links. This could include a mix of demand and supply measures, such as active demand management (i.e. pricing and technology based demand management) and targeted road network capacity enhancements.

8.1.3 Lessons drawn on the governance of Australia's container ports

Brisbane was the first major capital city container port that was privatised. Having emerged from the old publically owned model of port governance, it is now in a position to more actively manage its assets and is realising the need to secure its strategic land transport access links. The port's continued growth and survival as a profitable enterprise depends on it. The complicating factor is that this is an area over which the port has little direct control. Removed from the umbrella of state ownership, the port is exploring other ways to further its interests. This railway proposal can be seen as one follow-through action from this new position. It is focussing its energies on where it sees its major risks in the future and realises it has to lead this process, with, if necessary, some ownership role.

The Port of Brisbane's strategies to manage its assets more efficiently and mitigate its long term risks to growth bodes well for the further privatisations of Australia's container ports.

Each port has unique issues with land transport. If they cannot address them adequately, there will be impacts on their bottom lines.

8.1.4 State government reaction

This proposal also raises a number of questions about State government policy. The State government over the years has clearly favoured bulk ports such as Gladstone, Hay Point and Abbot Point as its preferred exit point for bulk coal.

However, there are substantial quantities of coal in the Surat Basin in the south-east of the state. Brisbane is clearly the closest port to these areas at, for example 380km for the Cameby Downs mine near Miles compared to 496km to Gladstone. For mines closer in, such as New Acland, which the Port has forecast as having 10mtpa potential, the distance equation is further skewed at 227km to Brisbane and 649km to Gladstone.

8.1.5 POB railway impact on other rail projects

As we have seen, this project has the potential to have considerable effects on other rail projects and areas of expenditure. In particular, the potential to benefit the City train network by removing freight trains from this network, could be a key driver for the project over the longer term. This connection with other large scale rail proposals and issues highlights the fact that this proposal could in future be considered in combination with them. While the project, in its present state, has been shown to be both financially and economically unviable, the port is stuck with the problem of securing its land transport links to its hinterland in the future. Rail capacity as it stands, is constrained and only likely to get worse with growing demand for more passenger services. With the current higher than average coal prices, coal exporters will seek to utilise as much of the available capacity as they can. If this continues into the future, as truck numbers grow, more and more pressure will be placed on the Gateway Motorway to deal with the growth in containers.

8.2 Ongoing project development by the Port of Brisbane

The Port of Brisbane is aware of the issues and challenges that confront the project. Since the initial period of consultation with the Port of Brisbane and the development of this concept project case study, the Port has continued to develop the project in consultation with key stakeholders, including the Federal and Queensland governments.

Advice from the Port of Brisbane is that lower cost options currently are being investigated as part of its pre-feasibility study. The Port has also been re-thinking and updating its assessment of market potential for the project, and preliminary findings suggest the railway may deliver greater value potential than what has been modelled in this case study.

We understand that the Port of Brisbane intends to continue to work closely with government and industry stakeholders to develop a detailed business case by 2015 to demonstrate the commercial, economic, social and environmental feasibility of the project.

APPENDICES

Appendix A List of Stakeholders

Name	Role	Organisation
David Anderson	CEO	Ports Australia
Derek Harris	Manager, Infrastructure Strategy	Australia Rail Track Corporation
David Coonan	National Policy Manager	Australian Trucking Association
Llew Russell	CEO	Shipping Australia
Don Hogben	Freight policy	Austroads
Ash Salardini	Economist	Australian Railways Association
David Salisbury,	General Manager, Transport and General Prices	ACCC
David Attlee	General Manager, Infrastructure Strategy	Asciano
Steve Gunn	General Manager - PBLIS	Sydney Ports Corporation
Lachlan Benson	General Manager – Industry Relations and Logistics	Sydney Ports Corporation
Marika Calfas	General Manager - Planning	Sydney Ports Corporation
Alan Turner	Senior Manager Trade	Port of Brisbane
Andrew Brinkworth	Trade Development Executive	Port of Brisbane
Bill Tranberg	Chief Engineer	Port of Brisbane
Ross Mensforth	Director – Multi-Modal Freight Policy	QLD Department of Transport and Main Roads
Russell Ingham	Principal Advisor – Freight Programs and Information	QLD Department of Transport and Main Roads
James Thompson	Freight Analyst	QLD Department of Transport and Main Roads
Anthony Spoto	Director - Contract Management	QLD Department of Transport and Main Roads
James Stubbersfield	Master Planning Coordinator	QR
Noel Morris	Network Planner SEQ Freight	QR
Des Kratzmann	Manager Freight Planning	QR
Glen Mullins	VP Enterprise Development	QR National
Glenn Wayne	Operations Manager	DP World
Aaron Bryant	Yard and Transport Superintendent	DP World
Matt Hollamby	Manager	Patricks
Daniela Geaboc	Traffic Engineer	Queensland Motorways
Neville Silvester	GM Development	Queensland Motorways
Craig Luxton	Managing Director	Deluxe Freight Systems (QTA Executive)
Brad Scot	Manager	Patrick Trucking Services
Jan Pattison	Heavy Vehicle Law & Policy Consultant	Queensland Trucking Association
Mark Curry	Director, Freight, Logistics and Marine	Victorian Department of Transport
Caryn Anderson	Executive Manager, Business and Planning	Port of Melbourne
Robert Woodside	General Manager Strategy	Port of Melbourne
Anya Richards	Manager Strategy	Port of Melbourne
Glenn Drover	Manager Economic Infrastructure	Victorian Department of Business and Innovation
Robyn White	Director Infrastructure	Victorian Department of Business and Innovation
Chuyang Lui	Manager Transport	Victorian Department of Business and Innovation

Name	Role	Organisation
Rose Elphick	Chief Executive Officer	Victorian Freight and Logistics Council
Ian Hunter	Project Director, Freight Reform	National Transport Commission
Peter White	Director Network Planning and Policy	VicRoads
John Murphy	Senior Transport Planner	VicRoads
Mark Kissane	Graduate Engineer	VicRoads
Amanda James	Senior Project Engineer	VicRoads
Demos Michalopoulos	Network Strategy Coordinator	VicRoads
Giles Michaux	Team Leader Regional Strategies	VicRoads
Doug Brindal	Manager – Logistics	Fremantle Port Authority
Jennifer Hall	Transport Analyst	Fremantle Port Authority
Lyle Banks	Manager – Planning and Development	Fremantle Port Authority
Tom Maughan	Manager – Freight Operations	Western Australian Road Transport Association
Des Snook	Executive Director – Road Network Services	Main Roads Western Australia
John Park	Regional Manager	Custom Brokers & Freight Forwarders Council of Australia
Ray U'Chong	Manager – Fremantle	Jayde Transport
Robert Boyce	General Manager	MSC
Drew Gaynor	Director – Freight Policy	WA Department of Transport
Jim Stevenson	General Manager	Stevenson Logistics
Bob Hancock		Container Cargo Specialists
Steve Philips	Network Planning	WA Department of Transport
Anne – Marie Bits		WA Department of Transport
Bryant Roberts	Project Manager – Major Transport Projects	WA Department of Transport
Bob Hancock		Container Cargo Specialists (CCS)
Paul Hamersley	Manager – Corporate Development	Brookfield Rail

STAKEHOLDERS –CASE STUDIES		
Various	Strategic/Network Planning	VicRoads
Andrew Brinkworth	Trade Development Executive	Port of Brisbane
Peter Keyte	General Manager Trade Services	Port of Brisbane
Pricilla Radice	Manager Strategic Projects	Port of Brisbane
Ross Mensforth	Director – Multi-Modal Freight Policy	QLD Department of Transport and Main Roads
Russell Ingham	Principal Advisor – Freight Programs and Information	QLD Department of Transport and Main Roads
James Thompson	Freight Analyst	QLD Department of Transport and Main Roads
Mark Allwood	Principal Advisor - Contract Management	QLD Department of Transport and Main Roads
James Stubbersfield	Master Planning Coordinator	QR Ltd
Noel Morris	Network Planner SEQ Freight	QR Ltd
Tim Ripper	Group General Manager Network Business	QR Ltd
Daniela Geaboc	Traffic Engineer	Queensland Motorways
Craig Luxton	Managing Director	Deluxe Freight Systems (QTA Executive)
Brad Scot	Manager	Patrick Trucking Services
Jan Pattison	Heavy Vehicle Law & Policy Consultant	Queensland Trucking Association

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