Contract Report

Final

Kwinana Intermodal Terminal Study

by ARRB GROUP, MEYRICK and ASSOCIATES, and GHD

for Department for Planning and Infrastructure

WC72329 Final November 2006

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for Department for Planning and Infrastructure

	Reviewed
Project Leader	Anne Still
Quality Manager	Steve Yapp

WC72329- Final November 2006

Summary

Background to this report

There has been a long-standing Western Australian Government policy commitment to develop intermodal facilities in the Kwinana area. An opportunity currently exists to reserve land in Kwinana for freight-handling facilities as part of Landcorp's precinct planning for the Hope Valley Wattleup Redevelopment.

The Department for Planning and Infrastructure (DPI) and partner organisations have commissioned an investigation into the potential development of an intermodal freight terminal in Kwinana. The principal outcome of this report will be an assessment, to a pre-feasibility level, of the potential for a new intermodal terminal development in the Kwinana region.

This report investigates the case for the development of an intermodal terminal in Kwinana including an analysis of the level of potential demand for the terminal in the context of freight growth and existing terminals in the Perth region and the potential role and ensuing functionality of a new terminal. The operational and physical characteristics of a number of intermodal terminals are also presented.

Demand for intermodal services in Western Australia

Demand for freight services is linked to changes in economic growth with a number of major studies such identifying that regional and urban freight movements are strongly correlated to economic activity.

It is expected that the demand for freight services including intermodal services will continue to increase as economic activity in Western Australia, as measured by Gross State Product, has been strong since 2001and the annual growth in economic activity is forecast to continue at a rate of no less than 3.5 per cent until 2010.

The demand for intermodal terminal services in Western Australia has three segments, being the demand for international, inter-state, and intra-state terminal services.

The demand for international intermodal services will be driven by a number of factors, in particular the acceleration of international container trade through the port of Fremantle and the Outer Harbour when it commences operation as a container terminal at some point around 2015. The total volume of containers handled through the port of Fremantle is forecast to rise from 480,000 TEU in 2004/05 to approximately 900,000 TEU by 2015, 1.5 million TEU by 2025, and 2.4 million TEU by 2035[1].

The volume of international containers moved on rail is currently quite low, at approximately 5 per cent. It is however Western Australian Government policy that the share of international containers carried by rail should rise to 30 per cent of the total international container task and this target has been used in developing this report.

The demand for inter-state intermodal services is dominated by the importation of industrial product (55 per cent) and consumer goods (45 per cent) from the eastern states to Perth. The export of goods to the east is predominantly industrial products

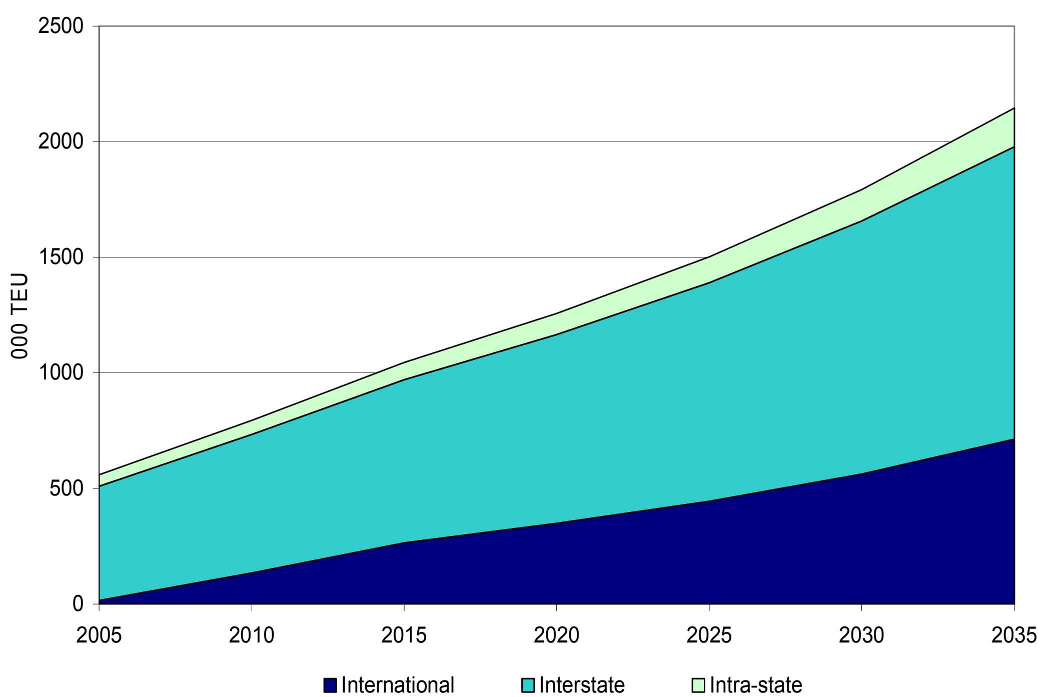
1 Fremantle Port Authority trade forecasts (2005)

and is about 70 per cent of the volume imported from the east. The Bureau of Transport and Regional Economics (BTRE) published a report in March 2006,[2] which analysed the freight task on the Eastern States to Perth corridor, which suggests that the forecast growth rate for non-bulk freight movements will be 3.6 per cent per annum until 2020.

The current intra-state freight task in Western Australia is dominated by mining inputs that are moved between the various terminals of Kwinana, Kewdale, Fremantle and Kalgoorlie and the numerous mine sites located around the State, as well as transfer between the mine sites. There are a number of areas, particularly in the South West, which are generating containerised trade that could use intra-state rail services. At this time the intra-state demand is estimated at 50,000 TEU and following a review of a number of reports into the Western Australian Freight Rail Task and consultation with freight owners and forwarders an expected annual growth rate of 4.1 per cent for this task was used.

As shown at Figure 8 the total demand for intermodal services in Western Australia in 2006 is estimated to be 550,000 TEU with inter-state demand the largest element. The total demand for intermodal services is expected to reach 1 million TEU by approximately 2015, rising to 1.5 million TEU in 2025 and exceeding 2 million TEU after 2030.

FIGURE 8 TOTAL DEMAND FOR INTERMODAL TERMINAL SERVICES IN WESTERN AUSTRALIA 2005-2035



[2] BTRE Report, Demand Projections for AUSLINK Non-Urban Corridors: Methodology And Projections, March 2006

Supply of intermodal services in Western Australia

In Western Australia the Kewdale/Forrestfield area has become a focus of domestic freight activity due to its road and rail access which enables the transport and distribution of goods to local, intra-state, and inter-state destinations, and to and from the port of Fremantle. Other intermodal terminals are located at Fremantle and Kalgoorlie. The configuration and throughput of the main Western Australian intermodal terminals is shown below.

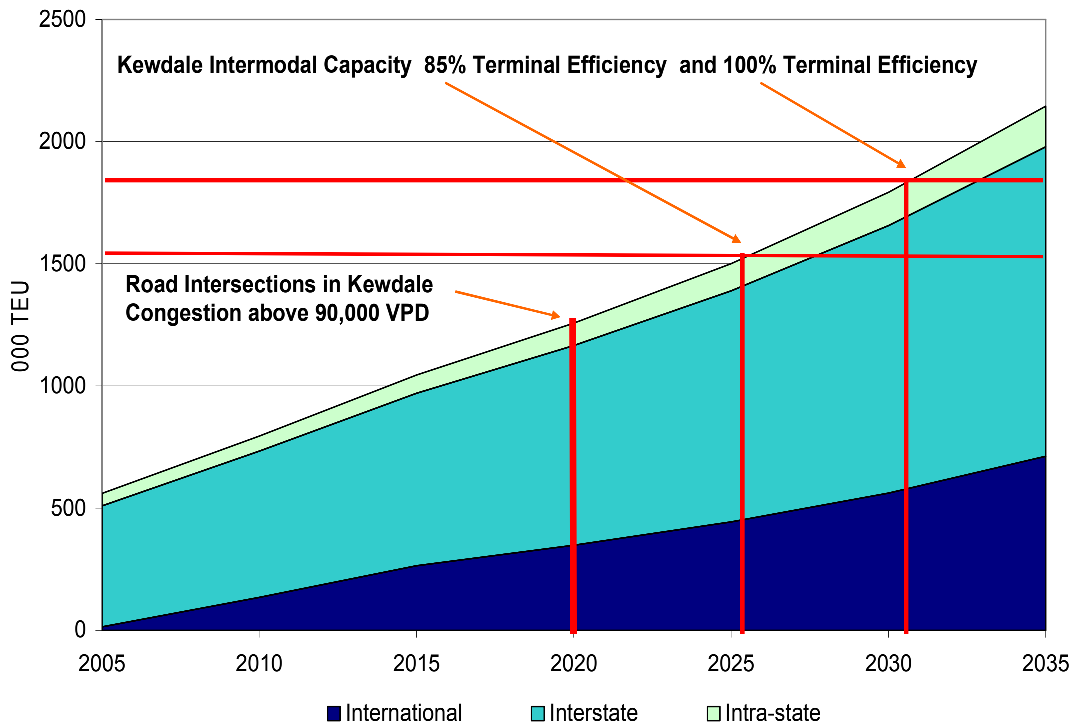
TABLE 1 CURRENT WESTERN AUSTRALIAN MODAL TERMINAL THROUGHOUT AND CAPACITY

Interstate Terminals	Throughput (TEU)[3]	Terminal Capacity (TEU)[4]
Pacific National	400,000	750,000
Sadleirs[5]	40,000	180,000
SCT[6]	100,000	420,000
Kewdale New (2010)		500,000[7]
Total Kewdale /Forrestfield Precinct	**540,000**	**1,850,000**

Figure 8 shows that the predicted supply of intermodal terminal services of 1.8M TEU will not be exceeded by the demand for intermodal services until after 2030. There are however a number of events such as terminal operational constraints and congestion on road networks which could also reduce the supply of intermodal terminal services and which could bring forward the need for a intermodal terminal in another metropolitan location as shown at Figure 15.

[3] Throughput estimates are base on industry interviews
[4] Intermodal terminal capacity is difficult to estimate, as it is affected not only by the basic layout and handling productivity but also by the temporal pattern of demand for the facility and the way in which the terminal is managed.
[5] Converted Sadleirs tonnage into equivalent TEU
[6] Converted SCT tonnage into equivalent TEU
[7] Terminal to be released for development in 2006 - Estimated capacity as agreed by PTA

FIGURE 15 WESTERN AUSTRALIAN DEMAND FOR INTERMODAL TERMINAL SERVICES AND EXPECTED SUPPLY



Location of a new intermodal terminal in Perth

A key issue for this study is the location of additional intermodal capacity in Perth. The question of whether development should continue to be focused in Kewdale or be developed in another location is important. While the Kewdale/Forrestfield precinct has the advantage of existing infrastructure and proximity of freight networks, there are a number of strategic and social reasons why the development a new intermodal terminal away from the dominant Kewdale/Forrestfield precinct can be justified. These are:

- it lessens the risk of the whole intermodal network being affected by an event which impacts on operations at or in the vicinity of Kewdale.

- similarly the impact on the local community of the Kewdale intermodal precinct and the supporting industries which tend to be congregated around the Kewdale area will be reduced if there is an intermodal terminal which services the same market in another location.

The concept of ‘spreading the intermodal load around’ is not new with many Australian cities now operating dispersed terminals.

In locating an intermodal terminal a number of prerequisite elements are required.

Summary of locational issues

Kwinana is a suitable location for a major intermodal terminal in the Perth Metropolitan area from a supply perspective as it meets the key locational drivers for a successful intermodal terminal which are:

- proximity to the main freight rail lines and to road networks that can accommodate the volume of trucks
- proximity to key cargo catchments such as ports and distribution centres
- separation from residential or other sensitive and in some cases incompatible land uses
- flat topography to allow for long trains such as 1500-1800m in length
- adequate area of land for future growth and for complementary uses.

Kwinana also rates well from a demand perspective because of the:

- importance of industrial and construction goods in the freight task
- reasonably good accessibility to much of the metropolitan population base
- strong growth prospects of the South West region
- possibility of significantly supplementing domestic intermodal freight with import/export freight through the Outer Harbour.

The physical and operational characteristics of a new intermodal terminal at Kwinana

Overview

The size, role, and operations of a new intermodal terminal at Kwinana would be dependant on a range of factors including the:

- overall terminal throughput
- mix of core road/rail exchange and other activities on the site
- relative share of inter-state, international and intra-state rail freight – each has different and not always complementary needs
- number of independent terminal, warehouse, and freight forwarder operations.
- size and frequency of trains and how the cargo is handled to and from the trains.
- road and rail access arrangements to and from the terminal and buffer zone
- access to adjacent areas be they residential or industrial.

Intermodal Demand at Kwinana

Four intermodal demand scenarios were developed to determine what area would be required by a new intermodal terminal. Each scenario covers the key drivers which would influence the land requirement and the operations to be carried out. The drivers include:

- a range of freight task volumes, low, medium and high
- a mix of inter-state, international and intra-state cargos and different train lengths
- the effect of on-dock rail at the Outer Harbour.

Low Level Scenario

The low scenario assumes that limited intermodal activity takes place in Kwinana.

- There is low development of distribution centre activity in the Kwinana area which limits the share of the inter-state rail task to 15 per cent of the market
- There is on-dock rail at the Outer Harbour container terminal which limits the volume of trade handled by an intermodal terminal at Kwinana to 5 per cent of the Outer Harbour container task in 2035
- There is low growth (2 per cent) of intra-state rail activity in the Kwinana area.

Medium Level Scenario (On-dock Rail)

The second scenario assumes that although a higher overall share of inter-state and intra-state freight may move by rail as opposed to road therefore increasing the volume of these sources of freight moving through an intermodal terminal at Kwinana.

- There is medium development of distribution centre activity in the Kwinana area which limits the share of the inter-state rail task to 27 per cent of the market
- There is on-dock rail at the Outer Harbour container terminal which limits the volume of trade handled by a intermodal terminal at Kwinana to 5 per cent of the Outer Harbour container task in 2035
- There is medium growth (4.1 per cent) of intra-state rail activity in the Kwinana area.

Medium Level Scenario (No On-dock Rail)

The third scenario estimates the proportion of freight that an intermodal terminal at Kwinana could be expected to handle if there was no on-dock rail at the Outer Harbour.

- There is medium development of distribution centre activity in the Kwinana area which limits the share of the inter-state rail task to 27 per cent of the market
- There is no on-dock rail at the Outer Harbour container terminal and the volume of trade handled by a intermodal terminal at Kwinana rises to 30 per cent of the Outer Harbour container task in 2035

- There is a medium growth (4.1 per cent) of intra-state rail activity in the Kwinana area.

High Level Scenario (No On-dock Rail)

The fourth scenario, without on-dock scenario presents the most optimistic, and least likely, picture of the volume of freight moving through the Kwinana Intermodal Terminal.

- There is high development of distribution centre activity in the Kwinana area which limits the share of the inter-state rail task to 40 per cent of the market

- There is no on-dock rail at the Outer Harbour container terminal and the volume of trade handled by a intermodal terminal at Kwinana rises to 40 per cent of the Outer Harbour container task in 2035

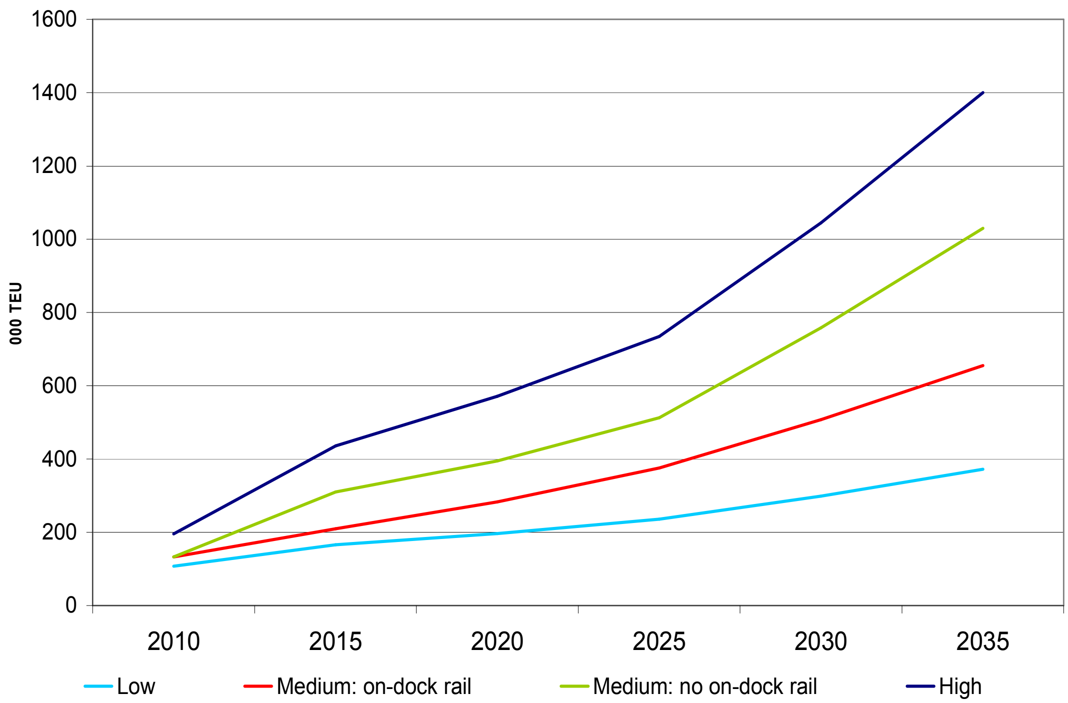
- There is high growth (5.5 per cent) of intra-state rail activity in the Kwinana area.

The growth over time in each of the four scenarios for demand of intermodal services at a new Kwinana Intermodal Terminal is shown in Table 2 and Figure 27.

TABLE 2 KWINANA INTERMODAL TERMINAL – DEMAND FORECASTS ('000 TEU)

Scenario	2010	2015	2020	2025	2030	2035
Low Level	107	165	196	235	299	372
Medium Level (On-dock Rail)	133	210	283	376	508	655
Medium Level (No On-dock Rail)	133	310	395	513	758	1030
High Level (No On-dock Rail)	196	436	571	734	1044	1400

FIGURE 27 POTENTIAL INTERMODAL DEMAND AT KWINANA 2010 - 2035



Land requirement

The land required for an intermodal terminal has four main uses. It is required for rail operations, used for handling containers to and from the rail operation, used for warehouses and other ancillary purposes, and used for internal roadways.

The conceptual intermodal terminal in this study is assumed to have a throughput of 600,000 TEU pa and have a 80 per cent rail/road and 20 per cent road/road operation as it is likely that a significant amount of inter-state freight is expected to remain on road and the freight forwarders are likely to need to operate across both modes. Cargo movement is 10 per cent transhipment, 15 per cent temporary storage and 75 per cent warehoused on site.

Terminal size

The land required for rail operations is dependant on the number of rail sidings required which is a function of the terminal throughput, the types of trains used and the container handling equipment.

Container handling is expected to be by the use of Rail Mounted Gantry (RMG) cranes which are the most efficient for medium terminals (150,000+ TEU) as they allow operations across a number of tracks and have a general capacity of 150,000 TEU per annum.

To cope with the number and type of train movements of the concept intermodal terminal three rail sidings are required. The areas required for rail operations is 18 ha and for container storage 10.5 ha.

The land required for warehousing activities has been estimated at 10.5 ha of warehouse per 200,000 TEU of throughput, leading to 31.5 ha for the concept terminal.

Internal roadways are estimated to comprise 25 per cent of the terminal area and are therefore expected to require 15 ha of land.

The size of land required for the concept terminal and a range of multiple throughputs are shown in Table 27.

TABLE 27 REQUIRED FOR THE CONCEPT TERMINAL

Terminal Throughput (TEU/yr)	Rail Throughput	Warehousing	Container storage	Rail Areas	25% (Circulation roads, car parking, misc)	Total Yard Area (ha)
200,000 Facility	160,000	10.5	3.5	12.0	6.5	33
400,000 Facility	320,000	21.0	7.0	18.0	12.9	59
600,000 Facility	480,000	31.5	10.5	18.0	15.0	75
1,200,000 Facility *	960,000	42.0	14.0	36.0	23.0	115

Rail access to and from the terminal

The efficiency of rail operations at the terminal would be improved by the following:

- an arrival track to minimise mainline disruption
- a run around track to enable locomotives to move from one end to the other without having to access the mainline
- a departure track to enable the reconnection of trains to build 1800m lengths
- the use of rail fans to move trains onto and off terminal and onto arrival and departure tracks
- the grade separation of the arrival and departure tracks would reduce local road traffic disruption

The indicative rail lengths required are:

- arrival Track 2.2 km
- terminal Sidings 1.6 km
- departure Track 1.2 Km

Ownership models

There are various models for the ownership and management of intermodal terminals. The central concern is the need to balance the incentive to invest in terminal facilities with the desirability of encouraging and supporting competition and innovation in the provision of above-rail services. At least five different models can be distinguished. Two of these models are most suitable for a new intermodal terminal in Kwinana. These are detailed in Table 3.

TABLE 3 MOST SUITABLE TERMINAL OWNERSHIP AND MANAGEMENT MODELS

Model	Description
Structurally separate unitary unregulated (model 1)	The terminal as a whole is owned by/leased to a specialist terminal operator who is unrelated to the rail operators likely to use the terminal. The operator is not required by regulation or lease conditions to provide access to all parties, but it is generally expected that it will be in its interests to do so.
Modular unregulated (model 2)	In this case, the terminal is divided into several sub-terminals, each of which may be leased to competing above-rail operators or to a specialist terminal operator who makes the sub-terminal available to above-rail operators on a common user basis.

The choice between these two will depend on the scale and physical structure of the terminal development and Western Australian Government policy decisions.

Contents

1 Introduction

This report investigates the case for the development of an intermodal terminal in Kwinana including an analysis of the level of potential demand for additional intermodal facilities in Perth and the potential role and ensuing functionality of a new terminal. The operational and physical characteristics of a number of intermodal terminals are also presented.

1.1 Background

Intermodal facilities are established to enable the exchange of freight between different transport modes and are critical to the efficient functioning of the Western Australian freight network.

There has been a long-standing Western Australian Government policy commitment to develop intermodal facilities in the Kwinana area. An opportunity currently exists to reserve land in Kwinana for freight-handling facilities as part of Landcorp's precinct planning for the Hope Valley Wattleup Redevelopment.

The Department for Planning and Infrastructure (DPI) and partner organisations have commissioned an investigation into the potential development of an intermodal freight terminal in Kwinana. The principal outcome of this report will be an assessment, to a pre-feasibility level, of the potential for a new intermodal terminal development in the Kwinana region.

The outcomes of the Kwinana Intermodal Terminal Study will have wide ranging impacts for freight handling in Metropolitan Perth. The Kwinana area represents a key convergence point for road, rail and sea freight activities and the level of activity that is likely to occur in this location in the future may generate the demand for additional intermodal facilities. This study is of particular importance due to the physical proximity of the Kwinana area to the existing Fremantle Port and the opportunities that exist for a terminal to service development at the planned container terminal at the Outer Harbour, the Kwinana Industrial Area and the Hope Valley Wattleup area.

1.2 Scope of the study

This report relates to Stage 1 of a 2 stage project.

The purpose of Stage 1 is to determine whether a case can be made for selection of a new intermodal terminal site within the Kwinana area, and to provide an insight into its potential functions within the freight transport system, determining, if appropriate, what the operational and physical requirements for a new intermodal terminal may be.

The approach to the project for Stage 1 has involved three phases:

1. An assessment of the supply and demand of existing and future Western Australian intermodal terminal services.

2. An exploration of the possible role of the Kwinana Intermodal Terminal within the existing and known developments in the regional system of intermodal terminals.

3. Development and assessment of different options for the scope and scale of any proposed Kwinana Intermodal Terminal.

1.3 Structure of the report

The report is structured around three key questions:

- Is there a need for another major intermodal terminal precinct in the Perth metropolitan area?
- Is Kwinana a desirable location for a new intermodal terminal?
- If a Kwinana Intermodal Terminal is desirable, what operational and physical requirements would be necessary to support the effective and efficient operation of the terminal?

2 The need for a new metropolitan intermodal terminal

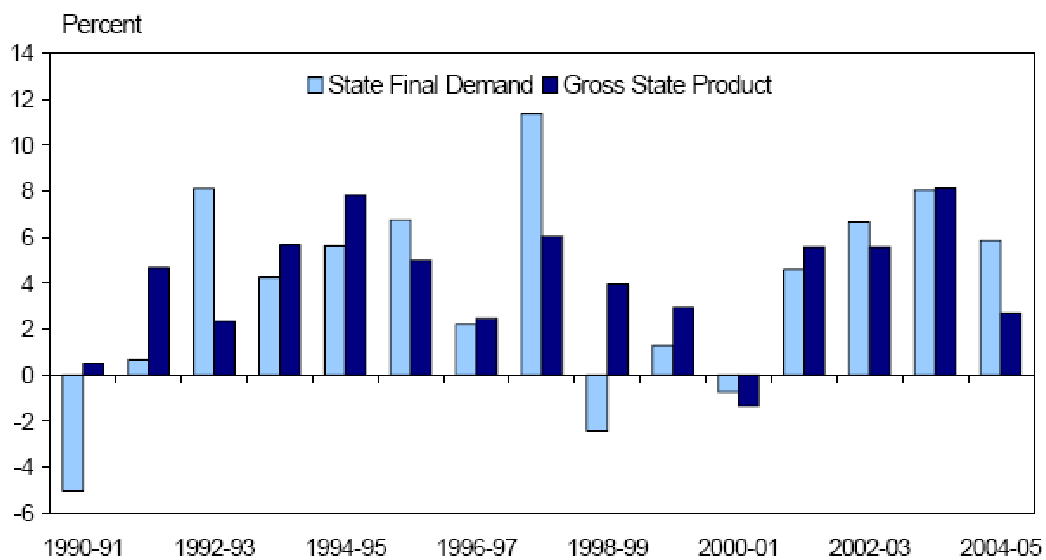
2.1 Demand for intermodal services in Perth

2.1.1 Western Australia's economic development prospects

Demand for freight services is linked to changes in economic growth with a number of major studies such as Twice the Task (SKM Meyrick 2006) and Freight Measurement and Modelling in Australia (BTRE Report 112 -2006) identifying that regional and urban freight movements are strongly correlated to economic activity.

Economic activity in Western Australia, as measured by 'Gross State Product' and 'State Final Demand', has been strong since 2001, as shown in Figure 1. This growth in economic activity is forecast to continue at a rate of no less that 3.5 per cent until 2010 and is backed by more recent figures for Domestic Activity in Western Australia, showing growth of 4.8 per cent in the December quarter of 2005 and 1.7 per cent in the March quarter of 2006.

FIGURE 1 WESTERN AUSTRALIAN ECONOMIC GROWTH 1990-2005[8]



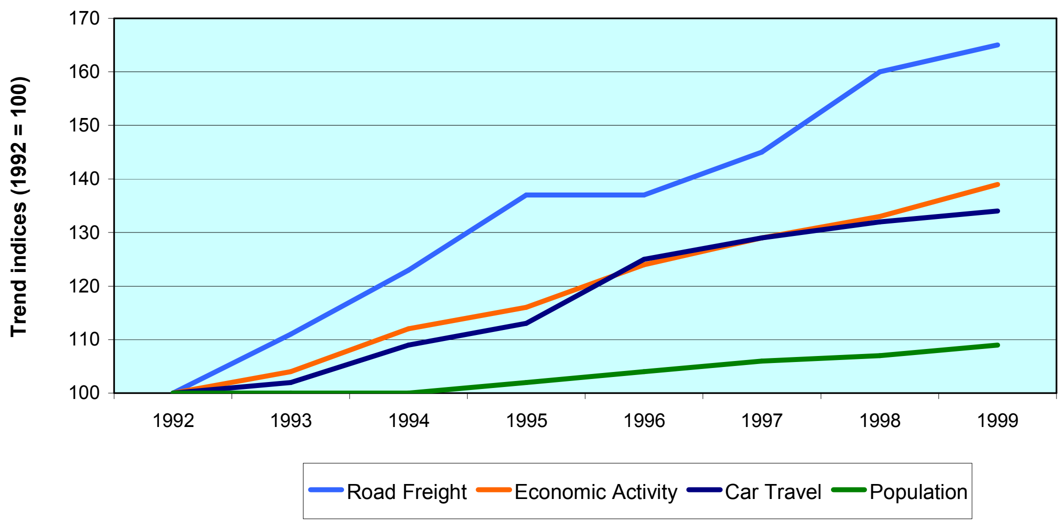
Western Australia's economic boom is also expected to be supported by an increase in WA's population. Population projections for WA estimate the State's population is set to rise to approximately 2.9 million by 2031, fuelled equally by a natural increase and migration. The Western Australian Planning Commission has stated that with the economic boom continuing, the migration rate is likely to escalate further and that this is already starting to place a significant burden on the infrastructure that supports the city (WAPC 2001).

As shown in Figure 2 the increase in freight carried on road between 1992 and1999 exceeded the changes in economic activity and population growth over the same

[8] http://www.dtf.wa.gov.au/cms/uploadedFiles/stateaccounts200405.pdf

period. If both Western Australia's economic growth and population are expected to increase then the volume of freight carried on road in WA could also be expected to increase significantly.

FIGURE 2 POPULATION GROWTH – ECONOMIC ACTIVITY AND ROAD TRANSPORT TRENDS 1992 - 1999[9]



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These trends support a forecast increase in the volume and number of freight transport movements over the next 40 years. The growth in freight movements is likely to be driven by the production of bulk goods for export, predominantly from Western Australia's agricultural and mining sectors as well as increasing demand from the residential sector for building materials and personal goods. Industrial areas account for approximately 20 per cent of the demand for all road freight and a significant proportion of the demand for rail[10]. Therefore it is anticipated that expected growth in industrial land development in the South West will also have an influence.

While increased fuel prices are unlikely to affect overall demand for freight[11] there are likely to be cost benefits in minimising the movement of freight on road and increasing the use of rail to carry freight.

[9] Metropolitan Freight Master plan working group 2, DPI, 2002
[10] Freight Network Review, 2002
[11] Containerised freight movements appear to be independent of fuel as there is no evidence of any decline in freight volumes despite movements in exchange rates, interest rates, or fuel prices.

2.1.2 Commitment to increased freight on rail

Improving Kewdale-Kwinana-Fremantle rail links

A key aim of the Draft Metropolitan Freight Strategy is to put more freight on rail. Specifically, 'improved rail linkages between Kewdale, Kwinana and Fremantle will help industry transport freight by rail instead of by road' (MFN, 2006). The target for containers carried by rail has been set at 15 per cent by 2006 and 30 per cent by 2013 (DPI, 2006). It is unlikely that normal market forces will cause a sufficient shift in freight volumes to rail to meet these targets without Government intervention.

A number of measures have been identified to help meet this target including:

- construction of a new rail loop and terminal at North Quay (enabling narrow gauge trains to access the North Quay rail terminal)
- expansion of the Kewdale Intermodal Terminal
- feasibility for realignment of the Midland Freight Line.

Results from the Container Movement Study conducted by SKM on behalf of the Department for Planning and Infrastructure, Fremantle Ports, Main Roads WA and the Sea Freight Council of Western Australia indicates that the Government's target for the number of containers transported by the Fremantle-Kewdale rail service is achievable.

'Rail's share of the container trade transport task for 2003-04 was 7 per cent (28,000 TEU). However, reduction in land-bridge traffic to the Eastern States and loss of CBH grain containers to road reduced this market share to approximately 6.5 per cent' (DPI, 2006).

The port rail service has experienced growth since new arrangements for the provision of rail services were put in place in early 2003 resulting from the commercial activities of the operators, Fremantle Link Services and the Australian Railroad Group (ARG) (DPI, 2006). However, continued growth will be dependent on rail being able to attract business. Current rail operations between the port and Kewdale are marginal and might struggle in the short term to remain viable, although some fluctuation in the number of containers transported by rail is expected as a reflection of market volume variations and commercial processes (DPI, 2006).

The North Quay rail loop and terminal and associated road works were completed in March 2006. DPI are also pursuing other strategies including "*review of North Quay rail terminal costs, direct rail access to CBH Forrestfield, development of container facilities at Kewdale rail terminal, and the potential for capturing regional containerised freight through development of intermodal terminals in the South West region and at York*" (DPI 2006).

2.1.3 International Trade (Import/export movements)

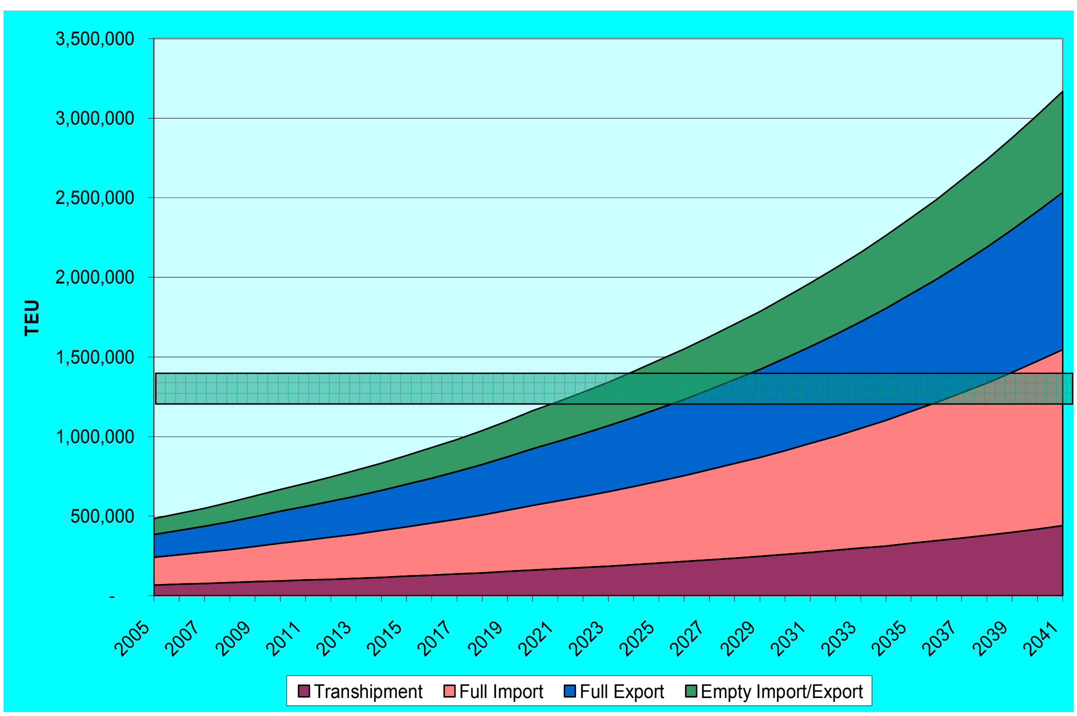
The past decade has seen world trade and container trade generally grow at strong levels despite both positive and negative influences from particular events — such as the Asian economic downturn in the mid–late 1990's. Nonetheless, a steady trend of strong growth has emerged during this period and this has cascaded down into average growth in both the Australian and Western Australian container trade which was 25 per cent stronger than average Australian container trade growth between 1996 and 2005[12].

Port of Fremantle future container trade volumes

The current outlook for container trade through the Port of Fremantle is robust especially in light of the growth expectations for the Western Australian economy. Given medium assessments of likely increases in international full container trades, empty container traffic (maintained ratio of 30 per cent of full containers), trans-shipment and Australian domestic coastal traffic, the total volume of containers handled through the port of Fremantle is forecast to rise from 465,982 TEU in 2003/2004 to approximately:

- 0.9 million TEU by 2015
- 1.5 million TEU by 2025
- 2.4 million TEU by 2035; and
- over 3 million TEU by 2040.

FIGURE 3 ESTIMATED FUTURE CONTAINER TRADE VOLUMES – PORT OF FREMANTLE 2005-2041



[12] Analysis of BTRE Waterline Data 1996-2005

Figure 3 shows container volumes through the Port of Fremantle[13] broken down into the four categories: trans-shipment containers, full import containers, full export containers and empty containers. The chart shows that imports comprise the largest proportion of container volumes, with exports being the second largest. The graph also contains a shaded box representing the current capacity of the Inner-Harbour facility – which is limited by landside factors – having a capacity of between 1.2-1.5 million TEU. Based on our estimates, the Inner-Harbour will reach maximum capacity around 2020. However, the planned opening of the Outer-Harbour in 2015-2017 will alleviate this capacity constraint.

FIGURE 4 FREMANTLE OUTER HARBOUR CONTAINER VOLUME 2005-2040

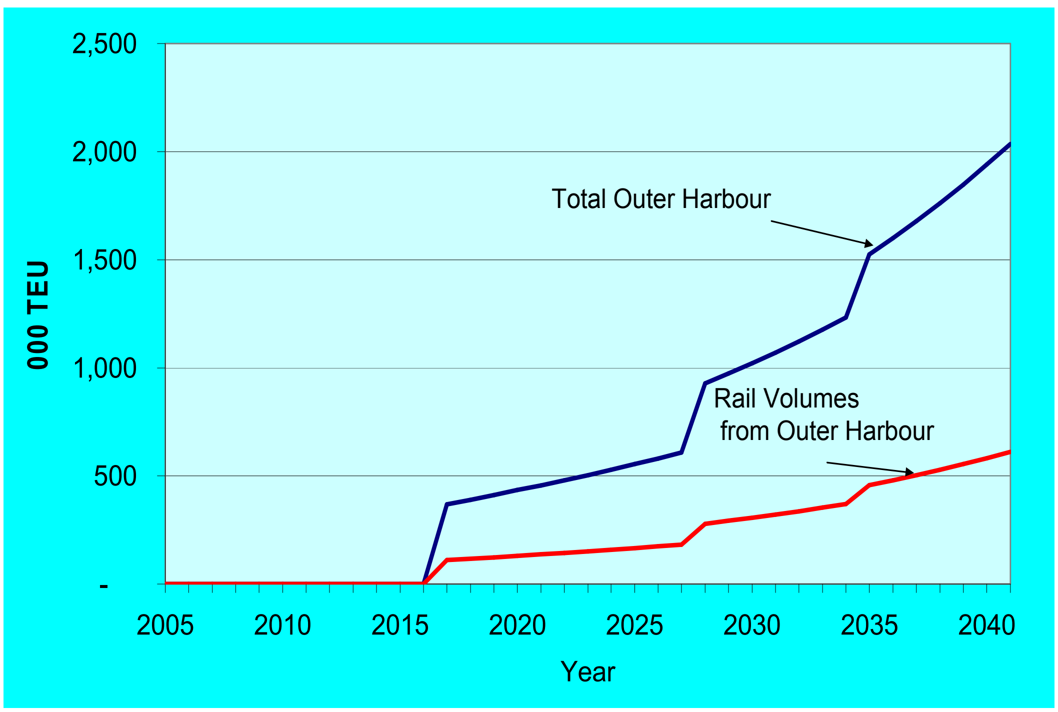


Figure 4 shows the forecast trade through the Outer-Harbour once the facility comes on-line in 2015-2017. The chart assumes that container trade is shared between the Inner and Outer Harbour in proportion to the capacity available at the two facilities and a 30 per cent rail mode share – based on government policy. Container forecasts[14] suggest that by 2030, the Outer-Harbour facility will have reached an annual TEU throughput of 1 million and approximately 2 million by 2040.

However, it is difficult to predict exactly how trade will be shared between the Inner and the Outer Harbour facilities once the new terminal commences operation. The growth path outlined in Figure 4 is a plausible hypothesis based on the assumptions above, rather than a definitive estimate.

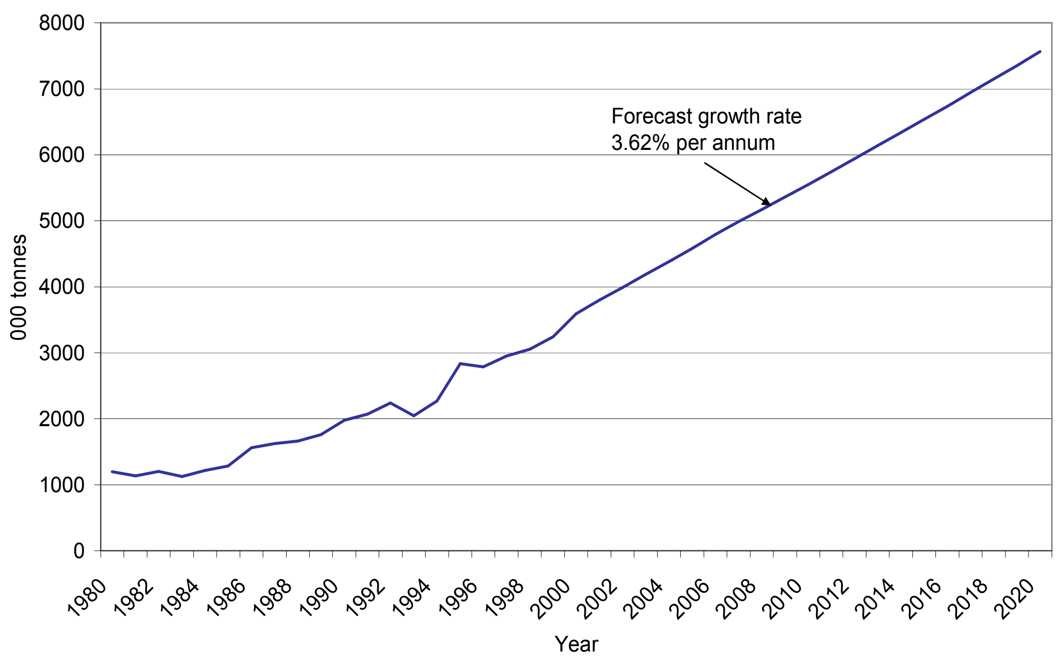
[13] Container Forecasts for the Port of Fremantle Inner and Outer Harbour were prepared by Meyrick and Associates in 2005 – These excerpts are published with the kind permission of the Fremantle Port Authority
[14] Ibid

2.1.4 Inter-state Trade

The majority of inter-state freight movements into Perth originate in Sydney, Melbourne, and Adelaide. Most of these movements are non-bulk consumer goods including white-goods and beverages. Historically, there has been a significant imbalance in the trade flows between Western Australia and these States with considerably more freight originating in eastern Australia moving westward than the reverse. A small proportion of eastbound freight is created by import containers that are discharged at Fremantle Port and then transferred to either truck or rail for the onward journey to the Eastern States.

The Bureau of Transport and Regional Economics (BTRE) published a report in March 2006,[15] which analysed the freight task from the Eastern States to Perth. The publication suggests that the forecast growth rate for non-bulk freight movements will be 3.6 per cent per annum until 2020. This is roughly consistent with the other inter-capital corridors analysed in the BTRE report: Melbourne–Sydney 3.6 per cent, Sydney–Brisbane 3.7 per cent, Melbourne–Brisbane 4.0 per cent, Sydney–Adelaide 3.1 per cent and Melbourne–Adelaide 3.0 per cent. Figure 5 shows the historical and forecast growth for all non-bulk freight movements between the Eastern States and Perth.

FIGURE 5 INTER-CAPITAL NON-BULK FREIGHT BETWEEN EASTERN STATES AND PERTH



[15] BTRE Report- Demand Projections for AUSLINK Non-Urban Corridors: Methodology And Projections March 2006

Mode Share of non-bulk movements between Perth and the Eastern States

Two key factors make rail the main mode for the movement of non-bulk inter-state freight to Western Australia. Firstly, freight is usually carried over very long distances and secondly, the relatively flat terrain and track condition allows for the double-stacking of containers on rail. Both factors give a cost advantage to rail over road.

Figure 6 shows that during 1972-78, sea dominated non-bulk inter-state freight movements from the Eastern States to Perth with road only playing a minor role in transporting non-bulk goods. In 1972, sea freight comprised 64 per cent of all non-bulk movements between the Eastern States and Perth, rail accounted for 32 per cent and road 4 per cent. However, by 1978, sea freight had sharply declined in terms of modal share; this continued till around 1992 when dedicated coastal shipping routes were re-introduced. During this time, the rail share increased and peaked in 1983 with 68 per cent of the mode share. As a result of the fall off in coastal shipping services, the task transported on road also increased.

FIGURE 6 EASTERN STATES – PERTH NON-BULK SHARES[16]

At present, rail dominates non-bulk freight movements along the east–west routes carrying 58 per cent of the freight task, road 24 per cent and sea 19 per cent[17]. This amounts to 2,645,000 tonnes on rail, 1,091,000 tonnes on road, and 846,000 tonnes carried by coastal shipping.

[16] BTRE 2006

[17] Based on industry estimates and other research conducted by Meyrick and Associates, this percentage is likely to be a conservative estimate of the rail share.

BTRE suggests that by 2020, the road and rail mode shares will slightly decrease while coastal shipping gains slightly. However, there is uncertainty about the coastal shipping share in these estimates which depends on the existence of excess capacity and to a large extent, the needs of a shipping line to re-position empty containers around the coast.

The main factor supporting the increase in coastal shipping is the opportunity for international shipping lines to acquire single and continuous voyage permits which enable them to carry domestic cargo ordinarily reserved for domestic shipping. As international shipping can carry this cargo at effectively marginal cost it can compete with inter-state rail for the non-time sensitive freight. In 2000, about 3.7 million tonnes of cargo was moved on the basis of permits around the coast of Australia. By 2005 this figure had increased to 15 million tonnes and is expected to continue to steadily increase.

Inter-state demand for intermodal services

Table 4 shows the anticipated inter-state demand for intermodal services.

TABLE 4 PROJECTED INTER-STATE CONTAINERS TRADE – 2005-2035

Inter-state	2005	2010	2015	2020	2025	2030	2035
Total volume (000 Tonnes)[18]	4,583	5,549	6,537	7,564	8,752	10,127	11,718
Rail volumes (000 Tonnes)[19]	2,645	3,151	3,646	4,139	4,789	5,542	6,412
Rail share	57.7%	56.8%	55.8%	54.7%	54.7%	54.7%	54.7%
Rail TEU (000 Tonnes)[20]	495	600	706	817	946	1,094	1,266

2.1.5 Intra-state Trade

The intra-state freight task in Western Australia is dominated by mining inputs that are moved between the various terminals of Kwinana, Kewdale, Fremantle and Kalgoorlie and the numerous mine sites located around the state, (as well as transfer between the mine sites), general freight (consumer goods) and agricultural products. The Intra-state demand falls into the following main categories:

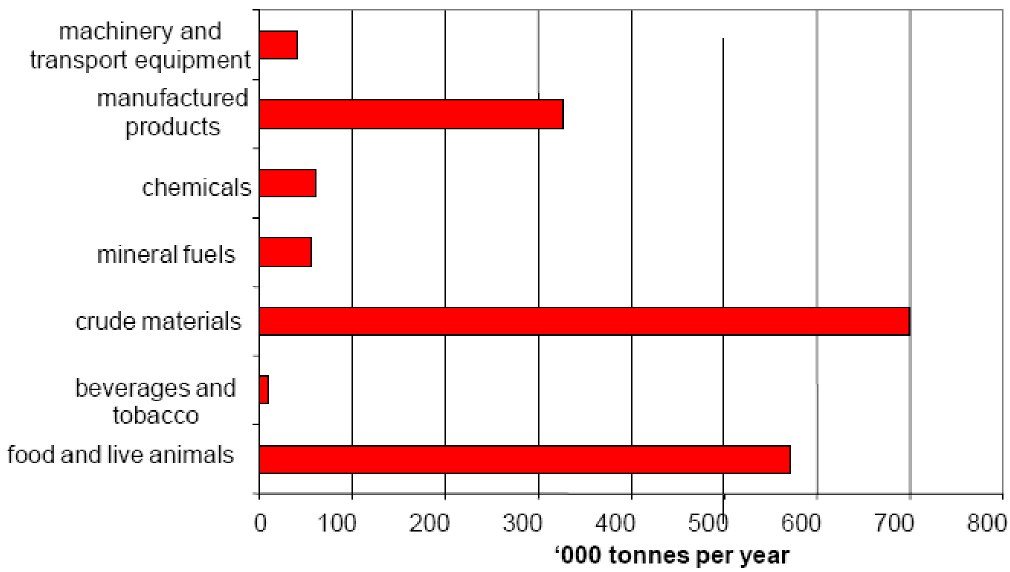
- Perth – Goldfields: mining inputs, general freight and fuel
- Goldfields – Perth: mining export products
- South West – Perth: mining and agricultural export products
- Perth – South West: general freight and mining inputs

[18] To 2020 from BTRE Rep 112 - later years extrapolated
[19] To 2020 from BTRE Rep 112 - later years constant share
[20] Based on Pacific National in 2004, assume 3.75%pa growth and Pacific national holds 85% market share. Const tonne/TEU ratio subsequent years

Freight between the South West and Perth

The movement of freight from the South West to Perth significantly exceeds the movement of freight into the region with approximately 20,000-30,000[21] TEU of cargo being exported annually. These exports are shown in Figure 7. Freight is also transferred by road to and from the Metropolitan region for domestic consumption and over-land transit to eastern states. Viticulture, fresh produce and processed timber products are consolidated within the Kewdale/Welshpool precinct (before export from Fremantle or inter-state distribution) whilst non-bulk imports bound for the South West via Fremantle are usually deconsolidated in Perth[22].

FIGURE 7 FREIGHT FLOWS FROM THE SOUTH WEST TO PERTH



Freight between Kalgoorlie and Perth

It is estimated nearly 6 million tonnes[23] of mining inputs is moved through the goldfields region per year, with the higher proportion being carried via road in bulk or liquid form.

Freight passing through Kalgoorlie falls into two broad categories:[24]

1. Perth – Goldfields: Mining inputs, general freight and fuel;
   Goldfields – Perth: Mining export products; and

2. East Coast – Perth: General freight for Perth and WA, and steel;
   Perth – East Coast: General freight, empty shipping containers.

Appendix D details the freight task moved between Kwinana and other terminals and mining sites within Western Australia. The largest tonnage of commodity transported is

[21] Based on figures from the Fremantle Inner Harbour Container Movement Study, SKM, 2004
[22] Development of intermodal services for the South West region, Sd&D 2006
[23] Data in the National Intermodal Terminal Study, Meyrick and Arup 2005
[24] Kalgoorlie Intermodal Freight Facility study, ARRB and Sd&DSd&D, 2006

Bauxite, Grain and Alumina. Generally freight movement to (and not from) Kwinana make up the larger proportion of all freight movements.

Around 2.5 tonnes of freight from the Eastern States passes through Kalgoorlie on rail destined for Perth (Table 5-7). Given the status of Perth as Western Australia's largest population centre it is assumed that over 90 per cent of this general (non-bulk) freight is destined for Perth and the populated areas of the South West. Inland population centres including Kalgoorlie account for as little as 5 per cent of the general freight volume. In addition, chemical freight destined for the mines (approximately 50 containers per week) is shunted from Pacific National trains via the ARG terminal whilst freight destined for the Pilbara is usually consolidated at Kewdale and transported by road to depots in the northern Pilbara region[25].

TABLE 5 CURRENT FREIGHT FLOWS TO KALGOORLIE- BOULDER AREA

To Kalgoorlie-Boulder	**Mode**	**Tonnes (PA)**	**Comment**
Mining Inputs			
From Perth	Road	20 000	Lime
	Rail	320 000	Lime, Cement & Cyanide
From Rawlinna	Rail	200 000	Limestone
Fuel			
From Esperance	Rail	300 000	Shell. BP, Caltex
	Road	<20 000	Mobil Only
General Freight			
From Perth	Road/Rail	<100 000	
Mining Outputs			
From Leonora	Rail	485 000	Nickel Concentrate
From Kambalda	Rail	210 000	Nickel Concentrate

TABLE 6 CURRENT FREIGHT FLOWS FROM KALGOORLIE – BOULDER AREA

From Kalgoorlie-Boulder	**Mode**	**Tonnes**	**Comment**
Mining Output			
To Perth	Road/Rail	25 000	
	Rail	140 000	Export Nickel Matte
To Esperance	Rail	70 000	Export Nickel Concentrate
Bulk liquid			
To Perth	Rail	56 000	Sulphur

[25] ARRB and Sd&D 2006

TABLE 7 CURRENT FREIGHT FLOWS FROM KALGOORLIE – BOULDER AREA

Through Kalgoorlie-Boulder		Mode	Tonnes	Comment
Mining Outputs				
	Leonora – Perth	Rail	28 500	
	Leonora – Esperance	Rail	135 000	
	Koolyanobbing - Esperance	Rail	4 500 000	Iron Ore
Mining Inputs				
	Perth – Leonora	Rail	50 000	Sulphur
	Perth – Goldfields	Road	190 000	See Note a
General Freight				
	Eastern States – Perth	Rail	2 500 000	
		Road	1 000 000	See Note b
Fuel				
	Esperance – Leonora	Rail	30 000	

Note a: Various Mining Inputs are road-hauled from Kwinana refineries to mine sites around the Goldfields region. These include anhydrous ammonia, caustic acid cyanide hydrochloric acid liquid zanthe sodium hydroxide
Note b: Road Freight on this corridor bypasses Kalgoorlie, passing through Kambalda and Coolgardie on the Eyre Highway

Intra-state demand for intermodal services

Table 8 shows the anticipated intra-state demand for intermodal services. There is an increasing trend toward containerisation of hay and grain although this is not yet of significant volume to alter future projections. In 2006/07 49,500 TEU of hay, grain and malt was exported via Fremantle.

TABLE 8 PROJECTED INTRA-STATE CONTAINER TRADE – 2005-2035

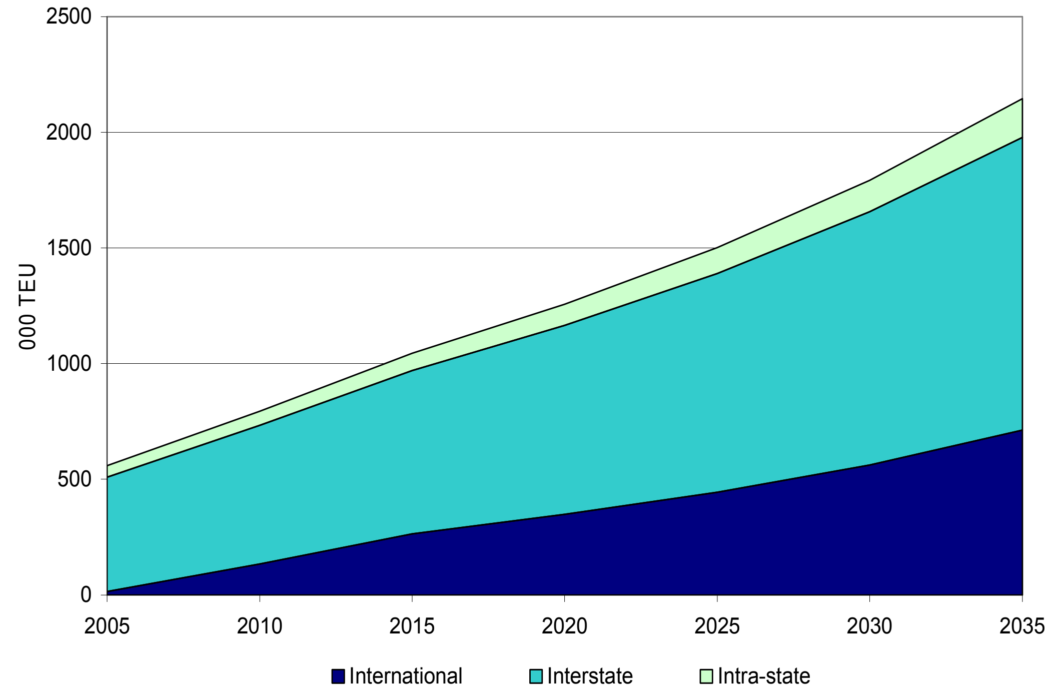
Intra-state	2005	2010	2015	2020	2025	2030	2035
Rail TEU (000)[26]	50	61	75	91	112	137	167

2.1.6 Demand for intermodal terminal services in Western Australia

The total demand for intermodal terminal services in Western Australia is the sum of the demand for international, inter-state and intra-state rail services. As discussed previously the total demand for intermodal services will be driven by a number of factors in particular the acceleration of international container trade through the port of Fremantle and the Outer Harbour when it commences operation as a container terminal at some point around 2015.

[26] Growth rate of 4.10% based on Industry interviews conducted as part of the Review of WA Rail Freight Task

FIGURE 8 TOTAL DEMAND FOR INTERMODAL TERMINAL SERVICES IN WESTERN AUSTRALIA 2005-2035



As shown in Figure 8, the total demand for intermodal services is currently estimated to be just over 550,000 TEU with inter-state demand the largest element. The total demand for intermodal services is expected to reach 1 million TEU by approximately 2015, rising to 1.5 million TEU in 2025 and exceeding 2 million TEU after 2030.

2.2 Supply of intermodal Services in Western Australia

2.2.1 Western Australian rail track providers

Rail services in Western Australia are operated and managed by two main providers:

- WestNet is the West Australian track owner. WestNet (owned by Babcock and Brown) own 5000km of track in Western Australia however the Australian Railroad Group[27] have a wholesale access agreement to use the intra-state rail network. Seventy four per cent of the WestNet Rail network comprises narrow gauge track, a further 22 per cent is standard gauge and the remaining 4 percent is dual gauge.

- The Australian Rail Track Corporation (ARTC) operates the intra-state rail line between Adelaide and Kalgoorlie and has a wholesale agreement in place with WestNet giving ARTC the rights to sell access to inter-state services between Kalgoorlie, Perth and Kwinana.

[27] On Jun 1 06, the Australian Railroad Group (ARG) became a subsidiary of Queensland Rail (QR). Under QR's ownership, ARG has above-rail operations in Western Australia and New South Wales

There are no private railways in the Perth Metropolitan area. The main line in Kwinana as well as the connecting line to Fremantle is Dual Gauge. The connection to Mundijong Junction is narrow gauge. The South West rail network is linked to Perth via a single, bi-directional, narrow gauge track linking Bunbury with the WA narrow gauge network.

2.2.2 Western Australian rail services

The main freight rail services in Western Australia are between:

- Perth and Kalgoorlie
- Kewdale and Fremantle Inner Harbour
- Kwinana and Fremantle Inner Harbour
- regional areas within the South West and Kwinana.

2.2.3 Metropolitan Perth rail operators

The main rail operators in the Perth Metropolitan area are:

- Pacific National (PN) who have a yard and depot at the Kewdale Intermodal Terminal
- Fremantle Link Services, a former joint venture between Toll and Patrick operates terminals in North Fremantle and at Kewdale
- South Spur Rail Services (SSRS) who provide hook-and-pull services for the Pacific National service between Kewdale Freight Terminal and Fremantle Port and more significantly for shuttle traffic between North Quay and Kewdale.
- Specialised Container Transport (SCT) who operate a terminal at Forrestfield and have a large intermodal warehouse with connections to the mainline

Intermodal operators

- BP Fuel who have a siding at the Kewdale Intermodal Terminal
- Sadleirs Transport who have a siding at the Kewdale Intermodal Terminal
- Country Carriers who have a siding at the Kewdale Intermodal Terminal
- BlueScope Steel who have a depot at the Forrestfield terminal

Inter-state intermodal train services

Pacific National (PN) operates 2 to 3 return services per day through Kalgoorlie-Boulder. The slowest of Pacific National’s inter-state services carries steel and general freight to Perth and is timetabled to stop in West Kalgoorlie to shunt Kalgoorlie-Boulder freight arriving from the eastern states. Up to 50 containers per week are shunted through West Kalgoorlie in this way, for an estimated annual net volume of 40,000 tonnes. This traffic consists of mining inputs and general manufactured goods. Faster services do not stop in Kalgoorlie-Boulder, other than to refuel at Parkeston (ARRB and Sd&D 2006).

Port shuttle train services

Fremantle Link Services operate rail freight terminals at North Fremantle and Kewdale, which function as two ends to a rail shuttle service. Rail lines from the terminal transport containers to Kewdale bring non-containerised freight including nickel matte from Kalgoorlie (undertaken by ARG), and connect to the eastern states for land-bridging of containers.

The Kewdale shuttle terminal does not have capacity to meet the objectives of Fremantle Ports and Western Australian State Government modal targets however; a new terminal is being planned with the assistance of Pacific National and Public Transport Authority to resolve this issue. Despite this, the volume throughput is also directly related to the competitiveness of rail versus road over such a short distance. At this time, there are service and rate advantages with road and current volumes are estimated at 30,000 TEU per annum.

Intra-state intermodal train services

ARG currently services Kalgoorlie-Boulder with a daily service from Perth. The train arrives in Kalgoorlie-Boulder for morning distribution to customers and returns to Perth in the late afternoon. Freight is accumulated from a variety of origins including Kwinana, Fremantle Port and customer sidings in Forrestfield. A second daily train, primarily carrying fuel from Kewdale direct to Malcolm also passes through the terminal with overflow freight for Kalgoorlie-Boulder if required[28].

2.2.4 Existing intermodal terminals

Metropolitan

In Western Australia the Kewdale/Forrestfield area has become a focus of domestic freight activity due to its road and rail access which enables the transport and distribution of goods to local, intra-state, and inter-state destinations, and to and from the port of Fremantle. The Kewdale/ Forrestfield area has intermodal terminals that are connected to the inter-state rail line to the Eastern states via Kalgoorlie.

There is a single major intermodal facility at Forrestfield where the SCT Logistics Group owns and operates an inter-state intermodal terminal on a 200,000m^2 site that handles mainly non- containerised cargos of approximately 800,000 tonnes per annum. This task is predicted to increase as SCT is seeking to expand their operations by purchasing new locomotives, rolling stock and seeking to gain new rail paths on the east/west rail network following the takeover of Patrick Corporation by Toll.

There are three main intermodal terminals in the Kewdale area[29]:

- the privately owned Sadleir's terminal at a size of 130,000m^2, processes 5,000 TEU per year plus 80,000 tonnes of non containerised cargo from 16 rail

[28] ARRB and Sd&D 2006
[29] Data in the National Intermodal Terminal Study Meyrick and Arup 2005

services a week[30]. This is expected to increase to approximately 20,000-30,000 TEU and 200,000 tonnes of non-containerised by 2008. The intermodal terminal is in the process of being upgraded with the installation of additional rail lines into the terminal and changes to the provision of access for narrow gauge trains.

- the Pacific National terminal at a size of 175,000m^2, processing 400,000 TEU per year and servicing 30 trains per week.

- the Fremantle Link Services terminal is located on the same land as the Pacific National Intermodal Terminal at a size of 80,000m^2. The FLS site handles international rail freight with approximately 30,000 TEU per year, servicing 6,400 trucks per year and an average of 5-6 trains per week.

The configuration and throughput of the main inter-state intermodal terminals is shown in Table 9.

TABLE 9 CURRENT INTER-STATE INTERMODAL TERMINAL CONFIGURATION AND THROUGHPUT

Inter-state Terminals	Track Length (m)	No Tracks	Double Stacked[31]	Throughput (TEU)[32]
Pacific National	1100	3	40%	400,000
Sadleirs[33]	500	2	40%	40,000
SCT[34]	1000	2	40%	100,000
	Total Kewdale /Forrestfield		**Inter-state Precinct**	**540,000**

As discussed, Intra-state freight task is handled by the Australian Railways Group which currently services Kalgoorlie-Boulder with a daily service from Perth. Cargo is accumulated from a variety of origins including Kwinana, Fremantle Port and customer sidings in Forrestfield[35]. The configuration and throughput of the main international and intra-state intermodal terminals is shown below.

[30] Sadleir's use either ARG or Pacific National to provide line haul services for consists of freight that is designated to Sadleir's Terminal.
[31] Double stacking estimates for SCT reflect the percentage of oversize rail wagons that SCT uses
[32] Throughput estimates are base on industry interviews
[33] Converted Sadleirs tonnage into equivalent TEU
[34] Converted SCT tonnage into equivalent TEU
[35] Kalgoorlie Inter-modal Freight Facility Study, ARRB and Sd&D, 2006

TABLE 10 CURRENT INTRA-STATE AND INTERNATIONAL INTERMODAL TERMINAL CONFIGURATION AND THROUGHPUT

Other Terminals	Track Length (m)	No Tracks	Double Stacked	Throughput (TEU)[36]
ARG Kalgoorlie	440	2	0%	60,000
North Quay Fremantle	360*	2	0%	20,000*
Port Shuttle - Kewdale	500	2	0%	10,000

The Public Transport Authority owns the land on which the existing Kewdale intermodal terminals are located except for the Sadleir's terminal. Major expansion is planned for the Kewdale site including:

- construction of 3 tracks adjacent to current track
- duplicated diagonal track to accommodate 1800m trains
- improvement of the hard stand area
- works on warehousing, car storage, and the container park area.

The ARG Terminal in Kwinana

ARG operate an intermodal terminal in Kwinana with access to duel gauge rail track. The main services and transfers to and from the terminal include:

- road delivery in the Kwinana Industrial Area[37]
- limited road service to the Port of Fremantle for international containers originating in the South West[37]
- haulage of grain, mineral sands, alumina, bauxite, coal, woodchips, quartz, nickel and iron ore between Perth and Kalgoorlie.

The current ARG terminal site at Kwinana does not have the physical requirements or the land footprint that is required for a major intermodal terminal operation. Additionally a recent report (2005) commissioned by Sea Freight Council of WA on alternative arrangements for transport, handling, and storage of shipping Containers associated with the Port found that the current facility at Kwinana has limited expansion opportunities.

Other possibilities for new terminals

Other possibilities exist for intermodal terminals in the Perth Metropolitan Area however these have not been advanced at present. Perth Airport has identified an area at the south east corner of the airport which may have the potential to accommodate an intermodal terminal. The area is located alongside an existing freight rail line. This possibility is noted in the Kewdale-Hazelmere Integrated Masterplan (WAPC, 2005)

[36] Throughput estimates are based on industry interviews

*North Quay Fremantle will be 600m in the future with a capacity of 300000 TEU per year.

[37] Information contained in report by Bovis Land Lease for the Sea Freight Council of WA - Alternative Arrangements for Transport, Handling and Storage of Shipping Containers Associated with Fremantle Port Inner Harbour, 2005.

with an action to review opportunities for integrated land use planning and development between the airport and Forrestfield. The action is medium priority and timed to occur in 2008.

The Public Transport Authority is also working with other stakeholders to prepare a site on the south side of the Pacific National operations area at Kewdale for another inter-state rail operator. The expansion is to include a new port shuttle terminal and adjoining Container Park. It is expected that expressions of interest will be invited within the next 12 months.

Other sites previously examined include:[38]

- a green fields site near Millendon;
- a redundant grain terminal and rail sidings at Bellevue in Midland; and
- as discussed above further development of the ARG intermodal terminal in Kwinana.

Kalgoorlie - ARG intermodal facility

The existing ARG owned and operated intermodal terminal in Kalgoorlie captures the majority of freight being moved between Perth and the Goldfields.

The main function of the yard and sidings is to aide:

- passage of express PN long distance intermodal trains
- shunting of Kalgoorlie-Boulder freight from westbound PN general freight services
- staging of minerals services from Leonora and Malcolm
- termination of the general freight service from Perth
- shunting of diesel, cement, containers, and vans into customer sidings such as BP Shell, Cockburn Cement, Sadleirs, and Centurion Transport.

2.2.5 Intermodal terminal capacity estimates

Determinants of capacity

Intermodal terminal capacity is notoriously difficult to estimate, as it is affected not only by the basic layout and handling productivity but also by the temporal pattern of demand for the facility and the way in which the terminal is managed. There are however three main factors[39] which drive intermodal capacity:

- The number of TEU that each rail track can handle, which is a function of:
  - the length of track where cargo can be exchanged

[38] Report commissioned by Sea Freight Council of WA into feasibility of Souble Stack Container Trains from the Port of Fremantle, 2000
[39] Key metrics used to assess rail terminal capacity are sourced from the Melbourne Freight Hub Master plan - 2003 (George Deutch Consulting)

  - the density of cargo carried on the train, assuming 7.5m/TEU for a double stacked train and 8.9m/ TEU for a single stack train
  - the percentage of double stacked containers on each train.

- The number of TEU that can be handled per year per rail track, which is a function of:
  - the number of times per day the rail track is turned over with a complete arrival/ unload/load/depart sequence which is assumed to be 2 per day for inter-state services and 3 times a day for domestic and port shuttle services
  - the effect of peak factors in loading which act to reduce terminal efficiency. An 85 per cent maximum terminal efficiency has been selected. This is up from the current level of 75 per cent and assumes improved productivity in terminal operations
  - the number of days the track is worked per year.

- The design of the intermodal terminal, which is a function of:
  - the number of rail tracks at the terminal
  - the mix of 1200m and 1800m long trains using the terminal.

Theoretical capacity

The factors and assumptions discussed above were used to estimate the capacity of existing rail terminals, as well as for a new terminal in Kwinana which provides inter-state, domestic, and port shuttle rail services.

At the Kewdale/Forrestfield site increased capacity will be achieved by a range of improvements including the increased use of double stacking for Pacific National rail services and the opening of a new intermodal terminal on the southern edge of the precinct which has a nominal 500,000 TEU per annum capacity.

The estimated future capacity of the Kewdale/Forrestfield inter-state intermodal terminals is shown in Table 11 and is above 1.8 million TEU per annum which is well above the 540,000 TEU throughput in 2006. The future capacity of the other intra-state and international intermodal terminals is shown in Table 12.

TABLE 11 FUTURE KEWDALE/FORRESTFIELD INTER-STATE INTERMODAL TERMINAL CONFIGURATION AND THROUGHPUT

Inter-state Terminals	Track Length (m)	No Tracks	Double Stacked	Throughput (TEU)
Pacific National	1100	3	60%	750,000
Sadleirs	500	2	40%	180,000
SCT	1000	2	40%	420,000
Kewdale – New PTA terminal	1000	2-3		500,000[40]
	Total Kewdale/Forrestfield Inter-state Precinct			**1,850,000**

TABLE 12 FUTURE INTRA-STATE AND INTERNATIONAL INTERMODAL TERMINAL CONFIGURATION AND THROUGHPUT

Other Terminals	Track Length (m)	No Tracks	Double Stacked	Throughput (TEU)
North Quay* Fremantle	400	4	0%	130,000
Port Shuttle – Kewdale**	500	2	0%	130,000
ARG Kalgoorlie	440	2	0%	110,000

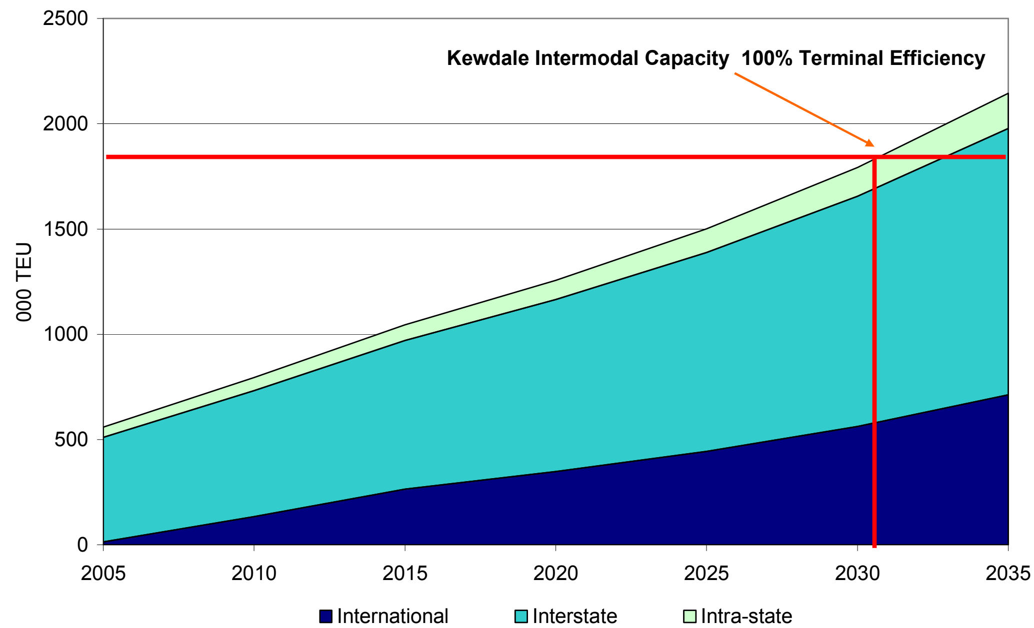
*North quay Fremantle will grow to 600m track length and 300000TEU in the future.
** Port Shuttle – Kewdale will grow to 600m track length and 3 tracks in the future

Based on the analysis in this section, it is possible to estimate the overall capacity for intermodal terminal services in Western Australia, by overlaying the expected supply of intermodal services with the predicted demand.

Figure 9 shows that the predicted supply of intermodal terminal services of 1.8M TEU will not be exceeded by the demand for intermodal services until after 2030.

[40] Terminal to be released for development in 2006 - Estimated capacity as agreed by PTA

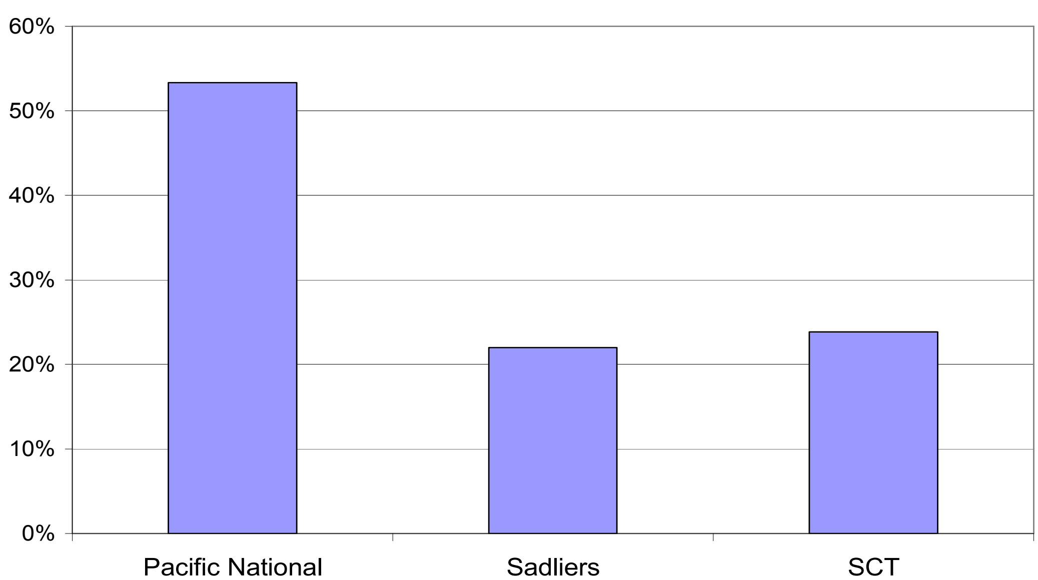
FIGURE 9 DEMAND AND SUPPLY FOR INTERMODAL TERMINAL SERVICES IN WESTERN AUSTRALIA 2005-2035



Terminal utilisation

The utilisation (Figure 10) of the intermodal terminals at Kewdale/Forrestfield is based on the current terminal throughput and the expected terminal capacity. It is estimated that the Pacific National terminal is operating at above 50 per cent capacity and that both Sadleirs and SCT Logistics are operating at just over 20 per cent capacity.

FIGURE 10 CURRENT UTILISATION OF INTERMODAL TERMINALS AT KEWDALE/FORRESTFIELD PRECINCT



Limitation on the capacity of intermodal terminal services

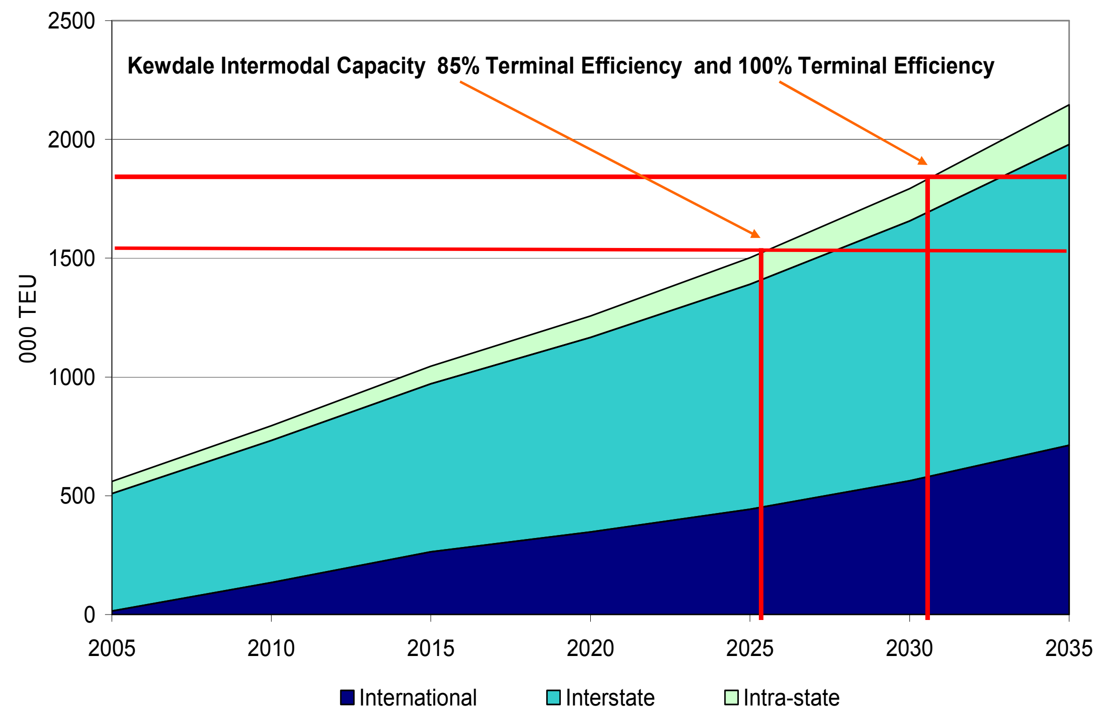
A number of issues may prevent the intermodal terminals at Kewdale/Forrestfield from being able to meet the demand for intermodal services in 2030. The two issues most likely to limit the supply of intermodal services are:

- internal operational constraints, and
- congestion prevents the efficient delivery of freight to the terminal.

Operational constraints

It is considered unlikely that an intermodal terminal could operate effectively at 100 per cent of its potential throughput capacity. The effect of any disruption on a terminal operating at capacity is one reason why terminal operators tend to operate at levels of throughput below capacity. As an example, international shipping terminals operate at less than 70 per cent of their berth capacity and Dubai Ports currently operate a container terminal at Melbourne at 40 per cent of berth capacity.

FIGURE 11 DEMAND AND SUPPLY FOR INTERMODAL TERMINAL SERVICES IN WESTERN AUSTRALIA 2005-2035



The effect of Kewdale terminals throughput being constrained to 85 per cent of their theoretical capacity would be to advance from 2030 to 2025 the time when the Kewdale/Forrestfield precinct would be unable to meet any additional demand for the supply of intermodal terminal services. This is shown in Figure 11.

Road network constraints

Approximately 30 per cent of all freight with an origin or destination in the Perth Metropolitan area is moved on road. Table 13 shows the proportion of all freight carried on different modes as a percentage of volume.

TABLE 13 PROPORTION CARRIED BY ALTERNATIVE FREIGHT MODES BASED ON ORIGIN/DESTINATION (PERCENTAGE OF TOTAL VOLUME)[41]

	Air	Sea	Road	Rail
Freight with Perth Origin	0.1%	46.8%	30.2%	22.9%
Freight with Perth Destination	0.1%	28.6%	31.5%	39.8%

Modelling undertaken by Main Roads WA for 2031 indicates that there will be an increase in the demand for road freight activity around Kewdale and Kwinana[42]. This demand will occur in the context of growth in general traffic, particularly on the Kwinana

[41] ABS, 2001:AFEC, 2001
[42] Metropolitan Freight Review 2002

and Mitchell freeways and will create the potential for congestion, conflict and inefficiency and impact on and probably impede the movement of heavy vehicles. Figure 12 demonstrates the expected increase in freight movements in the Kewdale and Kwinana areas. Heaviest desire lines are coloured red, orange, and yellow. The patterns reinforce the importance of Kewdale, Welshpool, Fremantle, Kwinana, Forrestfield, Canning Vale, and Perth Airport as strategic freight land use nodes (Metropolitan Freight Review, 2002) and the consequential increase in activity for these areas.

The Draft Metropolitan Freight Network strategy initiated in 2001-02 also identified the following:

- significant residential growth in all corridors is likely to simultaneously increase the amount of general traffic on those corridors and the demand for freight; this is despite modal shift targets.
- growth in regional areas, particularly the South West, is likely to generate increased freight movements to and from the metropolitan area.
- road freight will continue to be the dominant form of freight for non-bulky goods within the metropolitan area, due to the need for this freight to be delivered or picked up from different locations.
- the amount of vacant industrial land in the Perth Metropolitan area, particularly in the north-west and south west corridors, will generate significant freight movements in these corridors.

Recent traffic analysis undertaken by ARRB for the Perth Eastern Metropolitan Regional Council's Integrated Transport Strategy illustrates the expected increase in traffic levels in the Kewdale area. Traffic congestion was modelled using the concept of Level of Service (LoS) where a low LoS indicates a high level of traffic congestion. The following assumptions have been applied:

- upgrading of the Middle Swan Road between Reid and Roe Highways;
- grade Separation of the intersection of Leach Highway and Orrong Road; and
- the southern extension of Lloyd Street.

Assessment of traffic congestion beyond 2011 is, inevitably, subject to greater uncertainty. The assessment is made on the basis of anticipated land uses and travel behaviour, and assuming no major changes to the price or availability of transport fuel, if no improvements were made beyond the 2011 road network. Whilst this is not a realistic scenario, it does clearly highlight the increasing traffic pressure in this area.

It should be noted that sensitivity testing was also carried out on the basis of:

- a 5 per cent reduction in traffic volume on all roads for 2011; and
- a 10 per cent reduction in traffic volume for 2031.

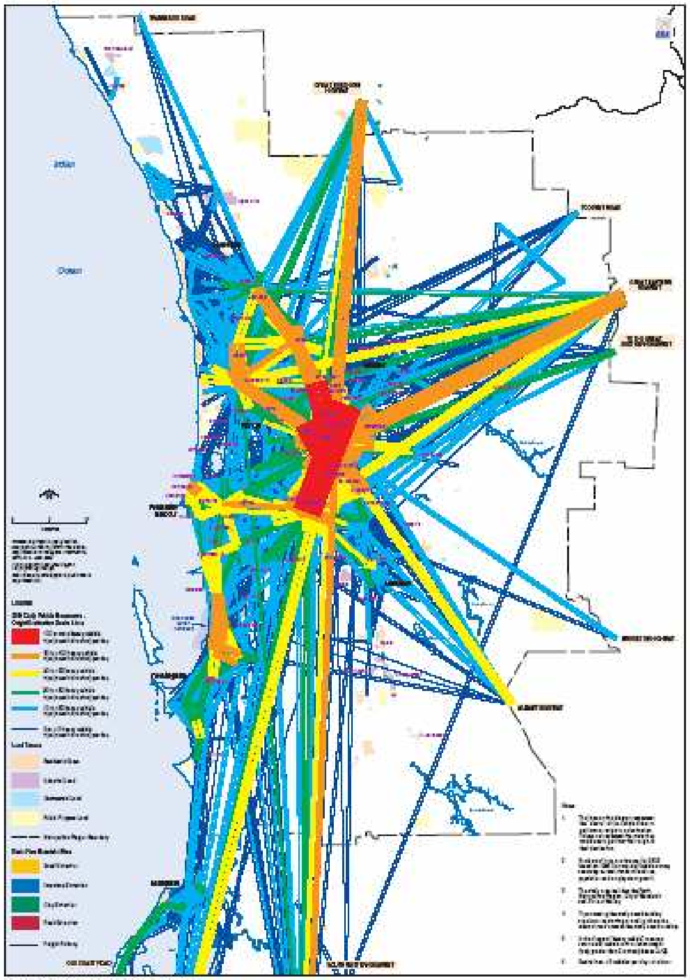
This is at appendix E.

Figure 13 shows a worsening LoS around Kewdale to 2031[43].

Clearly, traffic is a problem on Kewdale Rd and the assumptions under which the analysis was undertaken needs to be closely examined. Kewdale Rd has a very high proportion of heavy vehicles. Exact figures are not available however the crash data provided by Main Roads WA indicates that 29 per cent of crashes in the area involve a heavy vehicle; the metropolitan average is 3.09 per cent. The traffic modelling volume/capacity are undertaken on the basis of total *vehicle* movements and offer no insight in to the types of vehicles and their impact on congestion.

[43] We note that MRWA has been asked to develop a revised costing for upgrading GEH west of Tonkin Highway for possible inclusion of funding for the planning/design stages in the 2006/07 WA State Budget.

FIGURE 12 2006 AND 2031 – ALL HEAVY VEHICLE ORIGIN / DESTINATION TRENDS



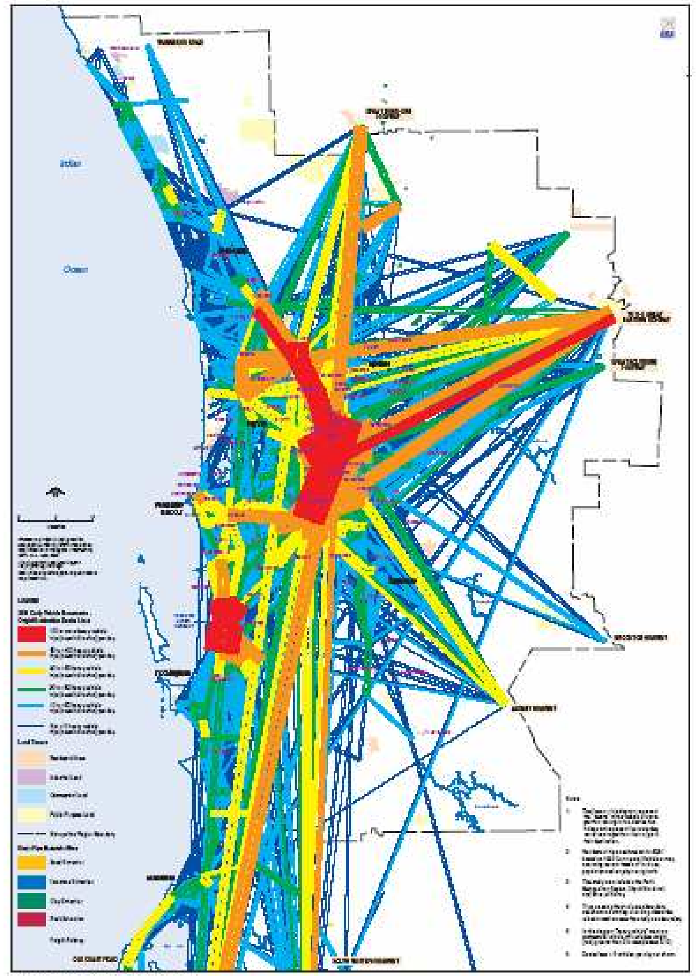
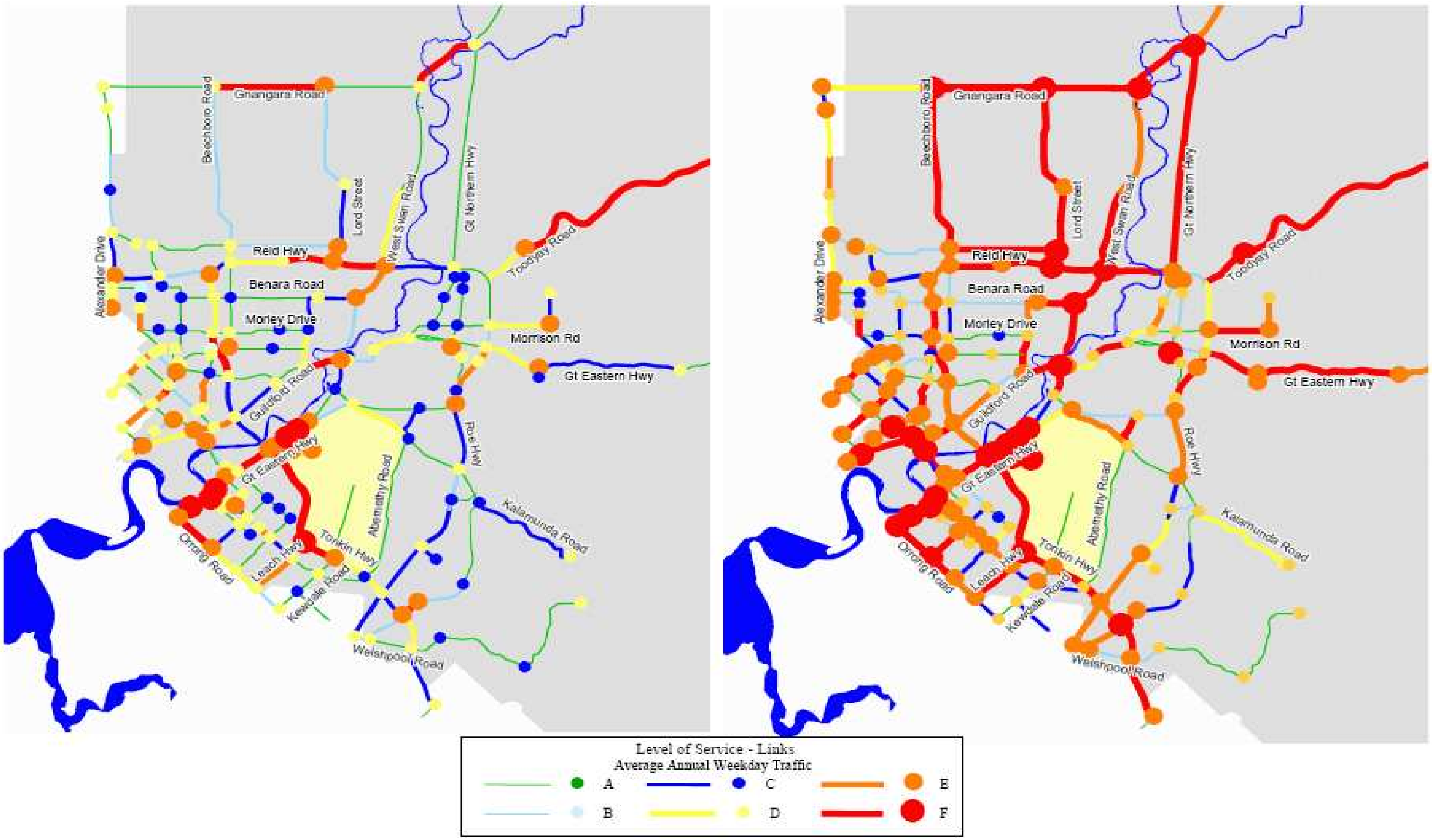


FIGURE 13 ROAD TRAFFIC LEVEL OF SERVICE :2011 AND 2031

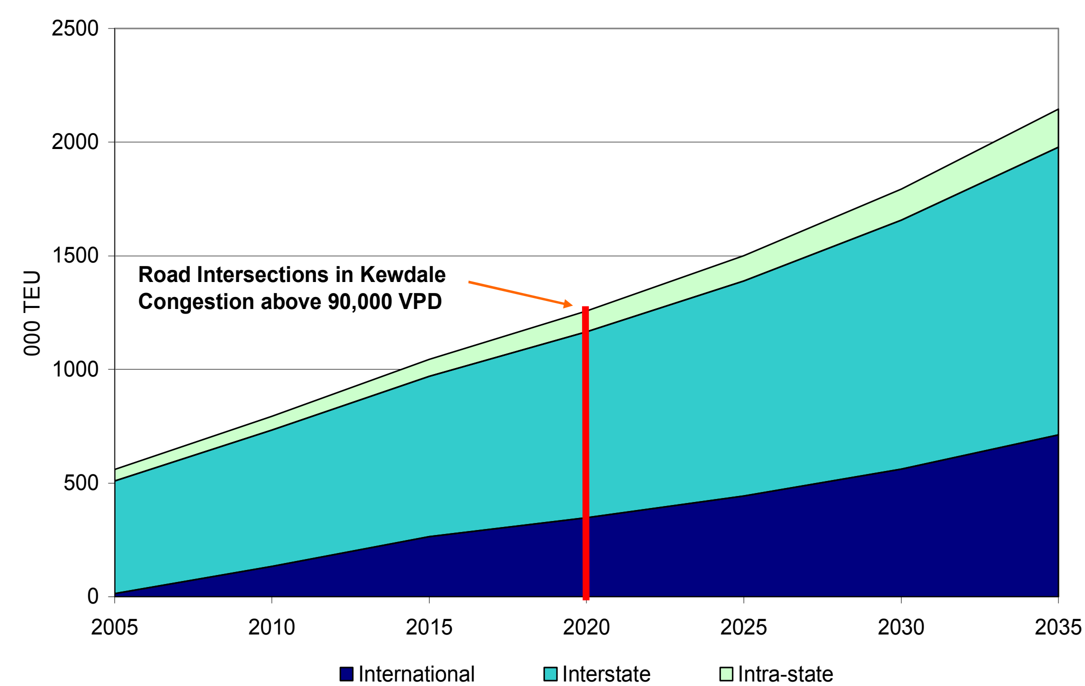


In 2001/02 DPI commissioned a study[44] to provide 'an updated traffic model for an area bounded by Orrong Road, Leach Highway, Roe Highway, and Tonkin Highway'. Full development of the airport and Kewdale were assumed. The study considered three scenarios up to 2021 including the base network and two scenarios for network improvement. The study stated that intersections with traffic volumes over 60,000 vpd <u>may</u> require grade separation and that intersections with traffic volumes over 90,000 vpd <u>will</u> require grade separation. For all of the intersections tested under <u>all three road improvement scenarios</u> no intersections were shown to have less than 81,000 vpd. The study concluded that key intersections and some links (although not to the same extent) suffer from congestion. Upgrading involving grade separation for 7 intersections is likely to be required by 2021 (GHD, 2002).

The development of the Perth Airport land is also likely to impact on traffic in the Kewdale precinct. The airport has recently accommodated a 65,000sqm Woolworth's distribution centre accessed from Colquhoun Road. Approximately 350 people are employed at the facility. Further plans exist to accommodate a Coles distribution centre and a possible relocation of Toll Logistics operations to airport land.

The effect of a cap of 90,000 vpd at intersections in the Kewdale/Forrestfield precinct would be to advance from 2030 to 2020 the time when the Kewdale/Forrestfield precinct would be unable to meet any additional demand for the supply of intermodal terminal services as shown in Figure 14.

FIGURE 14 EFFECT OF POSSIBLE VEHICLE CONGESTION ON THE SUPPLY OF INTERMODAL TERMINAL SERVICES



[44] GHD, 2002

It should also be noted that the Public Transport Authority who own the land on which Kewdale is sited has commissioned a study to assess the impact of the planned expansion of the Kewdale terminal on traffic in the Kewdale area. This report should be available early in 2007.

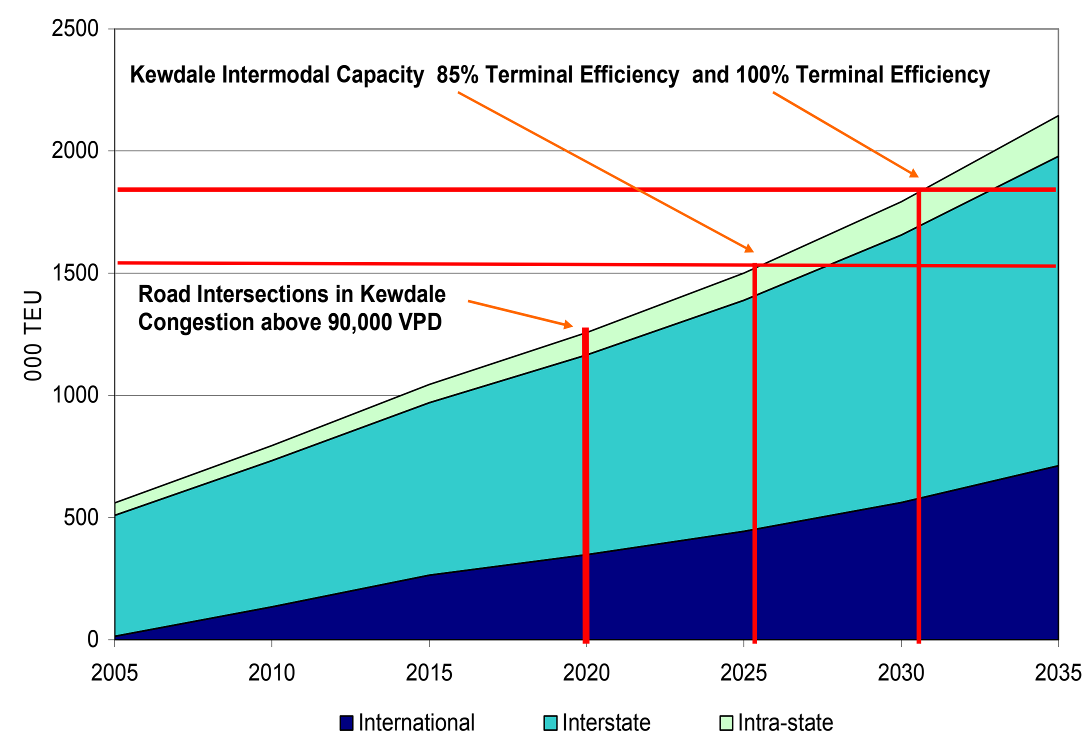
2.2.6 Summary of supply and demand issues

The total demand for intermodal terminal services in Western Australia is the sum of the demand for international, intra-state, and intra-state rail services. As discussed previously the total demand for intermodal services will be driven by a number of factors. In particular the acceleration of international container trade through the Port of Fremantle and the Outer Harbour when it commences operation as a container terminal at some point around 2015.

Initial indications are that the demand for intermodal terminal services would not be exceeded by the supply of intermodal terminal services in the Kewdale/Forrestfield precinct until 2030. There are however a number of events such as terminal operational constraints and congestion on road networks which could also reduce the supply of intermodal terminal services and which could bring forward the need for a intermodal terminal in another metropolitan location as shown in Figure 15.

The supply of Western Australian intermodal services however is only one factor in the decision to develop an intermodal terminal. Issues such as the shift of population and industry supply chains to the south may bring forward the development of new intermodal facilities in Kwinana. This will be discussed in the next section.

FIGURE 15 WESTERN AUSTRALIAN DEMAND FOR INTERMODAL TERMINAL SERVICES AND EXPECTED SUPPLY



2.3 Network redundancy and impact amelioration

The decision to develop a new intermodal terminal away from the dominant Kewdale /Forrestfield precinct can also be justified on the grounds of strategic and social outcomes.

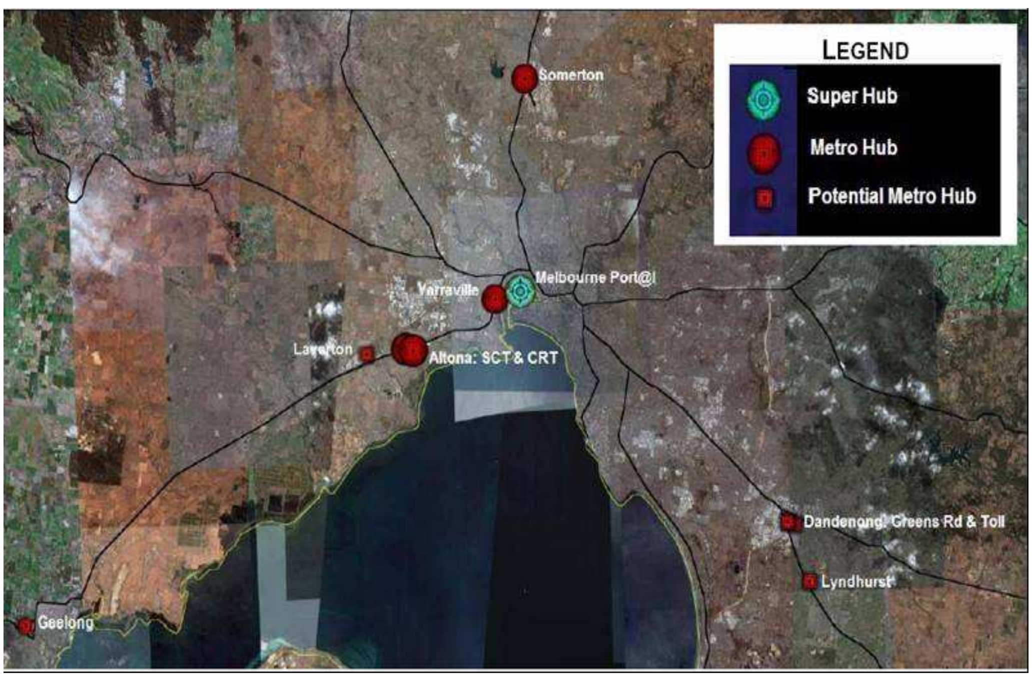
The development of a terminal away from Kewdale lessens the risk of the whole intermodal network being affected by an event which impacts on operations at or in the vicinity of Kewdale.

Similarly the impact on the local community of the Kewdale intermodal precinct and the supporting industries which have congregated around the Kewdale area will be reduced if there is an intermodal terminal which services the same market in another location.

The concept of "spreading the intermodal Load around" is not new with many Australian cities operating a number of dispersed intermodal terminals.

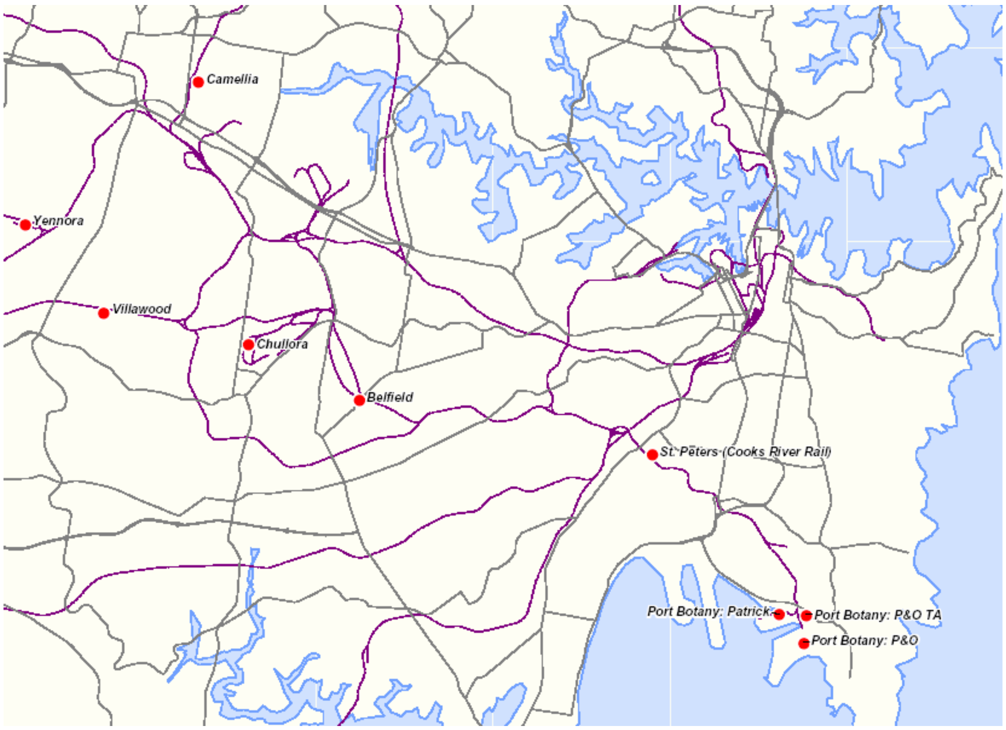
Figure 16 shows there are four areas in Melbourne where intermodal activity takes place.

FIGURE 16 SPREADING THE NETWORK LOAD IN MELBOURNE



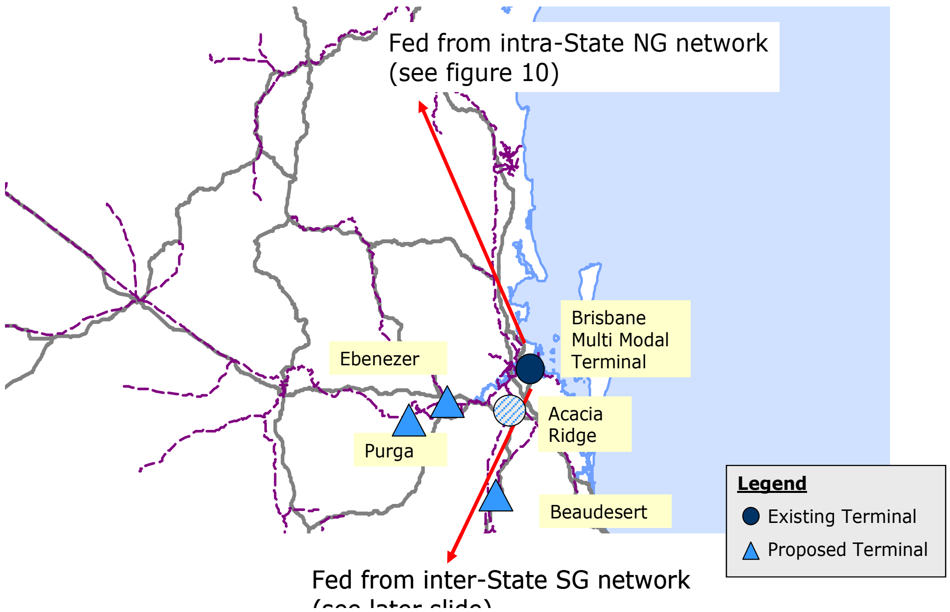
This is also the case in Sydney where there are numerous intermodal terminals spread around the inner and western suburbs of Sydney (Figure 17). The terminals in Sydney tend to support one of two main operations with those closest to the port used primarily for ancillary purposes including deconsolidation, container repair, empty storage (additionally Cook's River is increasingly used as a buffer terminal for the Sydney port) and those further out supporting the inter-state rail market.

FIGURE 17 INTERMODAL TERMINALS IN INNER SYDNEY



In Brisbane two main intermodal terminals are the Acacia ridge terminal which in Brisbane's inter-state and intra-state intermodal hub and the Brisbane Multimodal Terminal at the Port of Brisbane. As shown in Figure 18 there are a number of planned intermodal terminals which are located away from the existing terminals.

FIGURE 18 INTERMODAL TERMINALS IN BRISBANE



2.4 Supply chain considerations

2.4.1 Centralisation of distribution facilities by major retailers

In keeping with global developments in logistics, the trend in Western Australia has been to consolidate facilities at a single location. For rail-related freight, these facilities have tended to be concentrated in the Forrestfield/Kewdale area, whereas Canning Vale has developed a strong presence in pure road operations.

Despite sustained high fuel prices, it is likely that this practice will continue to dominate for the foreseeable future. It is likely that corporations with major investments in logistics facilities at established distribution nodes will continue to develop these facilities if physical space is available.

In an attempt to reduce supply chain costs and speed up delivery of goods to stores both Coles and Woolworths have recently embarked upon massive changes to their distribution networks throughout Australia. The changes are twofold. On the one hand, they are both reducing the overall number of distribution centres throughout the country and especially the reliance on a high number of specialist centres. On the other hand, a small number of large distribution centres are being built on parcels of land ranging from 6 to 30 hectares to handle traffic flows of up to 30 semi-trailers an hour for a broad spectrum of slow moving products.

These 'mega centres' are being developed with quick access to major roads (within 30 minutes drive from inter-state railways) and have different sections for specialist products. These mega centres are supported by a reduced number of smaller centres for faster-moving products.

Coles Myer for example is closing down[28] its food and liquor distribution centres and handling the slow moving goods in these categories through one of 11 new big sites located in areas that offer better transportation access. Room-temperature goods or slower-selling merchandise across the country will be located in Melbourne and at a business hub in Eastern Creek, which has easy access to the M7 freeway and traverses the high demand areas of western and south western Sydney. Specialist chilled facilities for frozen or perishable foods will also be located at the Eastern Creek site. Similar high turnover facilities will also be located in the southern suburbs of Brisbane, and in Launceston and Adelaide[45].

Woolworths is planning to replace 31 distribution centres throughout Australia with a hub and spoke network of two national and nine regional distribution centres. The national centres at Mulgrave in Victoria and Yennora in NSW handle slow moving products, while the regional centres in capital cities and other high population locations such as Wyong and Townsville service local stores with faster moving products.

The large investment made by both of these major retailers suggests that they are unlikely to establish additional major distribution centres in the Kwinana area, at least in the short term. However, the retailers do make use of additional sites to handle fast moving specialist merchandise. Coles currently uses at least six additional facilities, most of which are located in the South West. The consolidation strategy therefore does not entirely rule out the use of an intermodal terminal other than Kewdale as transfer point for some inter-state or international cargoes carried for the major retailers.

If population growth in areas to the south of Perth continues as predicted, the strategy of establishing smaller facilities to handle fast moving specialist merchandise might make it feasible to develop these at a hub located in Kwinana. This is discussed in more detail in 3.5.2.

2.4.2 Diversity of supply chains and supply chain strategies

Although each individual supply chain is likely to remain consolidated, there are a large number of independent supply chains serving different commodities and/or major companies. Coles-Myer, for instance, accounts for less than 5 per cent of the total inter-state non-bulk rail traffic. Although each of these may focus on a single major metropolitan distribution node, these nodes themselves need not all be in a single location.

Analysis of the movement of goods on the east/west freight corridor shows that there is a complex series of relationships between the key parties over who is responsible for the movement of cargo.

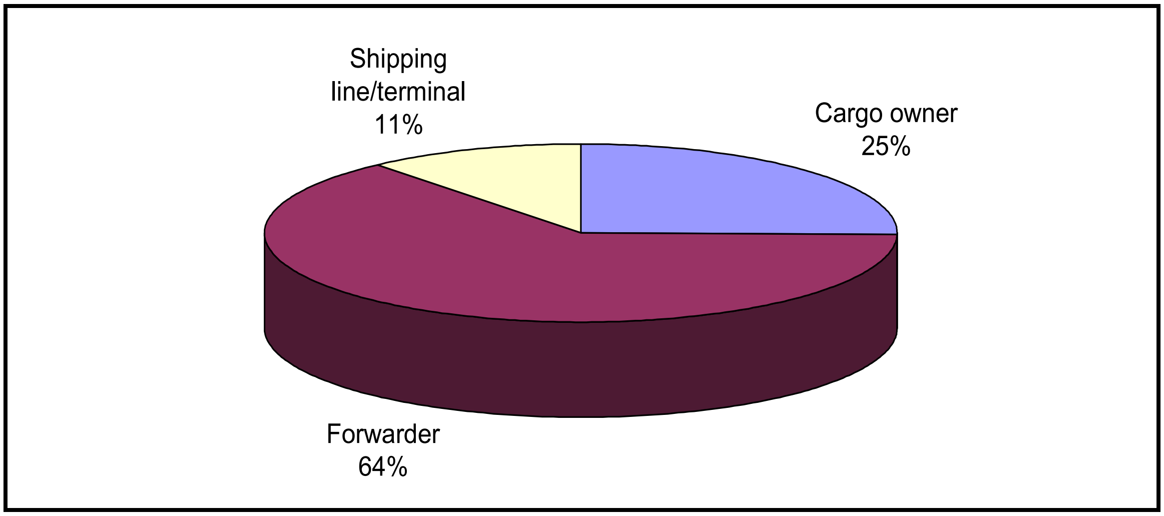
The major freight forwarders such as Toll, FCL, K&S and Linfox buy space on Pacific National and SCT Logistics rail services under a variety of contractual agreements and terms. Pacific National does not operate a road delivery or pickup service for inter-state freight and this task is carried out by the cargo owner directly or by a freight forwarder. In the case of SCT they handle the road movement of some cargo but the majority is again managed by either the cargo owner or a freight forwarder.

[45] Coles Myer - Submission to the Productivity Commission's Review of the Economic Costs of Freight Infrastructure and Efficient Approaches to Transport Pricing - May 2006

The exception to this is BlueScope Steel which has a national contract with Pacific National for the carriage of its products which comprise approximately 20-25 per cent of the Pacific National task to and from Western Australia. Steel product is typically delivered to the BlueScope siding at Kewdale on consists that are shunted from the main Pacific National Terminal.

Figure 19 shows the relative degree of control that the key parties exert in the inter-state trade. This is important as the controller of the freight determines by what mode and to where the freight moves on behalf of the cargo owner and in many cases the freight controller has temporary ownership of the freight between different owners along the supply chain, i.e. from manufacture to wholesaler to retailer. Decisions made by freight controllers about where and how their freight task will move will be crucial to the success of any new intermodal terminal.

FIGURE 19 EFFECTIVE CONTROL OF INTER-STATE INTERMODAL FREIGHT



2.5 Conclusion

The development of a second major intermodal terminal in the Perth Metropolitan area is desirable.

Kewdale/Forrestfield is the pre-eminent TDL cluster in metropolitan Perth and is likely to remain the predominant hub for these activities. The Kewdale terminals themselves could handle demand through to 2025, but the road system serving them is already under stress. Road freight traffic to and from the terminals will grow as rail volumes increase.

The development of a significant secondary intermodal hub would help to spread that load and reduce the impact that the intermodal terminals place on the community. It would also be a logical progression from a supply chain perspective, as has been the case in other Australian states. The rail freight task is diverse, encompassing a large number of distinct supply chains. In some cases the needs of a particular supply chain will no doubt be best served by a single metropolitan distribution centre, but the optimal location for this distribution centre will depend on the geographical distribution of the demand for the particular commodity concerned. It is unlikely that Kewdale/Forrestfield will be optimal for all chains and providing another option will provide greater flexibility to supply chain planners where a single metropolitan distribution centre is the appropriate strategy.

Moreover, a single centre may not always be the most desirable solution. While other options exist (either two major centres or a major centre supplemented by subsidiary specialist centres), encouraging them will contribute to the reduction in the amount of heavy vehicle movements in the metropolitan area. One of the implications of distribution centre consolidation is the increase in the number of trips and the distance travelled per trip in metropolitan areas. In its submission[46] to the Productivity Commission enquiry into road and rail infrastructure Coles Myer made the point that 80 per cent of its traffic movements are in metropolitan areas and that the current 150 kilometres average distance travelled for each trip is likely to increase as are the number of traffic movements as the number of distribution centres is reduced and demand grows, unless more efficient vehicles are employed. In such a scenario the development of a second major intermodal centre will help.

[46] Review of the Economic Costs of Freight Infrastructure and Efficient Approaches to Transport Pricing, 2005

3 Desirability of Kwinana as the location of a new intermodal terminal

3.1 Site requirements

A number of key physical characteristics relating to the location of intermodal terminals affect whether they can function effectively. These characteristics include:

- proximity to the main freight rail lines and to road networks that can accommodate the volume of trucks
- proximity to key cargo catchments such as ports and distribution centres
- separation from residential or other sensitive and in some cases incompatible land uses
- flat topography to allow for long trains such as 1500-1800m in length
- adequate area of land for future growth and for complementary uses.

3.2 Policy context

From a State Government perspective, there are a number of policies that need to be considered in the assessment of Kwinana as a site for the development of a second metropolitan intermodal hub:

- State Planning Strategy (Department for Planning and Infrastructure 1998), which aims to facilitate strategic development by ensuring land use, transport and utilities are mutually supportive;
- draft State Greenhouse Strategy (Minister for the Environment 2004) which emphasises the need for improved inter-modal freight handling and the consolidation of freight transport facilities;
- Transport and Infrastructure Policy, the central objective of which is to “provide transport and infrastructure that meets the current and future socio-economic needs of the State, while enhancing liveability and protecting the environment” (Department for Planning and Infrastructure 2005);
- draft Metropolitan Freight Network planning policy (Department for Planning and Infrastructure 2005) which has been shaped by the Transport and Infrastructure Policy;
- Hope Valley Wattleup Redevelopment Project.

The Draft Metropolitan Freight Network planning policy and the Hope Valley Wattleup Redevelopment Master plan are most relevant to the consideration of an intermodal terminal in Kwinana.

3.2.1 Draft Metropolitan Freight Network planning policy

One of the central planks of the Draft Western Australian Planning Commission Statement of Planning Policy: Metropolitan Freight Network (MFN) is the co-location of transport and other logistics facilities as a means of increasing the efficiency of freight distribution and minimising the impact of freight activity on urban sustainability. These principles are articulated in the objectives of the draft policy which are to:

- facilitate the development and operation of an efficient freight network, based on strategic co-location of freight handling facilities and services by an integrated network of freight transport facilities
- protect the primary freight network from avoidable encroachment by any incompatible or noise sensitive development with the potential to compromise freight handling and/or transport operations
- minimise adverse environmental and social impacts associated with the handling and movement of freight on noise sensitive development, such as housing; and
- inform local government and landowners of the designation of existing and proposed freight networks.[47]

To fulfil these objectives the draft statement envisages that these integrated facilities:

"… typically include local delivery services, freight terminals and intermodal facilities with specialist warehousing services which manage goods distribution involving receiving, storage, re-packaging and transfer between delivery vehicles. The location of these centralised facilities will affect the overall efficiency of freight distribution and are an integral element of the freight transport network."

It is against this backdrop that the Draft Metropolitan Freight Network plan suggests a number of intermodal centres that are strategically located on designated road and rail freight routes so that they are linked with the ports, major industrial areas, intra-state origins, and destinations of major commodities, and the eastern seaboard. Apart from the on-dock rail facility at the Inner Harbour, the draft planning policy suggests four other intermodal terminal locations in the Perth metropolitan area. Kwinana is one of these four locations, with the others being Kewdale, Forrestfield, and Canning Vale.

The draft policy also suggests minimising the demand for movement of goods by co-locating intermodal terminals not just with other transport and logistics activities, but also with manufacturing and processing businesses that benefit from good access to transport and logistics facilities and services. This aspect of the policy lends weight to a future intermodal terminal being located within close proximity to the future Outer Harbour and the Kwinana Industrial Area, where there is likely to be a high demand for the transportation of industrial inputs between the port and heavy industry operations in Kwinana; and between Kwinana and a number of intra-state locations that use the industrial commodities produced in the Kwinana area.

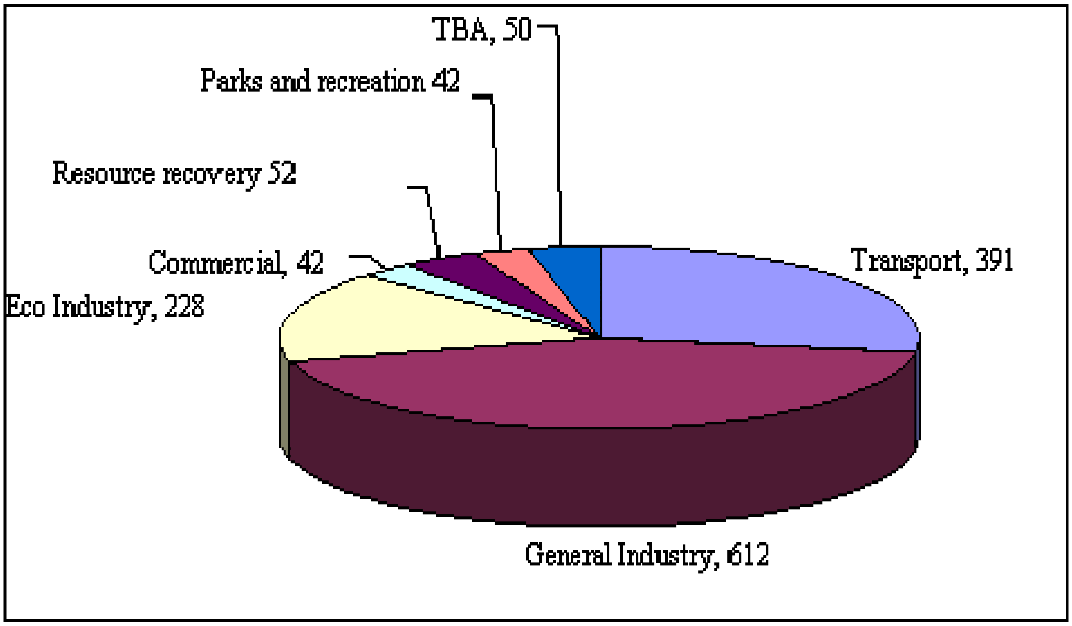
3.2.2 Hope Valley Wattleup Redevelopment Project

The Hope Valley Wattleup area is situated within the Fremantle-Rockingham region. Landcorp's Master plan for the Hope Valley Wattleup Redevelopment Project, released in December 2005 reinforces the appropriateness of the area for use as an intermodal hub. The master plan identifies a number of designated land use precincts which include transport activities in three areas: in the north, the centre, and the southern end of the redevelopment zone. The total area of the redevelopment site is about 1000 hectares (unconstrained by various easements, reserves and buffers), about 200

[47] Western Australian Planning Commission, Statement of Planning Policy: Metropolitan Freight Network Draft Policy, May 2005, page 3

hectares of which are zoned for transport related activities. Figure 20 shows the designated land uses for the redevelopment area.

FIGURE 20 LAND USE FOR THE HVWRA (HECTARES)[48]



3.3 Land use and land use planning in Kwinana

Kwinana covers an area of approximately 118 square kilometres in metropolitan Perth, and lies about 40 km south of the Perth CBD, via the Kwinana Freeway. The Kwinana Industrial Area (KIA) makes up a significant part of the Kwinana area. Comprising a total of 1180 hectares, the KIA is a long established strip of industrial land recognised as a major driver for the WA economy. A dedicated freight rail link links KIA to the ports and the south-east industrial area of Perth - Kewdale. A map of KIA is shown at appendix A.

The industrial development within the Kwinana region consists of a highly diverse range of industries from smaller service industries, such as fabrication and construction facilities, through to very large heavy process industries, including Alcoa, Nickel West Refinery, TiWest and BP to name a few (Van Beer et al 2005). The companies in the Kwinana Industrial Area generate a combined annual output valued at $8.7 billion per annum, direct sales of $4.34 billion, directly employ approximately 4,000 people (70 per cent live locally), and provide indirect employment to approximately another 24,000 people. Approximately 500 hectares of land in both public and private ownership has the potential to be further development for industry. A detailed list of companies operating in the KIA is at appendix B.

The *strategic General Land Study (*SKM 1997) identified that 1,461 hectares of industrial land would be required within the south west sector over the next 25 years

[48] Hope Valley-Wattleup Redevelopment Project The Proposed Master plan Report, LandCorp, 2003

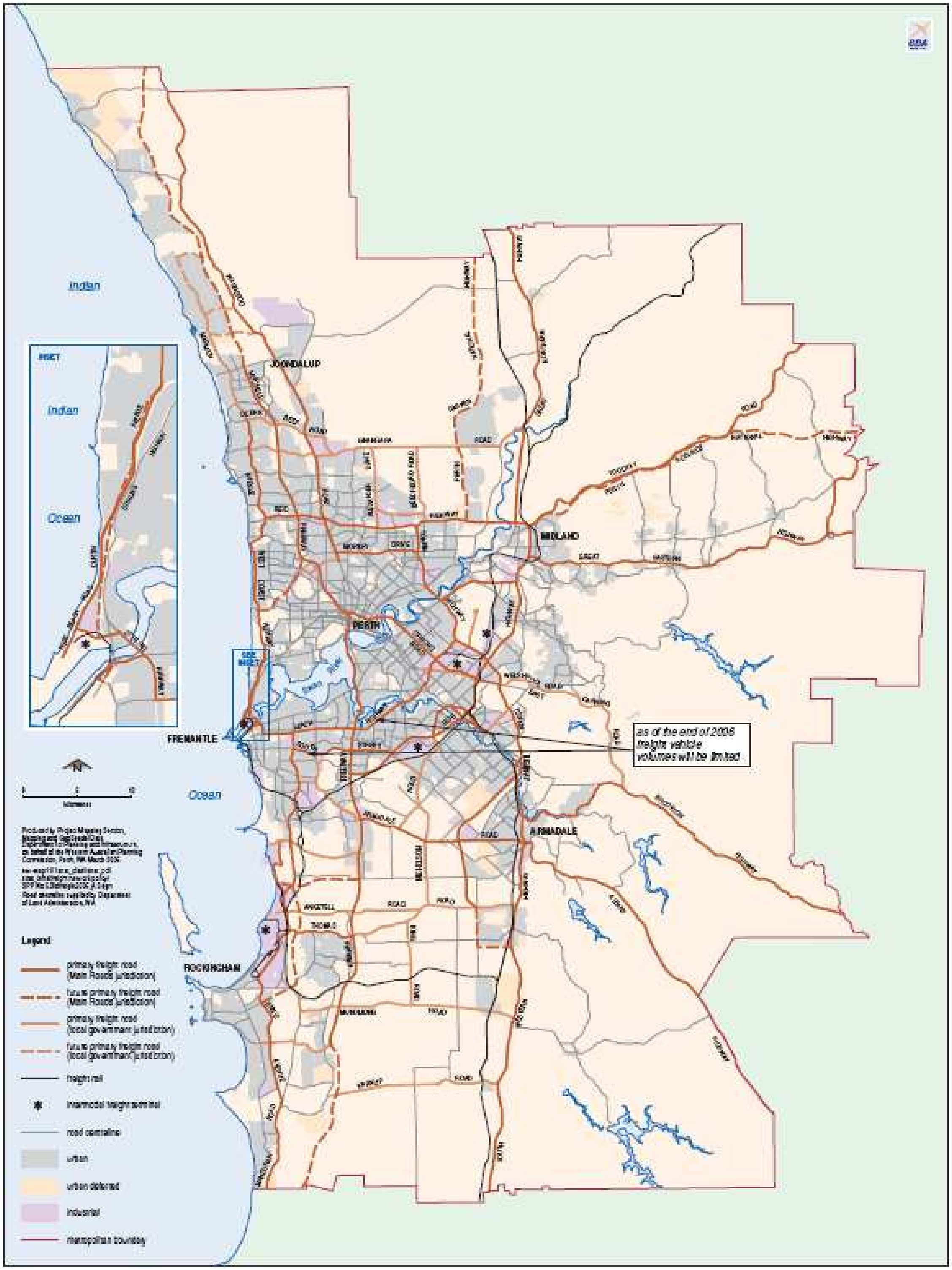
(revised to 1,000 -1,100 hectares by LandCorp in 2003) as a result of population growth, employment growth and future land area requirements by industry (LandCorp 2003). The Kwinana area is the logical location for the location of heavy and general industrial because of the level of infrastructure present in the network of road, rail and port facilities, and the benefits presented by conglomeration of heavy engineering/ processing firms and physical connection of these (LandCorp 2003). By the same token, the situation of the Hope Valley-Wattleup Redevelopment Area adjacent to the KIA and its proximity to the same key infrastructure makes it a logical candidate for the extension of industrial development.

3.4 Transport Networks

3.4.1 Access to the Kwinana area by road

Perth's road and rail network, shown in Figure 21, is well developed and connects key industrial areas and major population centres.

FIGURE 21 PRIMARY RAIL AND ROAD FREIGHT ROUTES IN WESTERN AUSTRALIA



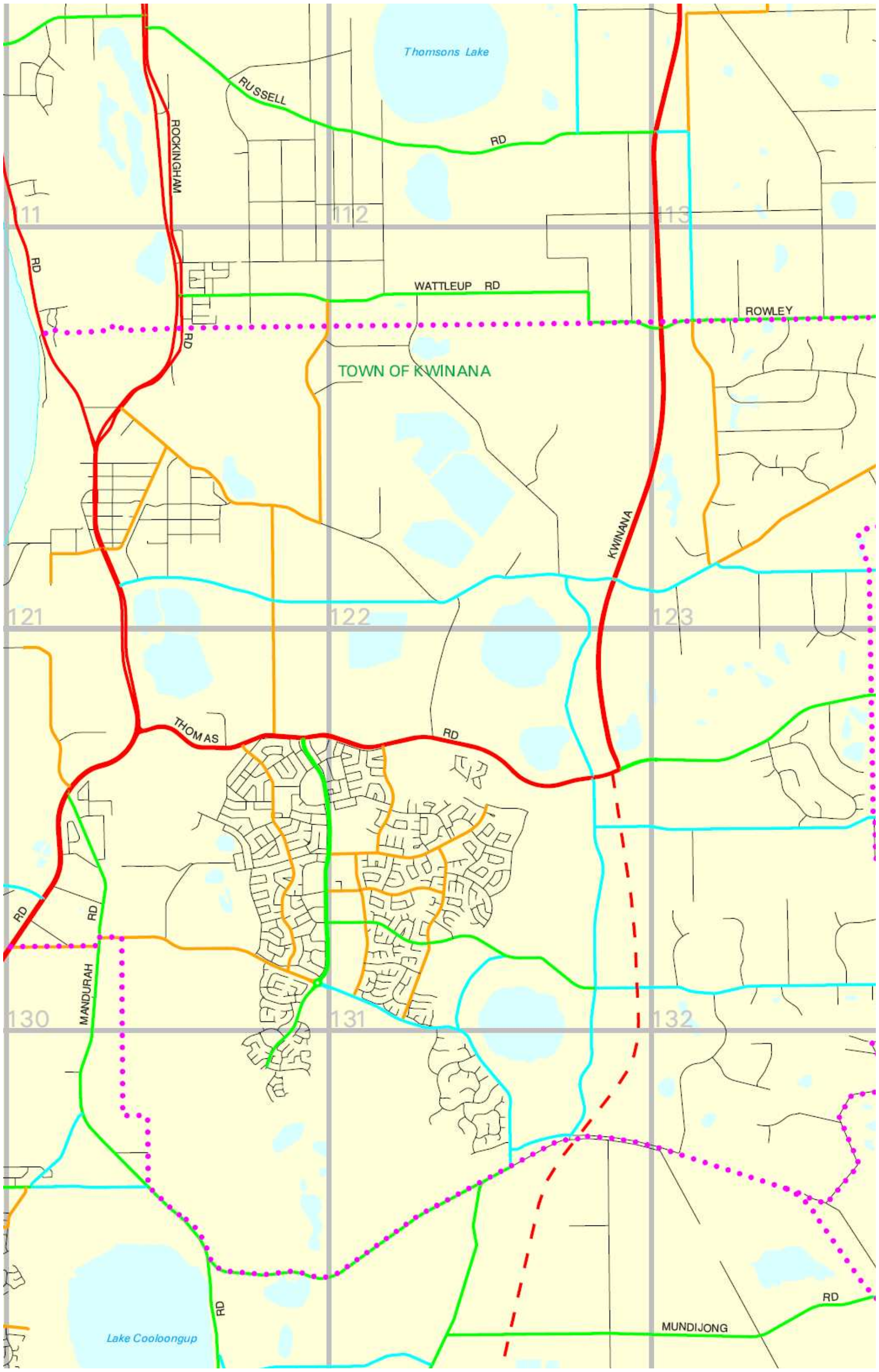
Several key rail and road transport linkages within the Kwinana Municipal Area have been identified as Primary Freight Routes[49]:

- Rowley Road west of the Kwinana Freeway (and its extension to Rockingham Road and beyond)
- Anketell Road (east and west of the Kwinana Freeway)
- Thomas Road (east and west of the Kwinana Freeway)
- Kwinana Freeway
- Proposed Fremantle/Rockingham Primary Regional Road Reserve
- Rockingham/Patterson Road
- Mundijong Railway as a Freight Rail Route

The level of access to Kwinana can also be gauged by assessing the designated functions assigned under the Main Roads WA 'Functional Road Hierarchy' to roads in the area. Roads are designated as one of four functional types. The criteria for each are outlined at Appendix C. The presence of Primary and District Distributors (type A and B) are most applicable in determining the level of access for freight vehicles to and from the Kwinana area. These roads are shown as red, green, and blue in Figure 22

[49] Draft Metropolitan Freight Strategy

FIGURE 22 ROAD FUNCTION CLASSIFICATION FOR KWINANA[50]



[50] http://www.mainroads.wa.gov.au/nr/mrwa/run/start.asp?G={START}

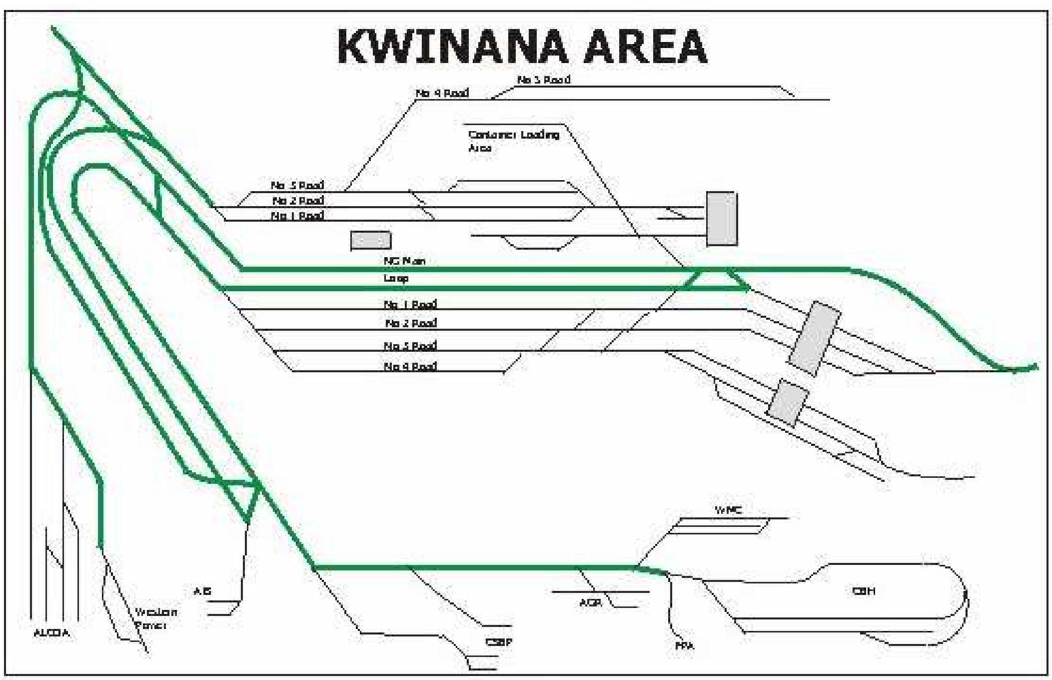
Although in general terms Kwinana is widely accessible from the highway network an access strategy would be required to assess the ability of specific sites to support an intermodal terminal.

3.4.2 Access to Kwinana area by rail

The rail network in Kwinana is used for the purpose of freight transport. Many companies also have track-side maintenance and storage depots, and there are numerous sidings in the area used to unload and load freight.

The rail inputs in Kwinana are predominately owned by the large manufacturers who rail inputs to Kwinana, companies in this group are Alcoa, Western Mining and in the future Hismelt; companies who use rail to move products out of Kwinana to their customers include Coogee Chemicals; CSBP who ship an estimated 30,000 TEU[50] to the ARG terminal at Kalgoorlie.

FIGURE 23 RAIL INFRASTRUCTURE IN THE KWINANA AREA[51]



3.4.3 Protection of freight routes in Kwinana

The protection of the key freight routes in Kwinana is largely dependant on the implementation of the Draft Metropolitan Freight Network Strategy. The freight Network Review (second congress) states that "the protection of intermodal facilities and access

[51] http://www.pta.wa.gov.au/scripts/viewoverview_contact.asp?NID=59

to these facilities, at Kewdale and Kwinana is critical to the future of the metropolitan freight system" (DPI, 2002).

A main thrust of the MFN is a logical approach to ensuring that freight generating land use and freight links are located so as to maximise the synergies between the two, while minimising the impact of freight movement on sensitive development. Several road infrastructure improvements under the MFN and DPI's 6 point plan such as the extension of Roe Highway will also assist in maintaining the integrity of Kwinana's freight routes.

Table 13 shows the length of road or rail in Kwinana abutting existing or planned urban development. While some freight routes are clearly less constrained or at risk from competing land use, several key routes namely, the Kwinana Freeway, Thomas Road and Anketell Road have significant frontage allocated to more sensitive land use.

TABLE 14 LENGTH OF ROAD OR RAIL IN KWINANA ABUTTING EXISTING OR PLANNED URBAN DEVELOPMENT[52]

Freight Links	Total Urban Frontage Distance Affected by Freight Routes
1. Kwinana Freeway	16.6
2. Thomas Rd	5.5
3. Anketell Rd	3.3
4. Rowley Rd	5.6
5. Mundijong Railway Line	1.5
6. Kwinana/Kenwick Fremantle Railway	0
7.Fremantle/Rockingham Highway	0
8. Rockingham Rd	0

Note for comparative purposes that the km does not take account of the total km of each road.

3.5 Potential demand for an intermodal terminal in Kwinana

The demand for intermodal services in Kwinana has been built up using a combination of existing forecasts for intermodal trade in Western Australia. These forecasts have then been segmented using industry analysis to determine what level of demand could be present at Kwinana over time.

3.5.1 Demand from International Trade (import/export movements)

The volume of freight that could be expected to be handled by a Kwinana based intermodal terminal is significantly affected by the design of the future Outer Harbour. If on-dock rail is incorporated in the design, then the proportion of the international task that would be handled by a second intermodal terminal in close proximity to the Outer Harbour is likely to be small.

[52] Ordinary Council Meeting, Town of Kwinana, September 2005

On-dock rail and its implications for a Kwinana based intermodal terminal

The current proposals for the future Outer Harbour include an on-dock rail facility that would function as an integrated part of the port-side operations. In this case most import containers travelling from the port by rail would generally travel directly to Kewdale or on dedicated shuttle trains to rail terminals outside of the metropolitan area. Similarly, export containers arriving at the port from Kewdale or the South West by rail would be off-loaded onto the wharf and then loaded onto the ship.

These approaches to cargo handling are typical of on-dock rail terminal operations in a number of other Australian ports. At Port Botany, for example on-dock facilities operate at both north and south Brotherson-docks. Similarly there are on-dock facilities at DP World's terminal at the Port of Adelaide and at the East Arm facility at the Port of Darwin.

If on-dock rail forms part of the Outer Harbour design, it is unlikely that a second intermodal terminal only three to five kilometres away in Kwinana would attract more than a minor proportion of the international container trade. It is however likely that some use would be made of a terminal in Kwinana, for example when import or export containers are added to a train that is primarily used for the carriage of inter- or intra-state cargoes. In this case, it will not be practical to take the entire train to an on-dock facility. Instead, the train is likely to use the terminal, and the import/export containers loaded (or unloaded) there. Transfer to and from the container terminals would be via road transport or specialised ITV's operated on dedicated lanes.

The Dynon terminal in Melbourne is currently used in this way to supplement on-dock facilities. Although the operations at the Port of Melbourne increasingly use on-dock rail facilities, some containers, mainly on non-dedicated trains, are transferred from near-dock facilities three kilometres away at Dynon. When the planned freight hub at Dynon becomes operational, this intermodal facility will also act as a staging post for freight moving in and out of the port.

A terminal in Kwinana could also serve as a 'buffer' facility to supplement the storage provided at the container terminals. In the event of a disruption that impacts on operations, Kwinana could provide temporary storage until the disruption is cleared thus allowing normal operation for other elements of the supply chain. Although there are on-dock facilities at Port Botany, near-dock intermodal facilities located a few kilometres away at the Cook's River facility also provides a buffer for container staging as well as for deconsolidation, container repairs, and storage of empties.

The distances between Cooks River and Port Botany, and Dynon and the Port of Melbourne container terminals are similar to the likely distance between a terminal located somewhere in the Hope Valley-Wattleup area - only a few kilometres. From this perspective Kwinana would be a realistic location for dynamic storage of containers that would be shunted between an intermodal terminal at Kwinana and the Outer Harbour Dock on either rail shuttles or small rapid transit vehicles.

Kwinana Intermodal Terminal in the absence of on-dock terminals

In contrast to on-dock rail facilities, near-dock facilities can serve several terminals and depending on the availability of land, can cater for a broader range of ancillary logistics services.

The intermodal terminal serving the Port of Brisbane is an example of a facility that is very near (but not on) the dock, and so export and import containers are transferred — albeit via a circuitous route — by 30-metre long super B-Double trucks that carry up to four 20-foot containers or two 40-foot containers between the railway and the two terminals operated by Toll (formerly Patrick) and P&O. While the location of the BMT involves extra handling of containers between rail and wharf, it does have the advantage of being positioned on nearly 700 hectares of land on which a broad range of port related and other transport and logistics activities have been developed.

If this operating model were adopted for the Outer Harbour, then all containers carried to and from the Outer Harbour by rail would pass through the terminal. To make this economical, transfer from the Kwinana Intermodal Terminal to the container terminals would need to be by high-productivity rubber-tyred vehicles. If this option were to be seriously considered, the road system linking the port and the intermodal terminal at Kwinana would need to be appropriately designed and upgraded to include a dedicated lane to support the unimpeded movement of containers. Under this scenario it may also be appropriate to consider making the road linkages between the port and the terminal, 'sterile' extensions of the port by making them freight-only thoroughfares. If this were to occur customs and AQIS processing could then take place at the terminal.

It is possible to extend this concept further and use the terminal as a transfer point for containers arriving at the port by road as well as those arriving by rail. In this case, it might be feasible to reduce the storage area behind the Outer Harbour wharf and directly transfer all containers to an intermodal terminal in Kwinana using high productivity rapid transit vehicles. However, in developing our forecasts of international container cargo handled by the terminal we have assumed that only the rail-based component of the import/export container task is routed through the terminal.

Likely international freight volumes using Kwinana

If the future Outer Harbour includes on-dock rail (low Scenario), the volume of trade that is likely to be handled by a Kwinana based intermodal terminal would be about 20,000 TEU or about 5 per cent of the Outer Harbour container task in 2015, with the proportion remaining unchanged over the next 20 years. This represents the minor buffer or staging post role played by the intermodal terminal and assumes that no action is taken by the State Government to bolster the proportion of import and export containers moved by road.

TABLE 14 INTERMODAL TRADE FORCASTS FOR KWINANA INTERMODAL TERMINAL

KIT share of Outer Harbour Market Share	2010	2015	2020	2025	2030	2035
Low with on-dock rail	0%	5%	5%	5%	5%	5%
Medium with on-dock rail	0%	5%	5%	5%	5%	5%
Medium w/o on-dock rail	0%	20%	30%	30%	30%	30%
High scenario - w/o on-dock rail	0%	20%	30%	33%	36%	39%

TABLE 15 INTERMODAL TRADE FORECASTS FOR KWINANA INTERMODAL TERMINAL

KIT share of Outer Harbour Vol ('000 TEU)	2010	2015	2020	2025	2030	2035
Low with on-dock rail	0	20	23	28	50	75
Medium with on-dock rail	0	20	23	28	50	75
Medium w/o on-dock rail	0	120	135	165	300	450
High scenario - w/o on-dock rail	0	120	149	198	390	600

The second scenario (medium with on-dock rail) reflected in Table 15 above assumes that although a higher overall share of freight may move by rail as opposed to road as a consequence of State Government policy initiatives – therefore increasing the volume of these sources of freight moving through an intermodal terminal at Kwinana, the Outer Harbour road and rail freight task and the proportion of this that flows through Kwinana would be the same as for the low volume scenario. This is because, just as with the low case scenario, the on-dock facility would render a Kwinana based terminal unnecessary for most of the port related freight task.

The third scenario (medium without on-dock rail) estimates the proportion of freight that an intermodal terminal at Kwinana could expect to handle if there was no on-dock rail at the Outer Harbour. According to this scenario, about 20 per cent of the Outer Harbour container task would be handled by rail at the time of the establishment of the Outer Harbour. This scenario assumes that over time the Kwinana Intermodal Terminal's role as an extension of the Outer Harbour will grow so that it will handle 30 per cent of import and export movements from 2020 onwards. In effect this means that Kwinana would be the Outer Harbour gateway for all of the import and export containers travelling by rail, while the remaining 70 per cent of import/export containers that move by road would travel directly to and from the Outer Harbour.

The fourth scenario (high), without on-dock scenario presents the most optimistic - and least likely picture of the volume of import and export freight moving through the Kwinana Intermodal Terminal. It anticipates that government policy initiatives would result in the rail mode share for port related freight increasing from 20 per cent in 2015 to nearly 40 per cent by 2035. This would mean that under this scenario Outer Harbour related container traffic is estimated to generate 120,000 TEU in 2015 increasing to 600,000 TEU in 2035.

As an extension of Scenario 4 (and subject to further assessment of the options available), it may also be possible to use Kwinana as the gateway to the Outer Harbour for all of the containers moving into and out of the port by road as well as by rail. If this was to occur then effectively this would lead to the creation of a landside international container terminal in the Kwinana area. The volume of containers expected to be handled at Outer Harbour in 2035 is approximately 1.5M TEU and the volume of containers that could be handled through a landside container terminal in 2035 would depend on the degree of coordination between the stevedores/shipping lines and landside logistics providers. If containers which are destined to be moved by rail are delivered direct to or from the Kwinana Intermodal Terminal from the Outer Harbour then the volume handled at the landside container terminal could be as low as 900,000 TEU. The volume handled could rise to 1.5M TEU through the landside container terminal if there was no direct movement, as is the case now in most Australian container terminals, between the rail and stevedoring operations.

The current productivity of landside container terminal operations has benchmarks of 30,000 TEU per Ha per year for the Port of Melbourne [53] and up to 40,000 TEU per Ha per year for world's best practice.[54] We would assume that container terminal productivity of current world's best practice would be standard in 2035 and therefore estimated that the additional land required to support a landside container terminal world range from 23 ha to 38 ha.

In addition to consideration of a landside international container terminal at Kwinana, consideration could be given to the option of reserving land for a container park in this area in the future. Land for a container park has not been allocated as part of the intermodal terminal footprint discussed in later sections of this report. A container park would be particularly relevant to Deepsea Empty containers which can wait long periods of time waiting to be collected. The management of deep sea empty containers is sometimes fragmented with each shipping line often managing its own containers. Both in Melbourne and Sydney empties are held in numerous container parks both close to and far away from the port.

3.5.2 Demand from Inter-state Trade

Future population growth and patterns of demand

In 2016, the import and export tasks are likely to be roughly double their current level and the inter-state task about one and half times the current level. One of the key drivers of this growth is the expected growth in population during that time. Between 2005 and 2031 Western Australia's population will increase steadily at an average annual rate of 1.3 per cent, moving from the 2005 level of 2,016,500 to 2,800,700.

The geographical pattern of distribution centres for retail business will be influenced by (though of course not entirely determined by) where this population growth occurs.

Table 16 shows that the area with the highest average annual growth rate - at 2.7 per cent is Peel, just south of Kwinana. The South West, which could also be a catchment area for inter-state and intra-state consumables and industrial inputs (as well as exports and imports which could be a source of demand for a Kwinana Intermodal Terminal), is expected to experience population growth only slightly below that of the Perth Metropolitan area.

[53] PoMC Port Development Plan
[54] Drewry Shipping publications and Presentations 2006

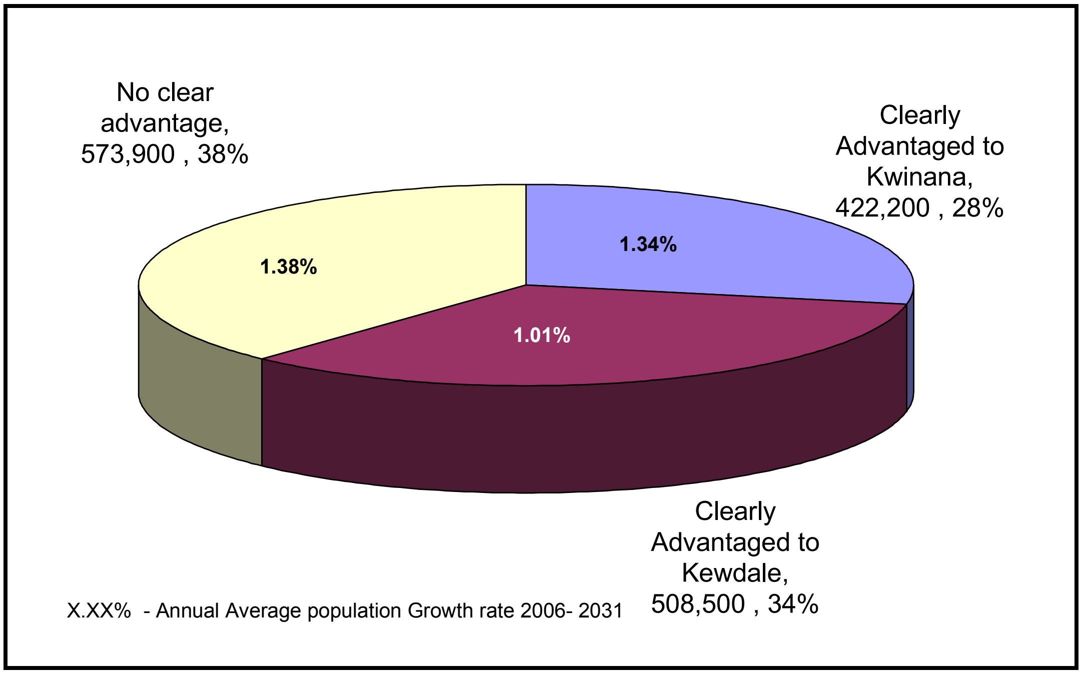
TABLE 16 WESTERN AUSTRALIAN POPULATION GROWTH ESTIMATES 2005-2031

Planning Regions	2005	Average annual growth rate	2016	Average annual growth rate	2031
Gascoyne	10,500	0.7%	1,300	0.3%	11,300
Goldfields - Esperance	55,900	0.8%	60,900	0.6%	65,400
Great Southern	54,600	0.8%	59,900	0.6%	63,800
Kimberley	37,200	3.0%	51,400	2.5%	70,400
Metropolitan	1,475,800	1.5%	1,734,300	1.3%	2,043,500
Mid West	51,200	0.7%	55,400	0.5%	58,100
Peel	79,300	3.2%	112,100	2.7%	158,400
Pilbara	42,100	0.9%	46,600	0.7%	50,200
South West	138,700	1.6%	165,400	1.2%	189,800
Wheatbelt	71,200	1.0%	79,100	0.9%	89,900
Western Australia	2,016,500	1.5%	2,376,400	1.3%	2,800,700

Using data on expected growth in firstly the metropolitan area and secondly Western Australia defined by planning zones, a cursory assessment has been made of the accessibility of populations to distribution centres in both Kewdale and Kwinana, and how this will change over the next 25 years. A subjective assessment was made for each area, taking into account the road transport system and distance. The results are shown in Figure 24.

This indicates that by 2016, Kewdale has a locational advantage to about 56 per cent of the metropolitan area while Kwinana is more accessible to about 38 per cent (relative distance at a particular time). The advantage offered by Kewdale, however, lessens in relation to its accessibility to the state as a whole. This is in part because of the relatively high population growth in the metropolitan coastal areas south of Perth in combination with high rates of growth in the non-metropolitan areas of Peel and the South West.

FIGURE 24 ACCESSIBILITY TO POPULATION FROM KWINANA AND KEWDALE



Given the possible changes in the locational advantage of Kewdale and Kwinana it is also useful to consider whether existing distribution centres, in particular Kewdale, would handle cargo moving to and from the same locations as those handled by a Kwinana based distribution facility; or whether over time each of the distribution centres would service different locations or distinctively different commodities.

As an example, if the current distribution practices of the large supermarkets were to continue this would suggest the emergence of overlapping use of competing distribution systems. Large players such as Coles and Woolworths might continue with the current practice of using a single centralised distribution centre from which to transport their products to all of their supermarkets.

How significantly this will influence logistics behaviour depends on history – and in particular on the established practice of significant wholesalers and retailers. Those that already have centres at other sites in Western Australia may concentrate on growing these sites, even if, on a green fields assessment basis, Kwinana was a more attractive location. This would certainly be consistent with the logistics strategies of the last decade, which have clearly favoured increasing consolidation.

There is little doubt that Kewdale will remain the primary centre for metropolitan supply chains serving the retail sector. Nevertheless, the expected strong population growth in the south west metropolitan area, and in the South West region, will encourage diversification, especially in those chains with a close relationship to domestic construction and related activities.

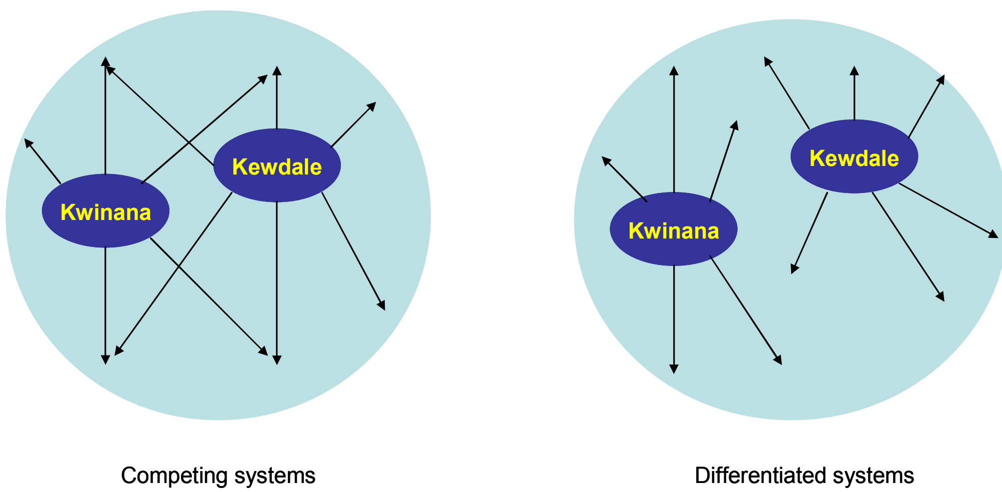
Moreover current distribution strategies were formulated in the early to mid 1990s. They reflect a decision to accept increased local distribution in order to lower inventory costs and product wastage.[55] However the environment in which these strategies were

[55] This second benefit is achieved because consolidation facilitates production to order, reducing the need to rely on estimates of future demand to determine production schedules. The result is a more precise match between supply and demand.

devised was one of relatively high interest rates and very low fuel costs. It is at least arguable that we have now entered an era in which interest rates are and will remain low by historical standards, and fuel costs will be high. In addition, social resistance to unnecessary transport activity is almost certain to increase. When and if these conditions are accepted as the background against which logistics decisions must be made, strategies may change. It might become more efficient to adopt a differentiated distribution system with a number of distribution centres dedicated to servicing nearby markets.

Therefore development of a Kwinana logistics centre, if it occurs, could take one of two forms or a combination of these two. The two forms are shown schematically in Figure 25.

FIGURE 25 POSSIBLE LOGISTICS SERVICE PATTERNS



The extent to which it takes the form of differentiated, complementary distribution centres is likely to reduce local distribution costs. The size of the cost reduction in this case is likely to be large. On the other hand, the extent to which it takes the form of competing systems will make the effect more ambiguous, but the most probable outcome is an increase in local distribution costs. However, the difference in accessibility to population between Kwinana and the main established logistics precinct, the Kewdale/Forrestfield/Canning Vale area, is small and likely to decrease over time.

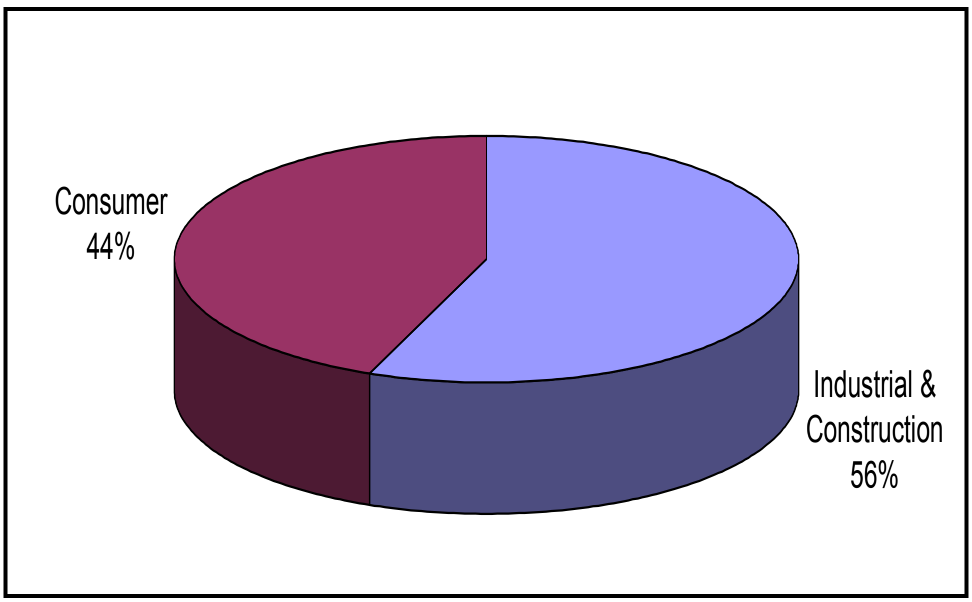
The diversity of supply chains

A related consideration is that, although the major retailers control an important share of importing, they do not control the whole market. There are a large number of independent logistics systems operating. Although we have done no analysis of this, we suspect that, in the case of Fremantle, the share of the major retailers in the local retail distribution market is much lower than it is in Melbourne or Sydney. This is because so much of their imports are brought in through Eastern States ports and distributed through national centres. Importers through Fremantle, therefore, are likely to have a lower share of goods for these operators than the national average.

Many of these logistics systems serve specialised markets, the geographical distribution of which may not be that of the major retail outlets. A differentiated distribution system may better support specialised markets such as industrial inputs, manufacturing equipment, and building products which may be in just a few concentrated locations, including Kwinana. If this is the case and if the average distance from a Kwinana based intermodal terminal to the cargo's final destination is lower than the average distance from Kewdale to the cargo's final destination, it is reasonable to believe that demand for some of these commodity groups would favour a distribution node in the South West near Kwinana.

The importance of industrial products in intermodal movement should not be understated. Industrial goods and construction materials comprise over 50 per cent of inter-state rail movements as shown in Figure 26. These goods also dominate intra-state intermodal movements. Kwinana is clearly a desirable location from the perspective of these supply chains.

FIGURE 26 FREIGHT GENERATED BY CONSUMER, INDUSTRIAL AND CONSTRUCTION SECTORS (INTER-STATE RAIL)



Likely inter-state volumes using a intermodal terminal in Kwinana

In developing estimates of how the inter-state trade would be split between the current intermodal terminals and a new terminal we believe that the Kewdale/Forrestfield terminals are likely to remain the pre-eminent hub with major anchor clients expanding activity in this area.

The *low* scenario assumes that:

- Kewdale's pre eminence continues and that the Kwinana Intermodal Terminal is only able to attract a low share of the inter-state rail trade.

As discussed the majority of inter-state rail trade has an industrial /construction goods component. The *medium* scenario assumes that:

- a number of industrial /construction goods supply chains relocate to the Kwinana Intermodal Terminal; and
- due to the population shift a number of supply chains in the consumer component also relocate to Kwinana.

The *high* scenario assumes that:

- over time the majority of the industrial /construction goods supply chains relocate to the Kwinana Intermodal Terminal; and
- due to the population shift a greater number of supply chains in the consumer component also relocate to Kwinana.

TABLE 17 INTER-STATE TRADE FORECASTS FOR KWINANA INTERMODAL TERMINAL

KIT share of Inter-state Trade Market Share	2010	2015	2020	2025	2030	2035
Low	5%	8%	11%	12%	13%	14%
Medium	7%	11%	15%	19%	23%	27%
High	10%	20%	30%	35%	38%	39%

3.5.3 Demand from Intra-state Trade

In developing estimates of how the intra-state trade would develop we have assumed that the majority of the intra-state trade would relocate to the Kwinana Intermodal Terminal, as much of the current intra-state rail trade originates in Kwinana (See appendix D).

Growth rates for the low, medium, and high scenarios were based on industry interviews.[56]

[56] Consultant discussions with Freight Owners and Forwarders Jun – Aug 2006

TABLE 18 INTRA-STATE TRADE FORECASTS FOR KWINANA INTERMODAL TERMINAL ('000 TEU)

Intra-state Trade using KIT	2005	2010	2015	2020	2025	2030	2035
Low Growth @ 2.0%	0	55	61	67	74	82	91
Medium Growth @ 4.1%	50	61	75	91	112	137	167
High Growth @ 5.5%	50	65	85	112	146	191	249

3.5.4 Kwinana intermodal Demand Scenarios

The four intermodal demand scenarios cover the key drivers which would influence the land required and the operations carried out at a new intermodal terminal at Kwinana. The drivers include:

- a range of freight task volumes, low, medium and high
- a mix of inter-state, international and intra-state cargos and different train lengths
- the effect of on-dock rail at Outer Harbour.

Low Level Scenario

TABLE 19 LOW LEVEL SCENARIO FOR KWINANA INTERMODAL TERMINAL – ASSUMPTIONS

Segment	Assumption	2010	2015	2020	2025	2030	2035
Share of Inter-state rail	There is a low level of distribution centre activity in the Kwinana area	5%	8%	11%	12%	13%	14%
Share of international rail at Outer harbour	There is on-dock rail at the Outer Harbour container terminal	0%	5%	5%	5%	5%	5%
Growth in Intra-state rail task	There is a slow growth of intra-state rail activity in the Kwinana area	2%	2%	2%	2%	2%	2%

TABLE 20 LOW LEVEL SCENARIO FOR KWINANA INTERMODAL TERMINAL – DEMAND FORECASTS ('000 TEU)

	('000) TEU					
Segment	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Inter-state	52	84	107	134	167	206
International	0	20	23	28	50	75
Intra-state	55	61	67	74	82	91
Total	107	165	196	235	299	372

Medium Level Scenario (On-dock Rail)

TABLE 21 MEDIUM LEVEL SCENARIO (ON-DOCK RAIL) FOR KWINANA INTERMODAL TERMIINAL - ASSUMPTIONS

Segment	Assumption	2010	2015	2020	2025	2030	2035
Share of Inter-state rail	There is a medium level of distribution centre activity in the Kwinana area	7.%	11%	15%	19%	23%	27%
Share of international rail at Outer harbour	There is on-dock rail at the Outer Harbour container terminal	0%	5%	5%	5%	5%	5%
Growth in Intra-state rail task	There is a medium growth of intra-state rail activity in the Kwinana area	4%	4%	4%	4%	4%	4%

TABLE 22 MEDIUM LEVEL SCENARIO (ON-DOCK RAIL) FOR KWINANA INTERMODAL TERMIINAL – DEMAND FORECASTS ('000 TEU)

	('000) TEU					
Segment	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Inter-state	72	115	169	236	321	413
International	0	20	23	28	50	75
Intra-state	61	75	91	112	137	167
Total	133	210	283	376	508	655

Medium Level Scenario (No On-dock Rail)

TABLE 23 MEDIUM LEVEL SCENARIO (NO ON-DOCK RAIL) FOR KWINANA INTERMODAL TERMIINAL - ASSUMPTIONS

Segment	Assumption	2010	2015	2020	2025	2030	2035
Share of Inter-state rail	There is a medium level of distribution centre activity in the Kwinana area	7%	11%	15%	19%	23%	27%
Share of international rail at Outer harbour	There is no on-dock rail at the Outer Harbour container terminal	0.%	20%	30%	30%	30%	30%
Growth in Intra-state rail task	There is a medium growth of intra-state rail activity in the Kwinana area	4.%	4%	4%	4.%	4%	4%

TABLE 24 MEDIUM LEVEL SCENARIO (NO ON-DOCK RAIL) FOR KWINANA INTERMODAL TERMIINAL – DEMAND FORECASTS ('000 TEU)

	('000) TEU					
Segment	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Inter-state	72	115	169	236	321	413
International	0	120	135	165	300	450
Intra-state	61	75	91	112	137	167
Total	**133**	**310**	**395**	**513**	**758**	**1030**

High Level Scenario (No On-dock Rail)

TABLE 25 HIGH LEVEL SCENARIO (NO ON-DOCK RAIL) FOR KWINANA INTERMODAL TERMINAL – ASSUMPTIONS

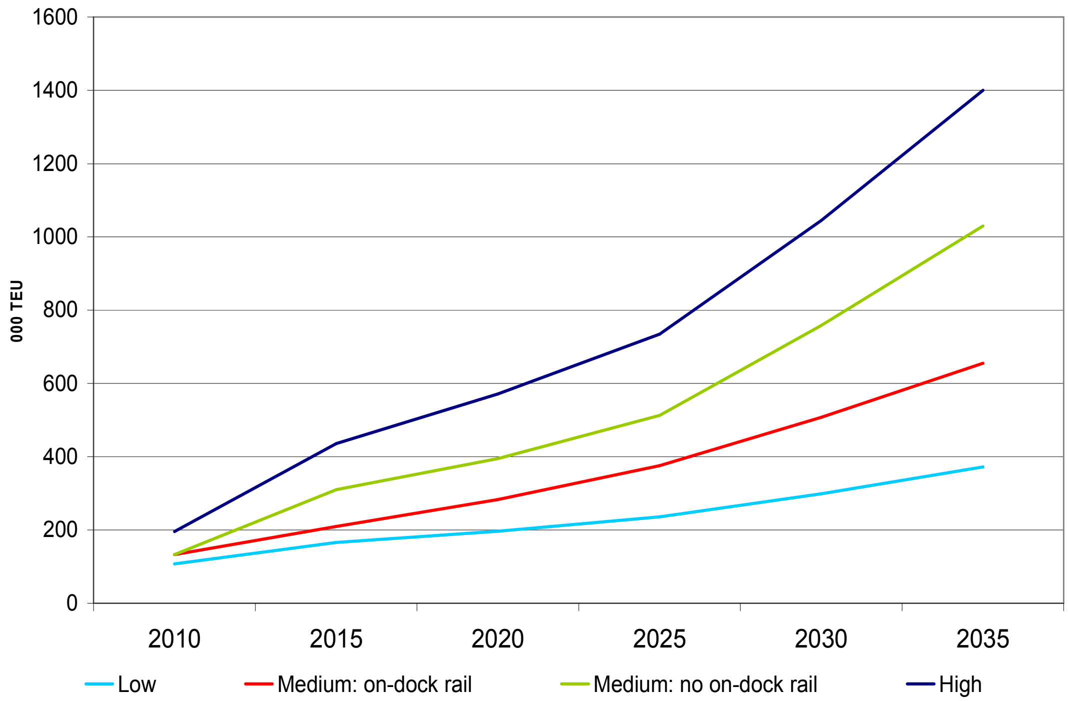
Segment	Assumption	2010	2015	2020	2025	2030	2035
Share of Inter-state rail	There is high development of distribution centre activity in the Kwinana area	10%	20%	30%	35%	38%	39%
Share of international rail at Outer harbour	There is no on-dock rail at the Outer Harbour container terminal. The rail mode share targets for the Outer Harbour are exceeded	0%	20%	30%	33%	36%	39%
Growth in Intra-state rail task	There is a high growth of intra-state rail activity in the Kwinana area	5.5%	5.5%	5.5%	5.5%	5.5%	55%

TABLE 26 HIGH LEVEL SCENARIO (NO ON-DOCK RAIL) FOR KWINANA INTERMODAL TERMINAL – DEMAND FORECSTS ('000 TEU)

	('000) TEU					
Segment	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Inter-state	130	230	311	391	464	550
International	0	120	149	198	390	600
Intra-state	65	85	112	146	191	249
Total	**196**	**436**	**571**	**734**	**1044**	**1400**

Growth over time in each of the four scenarios for demand of intermodal services at a new Kwinana Intermodal Terminal is shown in Figure 27.

FIGURE 27 POTENTIAL INTERMODAL DEMAND AT KWINANA 2010 - 2035



Terminal Viability

There is no definitive answer to what makes an intermodal terminal viable; there are efficient intermodal terminals which handle as few as 10,000 TEU per annum, although these tend to be 'glorified rail heads'. Equally intermodal operations at Somerton for example, were not viable until the terminal attracted a number of significant tenants who have distribution operations and use rail as part of their supply chain.

The viability of an intermodal terminal is a function of a number of different factors including the:

- type of terminal and other services offered. A greater range of services enables more value to be obtained and can make low revenue operations possible when a 'bundle' of terminal services is provided;
- scale of the operation;
- type of control that the terminal operator has over the terminal; and
- nature of the cargo the terminal handles and the relative demand and supply issues that the cargo has. Terminals handling agricultural commodities in regional areas are a good example with many terminals in NSW that handle cotton or rice ceasing operations over the last five years due to the impact of drought.

3.6 Conclusion

Based on the site requirements in section 3.1 there are few if any viable alternatives to Kwinana as the location for a second major intermodal terminal in the Perth metropolitan area.

Kwinana also rates well from a demand perspective because of:

- the importance of industrial and construction goods in the freight mix
- its accessibility to much of the metropolitan population base
- the strong growth prospects of the South West region
- the possibility of significantly supplementing domestic intermodal freight with import/export freight through the Outer Harbour.

4 Characteristics of a new intermodal terminal in Kwinana

This section examines the physical requirements and operational characteristics that are essential to the success of an intermodal terminal. It will also discuss some of the trends in intermodal design in Australia and in Europe. A range of options for the governance and management of a new intermodal terminal is presented.

4.1 Terminal characteristics

Each intermodal terminal is different, yet all have common features:

- the differences between terminals arise from the nature and volumes of the freight that passes through the terminal, how the freight is handled and the extent of value adding activities that take place while the freight is within the intermodal terminal;

- the commonality between terminals arises from the need to perform similar process such as loading, storage, and transfer.

4.1.1 Defining characteristics of intermodal terminals

The defining characteristic of intermodal terminals is the transfer of non-bulk freight between rail and road transport. The core services offered by an intermodal terminal include, but are not limited to:

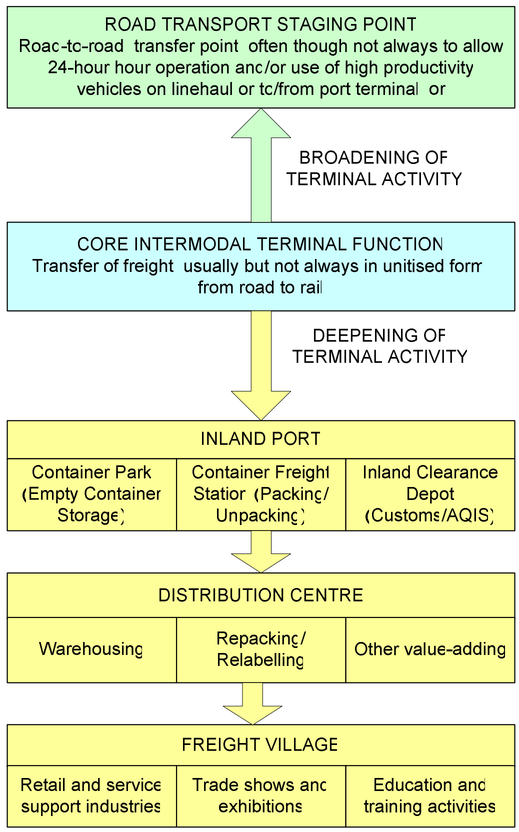
- a rail siding, spur or loop
- road access for trucks carrying containers
- working areas to allow containers and/or units to be removed from or loaded out to rail wagons
- hardstand for short term storage of empty or full containers
- provision and operation of the lifting equipment required to transfer containers to/from rail transport to the storage area (and in the case of inland terminals, from trucks to storage)
- management of both hard and soft infrastructure to facilitate the seamless movement of goods and containers through the facility. This includes a number of necessary support activities that take place at a terminal such as, maintenance of the infrastructure and machinery used on the terminal, traffic management associated with the road and rail (for a road/rail intermodal terminal) operations, control of access and egress by vehicles, and accepting, processing and generating transit and other documentation.

4.1.2 Scope of activities

Simple intermodal terminals confined to the core services above play an important role in facilitating the efficient movement of freight and in helping to achieve broader objectives of government such as encouraging greater rail participation in the freight task.

However, the range of activities that are undertaken in or in conjunction with, an intermodal terminal is potentially much wider. Figure 28 shows, this can entail both the broadening and deepening of the role of the terminal (or terminal-focussed complex).

FIGURE 28 OPTIONS FOR BROADENING AND DEEPENING INTERMODAL TERMINAL ACTIVITY



4.2 Design success factors

Irrespective of the particular set of ancillary activities that are co-located with intermodal terminals, there is no doubt that an increasing trend is to intensify the use of the terminal and its surrounding land for mutually beneficial economic and *sometimes* social activities. A number of characteristics are becoming increasingly common in the design of intermodal facilities. These include:

- positioning the rail siding, spur or loop so that it is capable of accessing nearby warehousing and distribution facilities
- having facilities for storage and handling of perishable goods
- co-locating road-to-road cross-docking activities to facilitate the dispatching of consignments into smaller loads for local delivery

- co-locating at the site, train support functions such as wagon storage, fuel, and maintenance, cleaning and crew facilities

- providing customer support services that reduce cargo handling and increase supply chain efficiency.

Other important factors are discussed in the following sections.

4.2.1 Availability of adequate area of land

When land is made available to relevant markets, there is a tendency for industrial operations and other transport and logistics operations to gravitate to an intermodal terminal. Local examples of this phenomenon are seen at places such as Acacia Ridge, Fisherman's Island and Kewdale itself (and the neighbouring areas of Forrestfield and Cannington), where Woolworths and Coles have established their distribution centres, or at Fishermans' Wharf where the land surrounding the Brisbane Multi-Modal Terminal – a near-dock rail facility – has been exploited for the development of a very broad range of complementary transport and logistics activities.

4.2.2 Co-location of ancillary logistics activities

The reciprocal attraction of trade through an intermodal hub and the co-location of activities that benefit from the proximity of the hub facilities are well documented. Take for example the comments below from a UK based study[57] on intermodal hubs:

"Rail linked warehousing allows for raw materials and finished products to be moved by rail for storage, processing and onward distribution. They may be used by single companies such as retailers, or as part of a logistics operation serving a range of customers. Onward distribution from the Strategic RFI can be by rail, but is most commonly by road.
There are economic benefits in businesses being located at Strategic RFI, by taking out the 'last-mile cost' - being the expense of the road link from the Strategic RFI to the warehouse or factory. The transport economics of businesses connected to rail at one or both ends of the freight movement are materially improved, significantly reducing the economic minimum rail trunk distance which businesses will find commercially acceptable."

Warehouse and distribution activities have gravitated to Kewdale and it is also possible, if the other pre-conditions prevail, that shippers and or freight forwarders may find an intermodal terminal at Kwinana a magnet for the establishment of alternative or additional distribution activities, especially if there is adequate demand for road freight movements within easier reach of Kwinana than Kewdale.

Warehousing and other businesses that may at the moment utilise Kewdale as the rail-road interchange point may want to keep their options open to use Kwinana in the future. In the meantime, they may use a Kwinana hub as a road to road interchange. If an intermodal terminal in Kwinana is developed as part of a hub, the location could be attractive to businesses keen to reduce their transport costs when they are ready to make the necessary changes.

[57] Strategic Rail Authority, *Strategic Rail Freight Interchange Policy*, UK, 2004, page 11

4.2.3 Encourage road to road interchange

There are two reasons for attracting road to road interchange activities to an intermodal hub.

The first and most direct is to provide truck to truck staging facilities. These are important in helping freight forwarders and the port to better control the flow of freight between the port and the origin or destination of the freight. The intermodal hub acts as a staging post for temporarily storing large imported freight loads before they are transported in smaller consignments to disparate metropolitan destinations or moved to the port in time for shipment. Sometimes the staging post is a way of alleviating the difficulties that arise from differences of hours of operation. Although this use of the hub could involve extra handling and storage costs, these can be offset by higher truck utilisation, and greater predictability in pick-up and delivery times, and a smoothing out of the time profile of trucks in and around the port area.

4.3 Emerging trends

4.3.1 Europe – freight villages

In Europe, in particular, it is increasingly common to use intermodal terminals as a focal point for the development of a cluster of logistics related activities.

At its most sophisticated, the integrated multi-functional approach gives rise to what has become known as a 'freight village', such as the Daventry International Freight Terminal in the UK midlands or the Quadrante Europa Freight Village in Verona in northern Italy.

The Europlatforms EEIG defines a freight village as:

" a defined area within which all activities relating to transport, logistics and the distribution of goods, both for national and international transit, are carried out by various operators. These operators can either be owners or tenants of buildings and facilities (warehouses, break-bulk centres, storage areas, offices, car parks, etc...) which have been built there. Also, in order to comply with free competition rules, a freight village must allow access to all companies involved in the activities set out above. A freight village must also be equipped with all the public facilities to carry out the above mentioned operations. If possible, it should also include public services for the staff and equipment of the users. In order to encourage intermodal transport for the handling of goods, a freight village must preferably be served by a multiplicity of transport modes (road, rail, deep sea, inland waterway, air). Finally, it is imperative that a freight village be run by a single body, either public or private". [58]

The Quadrante Europa in Verona exemplifies this trend. The Freight Village combines transport and other industrial activities on one integrated site. Located at the intersection of major motorways and rail lines and the Verona -Villafranca airport, this freight village is designed to handle cargo that is moving by road, rail or air

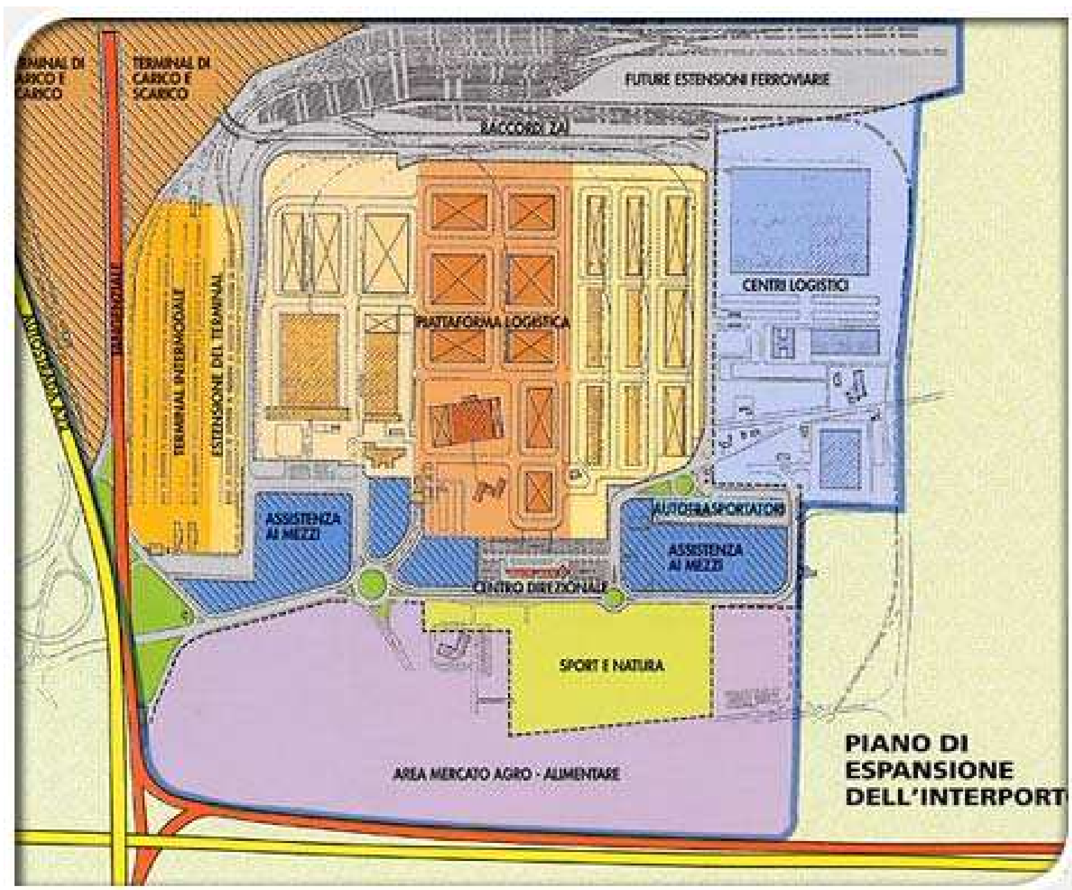
[58]Appendix to the Statute of Europlatforms E.E.I.G. Europlatforms is an association of the European freight villages (in Italy, France, Spain, Denmark, Germany, Portugal, Luxembourg, Greece, Poland), whose main objectives are to support and promote the strategic role of freight villages and intermodal terminals as regards the transport and logistics activities development.

between Italy and other European countries, in particular places in northern and Eastern Europe as well as Spain and France.

From the time of its establishment more than 30 years ago, its intended purpose has been to rationalise transport services and to contribute to the economic development of the Veronese area. It covers 250 hectares with more than 100 companies and 1800 employees involved in a very broad range of transport services and other industries that benefit from the close proximity and shared access to transport resources.

A potential limiting consideration for the integration of multi-functional activities within an intermodal terminal at Kwinana is the need to ensure that the freight village concept does not result in incompatible land uses within the Kwinana Industrial Area buffer.

FIGURE 29 INTERPORTO DI QUADRANTE EUROPA VERONA



4.3.2 Australia – transport and logistics clusters

In Australia the recent trend is similar. The Fisherman's Island complex at the Port of Brisbane is being developed around the Brisbane Multi-modal Terminal in this way. It is also an increasing trend with intermodal terminals such as the LOGIC industrial hub in Wodonga, Enfield Logistics Centre in Sydney and the Bathurst Business Park in Victoria that are in various stages of planning or construction.

FIGURE 30 EMERGING INTERMODAL HUB DESIGNS IN AUSTRALIA - ENFIELD

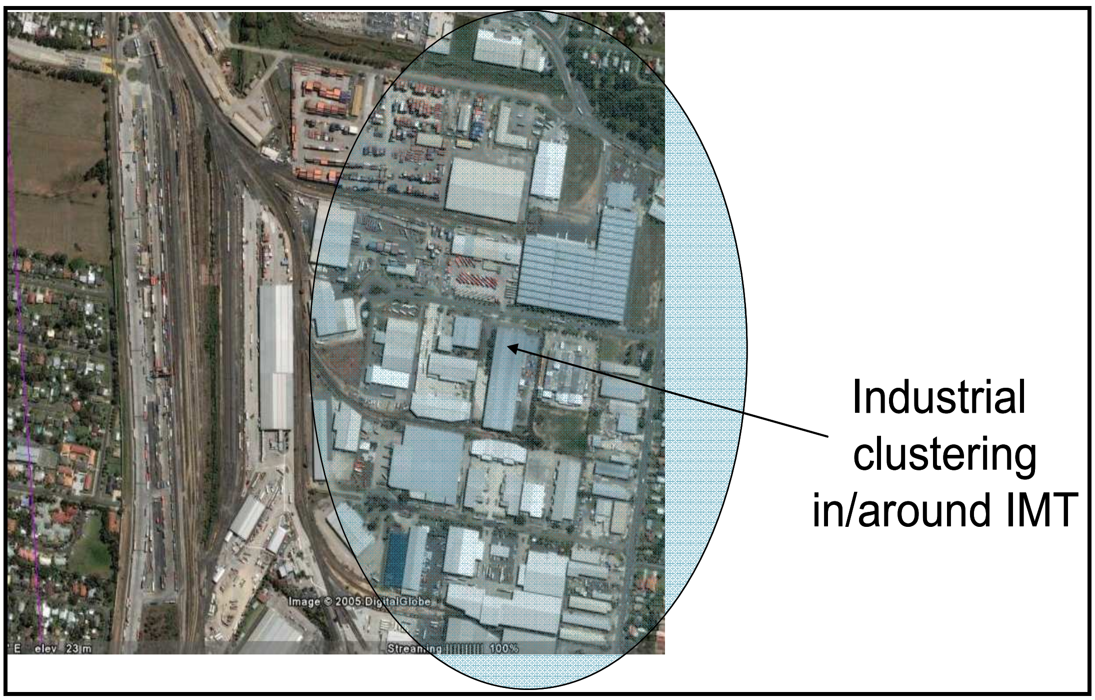
4.3.3 Acacia Ridge

The Acacia Ridge terminal in Brisbane provides a good example of a metropolitan hub that has acted as a magnet for industrial clustering as well as being a cost effective way of moving manufactured products headed south and north.

Located 14 kilometres south of Brisbane it handles inter-state, intra-state and a little international freight in two separate terminals: a standard gauge terminal, and a narrow gauge terminal, both of which are owned and currently operated by Queensland Rail. The estimated container throughput for 2004-2005 was around 380,000 TEU'S (Meyrick 2006).

The majority of inter-state freight moved by rail between Brisbane-Sydney and Brisbane-Melbourne (via Sydney) uses the standard gauge terminal; whereas, the narrow gauge terminal handles most of the container freight destined for locations to the north of Brisbane. (Meyrick 2006).

FIGURE 31 ACACIA RIDGE INTERMODAL TERMINAL



The terminal can handle 1,000m trains, but most infrastructure is suited to 850m or less.

The narrow-gauge terminal has two container loading tracks of around 400m loading lengths, as well as an adjacent marshalling yard used for splitting trains, handling non-container trains, and storing container wagons.

On the narrow-gauge network, there are 61 services per week (35 north, 36 south), with train lengths of a maximum of 650 m lengths (mostly 500-550m) and relatively frequent shunting trip trains between Acacia Ridge and Moolabin.[59]

[59] GHD/Booz Allen Hamilton, *SEQ Freight Intermodal Terminal Study* : Stage 2 (draft), 2004

4.3.4 Wodonga Intermodal Rail Terminal at LOGIC Wodonga

The Wodonga City Council is supporting the development of a rail terminal and associated infrastructure at its 440 hectare industrial park, LOGIC Wodonga. The terminal site lies 14km to the south of Wodonga at Barnawartha along the main inter-state rail line between Melbourne and Sydney. It is 230km from Melbourne and 580km from Sydney. Location of the intermodal yard directly adjacent to the rail interface will allow for the loading and unloading of standard containers (truck to/from train or train to/from site storage). Existing forecasts for road and rail volumes in the next few years are 5-10,000 TEU moving from Logic increasing to 100,000 over 20 years, with Woolworths as the major user.

The intermodal Freight Terminal is proposed to be an open access facility owned by the City of Wodonga and managed by the nominated terminal operator. The council has constructed an ownership model which encourages open access at the terminal - they maintain ownership of the land and the terminal and have leased the site for 20 years.

The primary purpose of the terminal is to provide rail access to the tenants of the LOGIC industrial park. The configuration of the terminal will need to accommodate trains of up to 1800m as well as access to adjacent private sidings for bulk or general freight use. To minimise land acquisition the terminal will be sited entirely outside the VicTrack owned rail reserve and separated from non-terminal areas by security fencing.

FIGURE 32 EMERGING INTERMODAL HUB DESIGNS IN AUSTRALIA – WODONGA LOGIC

4.4 Physical and operational requirements of an intermodal terminal

The following sections will discuss particular issues in designing an intermodal terminal and integrate the demand forecasts from the previous section to develop an estimate of the likely operating characteristics and the physical requirements of a new intermodal terminal in Kwinana.

The physical requirements of a new intermodal terminal in the Kwinana area will depend upon a wide range of factors:

- the level of terminal throughput, which could vary significantly, depending upon the actions of other parties in particular as to how rail operations at the new Outer Harbour container terminal will be conducted

- the source of the terminal throughput, as the trains on the inter-state, international, and intra-state services will have different characteristics and often not complementary needs which make the optimisation of an intermodal facility a challenging task

- the role of the intermodal terminal, which as discussed in the previous section could range from a pure rail/road exchange, to an inland port, to a freight village which incorporates a range of value adding activities within the intermodal terminal precinct

- the size of a new terminal at Kwinana will depend on size and frequency of trains and how the cargo is handled. The land footprint occupied by the terminal will depend on the road and rail access arrangements to and from the terminal and buffer zone requirements.

4.4.1 Topography

Contours indicate that achieving a level site, of the size required, adjacent to this section of the Perth-Kwinana rail corridor will require significant earthworks. In some areas up to 25m cuts could be required. In other areas the existing level is well below track level and/or incorporates quarries etc. Areas requiring filling may cause problems with differential settlement. Settlement will cause ongoing maintenance problems because rail tracks and gantry crane runways must be maintained perfectly level and container pavements should be flatter than 1:100.

4.4.2 Rail site layout

The rail terminal area is best placed if parallel/adjacent to the main line so that in the longer term it can be connected at both ends to the main line. Connection at both ends is important to allow for rail operational flexibility and avoid a bottleneck at the main rail entrance, in this case the Northern end. It also ensures that maintenance/failures of the turnouts at the main entrance don’t close down terminal operation. The volumes predicted indicate that this site will ultimately become a high throughput terminal comparable to some of the largest presently in Australia.

4.4.3 Container handling equipment

For a high throughput terminal, which Kwinana would become, the turnaround time for trains is critical. There is little that can be done to reduce arrival and departure shunting durations, therefore the pressure will be on reducing the unloading/loading duration.

The most efficient method of processing containers off and onto the train is by using gantry cranes. There are two types of gantry cranes; rail mounted gantry (RMG) cranes and rubber tyred gantry (RTG) cranes. The limitation with RMGs is that the runway rails must be perfectly straight and level. Therefore the sidings beneath must also be straight and parallel. Although RTGs have the advantage that they can operate along a curved alignment and even on slight gradients (up to 1:100 in extreme situations), recent advice from some terminal operators is that they want to avoid RTGs if at all possible because of their inherent higher maintenance requirements and longer down time.

The handling rate of RMGs can vary significantly depending on how sophisticated the equipment is and the efficiency of the rail operation and ancillary container delivery/removal processes. For the purposes of this study an annual rate of 150,000 TEU is considered to be a reasonable average.

It is possible to use heavy forklift trucks for smaller container volumes provided access is available to each rail siding. If there are two sidings with access from one side only then heavy lift reach stackers can be used. The time taken to process containers using either of these types of vehicles is much greater than Gantry Cranes. When train turnaround time in the terminal is not critical then forklifts and reach stackers can be used efficiently as they can also transfer containers to the warehouse and to the storage area.

4.4.4 Train configuration

It is anticipated that the majority of trains servicing this site will be standardised to the following configurations:

- Inter-state (~70 per cent) – 1,800m
- Inter-state (Expresses ~30 per cent) – 1,200m
- Intra-state (some also 800m) - 600m
- Port Shuttle (eg. to new Outer Harbour) - 300m

The assumptions in calculating the capacity of each of these configurations are:

- the train length quoted includes the locomotives (assumes 1800m train – 3 locomotives, 1200m train – 2 locomotives, 600m & 300m trains 1 locomotive).
- The remaining (wagon rake) length has unusable areas between wagons. Depending on wagon geometry and percentage of close-coupled wagons this will vary.

It has been assumed that there will be 10 per cent of unusable length. In addition for intra-state and inter-state trains there will frequently be circumstances where the usable length cannot be fully utilised due to the variety of container lengths, which are not multiples of the length. It is assumed that there will only be 90 per cent usage of available space for Inter-state trains and 80 per cent usage of available space for intra-state trains. There should be no unused space on the international shuttles as all containers to/from the docks should be a multiple of the twenty-foot standard. The capacity for each configuration is as follows:

- Inter-state (1,800m) – 230 TEU
- Inter-state (1,200m) – 155 TEU
- Intra-state (600m) – 70 TEU
- Port Shuttle (~300m) – 41 TEU

Advice from the Public Transport Authority was sought regarding the number of trains expected, their length, and frequency as identified in this study. The advice received was that there is sufficient rail capacity for substantial growth on the existing bi directional system and that when this system reaches capacity the main line can be duplicated within the existing reserve.

4.4.5 Loading and unloading area configuration

The configuration of the loading/unloading area is dictated by:

- train length

- number of sidings
- area required for transitional container stacking, area required for road vehicle access
- area required for container manoeuvring for transfer to warehouse or storage area.

As the medium to long term container volumes at this site will require minimum turnaround times for trains, the loading/unloading area should be configured to permit RMG operation.

There are varying views on the most efficient loading/unloading area length. From a container handling point of view when interfacing to a warehousing facility the optimal length is approximately 600m. However, when considering that the predominant inter-state train length will be 1,800m, a 600m length would require splitting the train twice. This is highly undesirable, particularly when rapid turnaround is required. It is not unusual to split 1,800m trains into 2 rakes and therefore 2 sidings are required. As 30 per cent the inter-state trains are 1,200m long and splitting them into 2 parts is undesirable, the siding lengths should ideally be 1,200m.

Another advantage of providing 1,200m sidings is that they can accommodate two 600m (intra-state) trains. It is therefore highly recommended that the site selected for unloading trains allow for 1,200m long straight rail sidings. By providing double ended sidings intra-state trains can depart in any order. As there are presently both standard gauge and narrow gauge intra-state trains at least some of the sidings should be dual gauge. Therefore the overall length for the loading/unloading area will need to be approximately 1,600m to allow for the sidings and the connecting track work.

Typically RMG operation requires the outgoing containers to be stacked under the RMG prior to train arrival and an isle available to stack incoming containers. Also a corridor is provided under the RMG for road vehicle access to allow direct transfer from train to truck. To allow for a combination of inter-state and intra-state trains with overlapping arrival and departure times and to achieve optimal throughput of the loading/unloading area, three sidings are required under the RMG. An annual throughput of this type of arrangement will be in the order of 400,000 to 450,000 TEU per annum. Based on the average capacity of a typical RMG in this configuration (150,000 TEU per annum) three RMGs will be required.

With three RMGs and three rail sidings this layout should be able to handle up to four 1,800m trains per day (330,000 TEU) on 2 of the sidings and six 600m trains per day (150,000 TEU) on the other siding. This provides a total rail capacity of 480,000 TEU per annum. Although this slightly exceeds the average annual handling rate for 3 RMGs it is well within the range achievable. There is some spare capacity on the sidings for additional small trains because they are double ended. It may therefore be possible to slightly increase the rail throughput capacity, to supplement the RMGs with some loading/unloading using heavy forklifts or reach stackers.

The proposed overall width of the loading/unloading area (approx 58m) is based on the following typical cross section:

- 20m wide container transfer isle (between container storage area and RMG leg)

- 8m wide isle for short term container holding area, stacked 2 wide by 3 high under RMG (allows space for RMG leg)
- 3m wide truck pavement
- 3m clear from edge of truck pavement to siding track centreline
- 4.2m between siding track centrelines
- 4.2m between siding track centrelines
- 3m clear from track centreline to RMG leg
- 4m from RMG leg to run-around track centreline (allows space for RMG leg)
- 3m clear from run-around track centreline to edge of maintenance access road
- 4m wide maintenance access road (allows for parking and unloading tools etc. from maintenance vehicle)
- 1m drainage/clearance to external security fence/boundary.

This cross sectional arrangement conforms to one of the common RMG configurations, which has a 25.24 span and can lift containers over a stack of 3 containers.

The loading/unloading area will therefore require a site approximately 10ha (58m x 1600m = 9.3ha). A 10ha site may also provide a small area for a refuge siding for defective wagons or other ancillary rail infrastructure. This area must be level so that all rail tracks are level to avoid run away wagons etc. and to minimise problems with shunting operations also to optimise container handling operations.

Although it cannot be presumed that a single rail operator would be vertically integrated with both rail and terminal services, it would be possible for a terminal to accommodate an additional operator if this was desirable. However, the economies and commercial benefit that could be generated by one operator providing all train management services including load/unload would be considerable.

4.4.6 Arrival and departure tracks and relationship to main line

Accurate main line grades are not available; however, the ruling gradient is 1:200. A preliminary review of the local topography in the Hope Valley Wattleup area indicates that there are only limited sections of the main line where the overall average gradient would allow a level terminal to be connected to the main line at both ends. The section south of Wattleup Road appears not to be suitable. The section north of Wattleup Road may be suitable subject to further investigation of track gradients and overall level difference.

The interaction between terminal internal train movements and the main line is to be minimised. It is also important that trains can move completely off the main line without delay and with minimal interaction with other activities in the container handling areas. This is best achieved by providing an arrival track long enough to accommodate the maximum train length (1,800m). The most efficient arrangement is for the loading/unloading sidings to connect to the south end of the arrival track, via a ladder road / track fan.

A separate run-around track would be important, as run-around movements will not be permitted on the main line. The run-around track would need to extend for the full length of the arrival road connecting to it at its north end and south end. The run-around track would also need to extend to the south end of the loading/unloading sidings providing connection to the sidings and main line.

The arrival track and run-around track functions can be interchanged by using appropriate track arrangements. This then also allows for the arrival of a train on one track whilst preparing a train for departure on the other. Therefore they are often designated as a pair of arrival/departure tracks. To accommodate the predicted high numbers of intra-state trains, particularly narrow gauge trains heading south from the terminal, a pair of 800m long arrival departure roads will be required. All arrival/departure tracks should be dual gauge consistent with operating narrow gauge intra-state trains.

The corridor width for the arrival/departure tracks needs to be at least 22m. This will allow the two tracks at 6m centres along with vehicle access roads on either side. This spacing is necessary to accommodate signalling, drainage, access for track and rolling stock maintenance vehicles and inspection of the departing train from both sides. Additional width will be required if topography dictates cut or fill batters within the corridor.

As these are long narrow corridors (north end approx 2.2km long, south end approximately 1.2km long) there may be an opportunity for part or all of their width to be accommodated within the rail corridor. These tracks do not need to be straight and therefore can closely follow the main line alignment so long as they are level or as close as possible to level.

Another consideration is the interaction between the terminal connections to the main line and their vicinity to level crossings. The combined overall length of the arrival/departure tracks at both ends of the site (2.2km + 1.2km) and the loading/unloading area (1.6km) is approximately 5km. Any level crossings should be a minimum of 100m beyond the main line turnout. There are no sections along this line, where the level crossings are far enough apart to achieve this. Therefore one or more of the road crossings will need to be closed or grade separated.

4.5 Staged development of the terminal

The above terminal layout provides a number of options for staged development. However, there are some minimum requirements for basic terminal operation. The requirement to accommodate 1,800m and 1,200m trains within the terminal dictates that two sidings must be installed, one of 1,200m length and the other a minimum of 600m length. These should be connected together so as to provide a release road (run-around) for the locomotives. The turnout should be at least 80m from the buffer to accommodate 3 locomotives with some clear space. An arrival/departure road and adjacent run-around road must also be provided to extend the 1200m siding so as to allow an 1,800m train to arrive clear of the main line and then run the locomotives around the train.

In this initial arrangement unloading/loading could be undertaken using heavy forklift trucks and/or reach stackers, depending on the adjacent pavement utilisation. As the container volumes increase the number and length of the sidings can be increased. Also the length of the arrival/departure roads will need to be extended to accommodate 1,800m trains clear of the main line and outside the loading/loading area. The timing and physical arrangement at any stage will be very much dependant on the mix of train lengths.

There is also some flexibility to accommodate short (~300m) shuttle trains in the early low container volume scenarios. These short shuttle trains would be used to link to the proposed Outer Harbour dock or to Fremantle to service the international container forecast volumes.

4.6 Intermodal terminal site footprint

The proposed Kwinana Intermodal Terminal based on the rail facility above will have a capacity of 600,000 TEU per annum of which 480,000 TEU will be handled by rail/road and 120,000 TEU road/road.

It is expected that of the total throughput 10 per cent will be direct transhipped, 15 per cent temporary stored for forwarding and 75 per cent to warehousing[60] activities. Warehousing for a typical 200,000 TEU per annum site will have a capacity of 150,000 TEU per annum and occupy approximately 10.5ha. On-site warehouses will handle all road/road operations as well as 70 per cent of rail/road operations.

It is expected that of the total throughput will be managed as follows

- 10 per cent will be direct transhipped,
- 15 per cent temporary stored for forwarding and
- 75 per cent to warehousing activities.

Warehousing for a typical 200,000 TEU per annum site will have a capacity of 150,000 TEU per annum and occupy approximately 10.5ha.

On-site warehouses will handle all road/road operations as well as 70 per cent of rail/road operations.

TABLE 27 SITE FOOTPRINT AREA

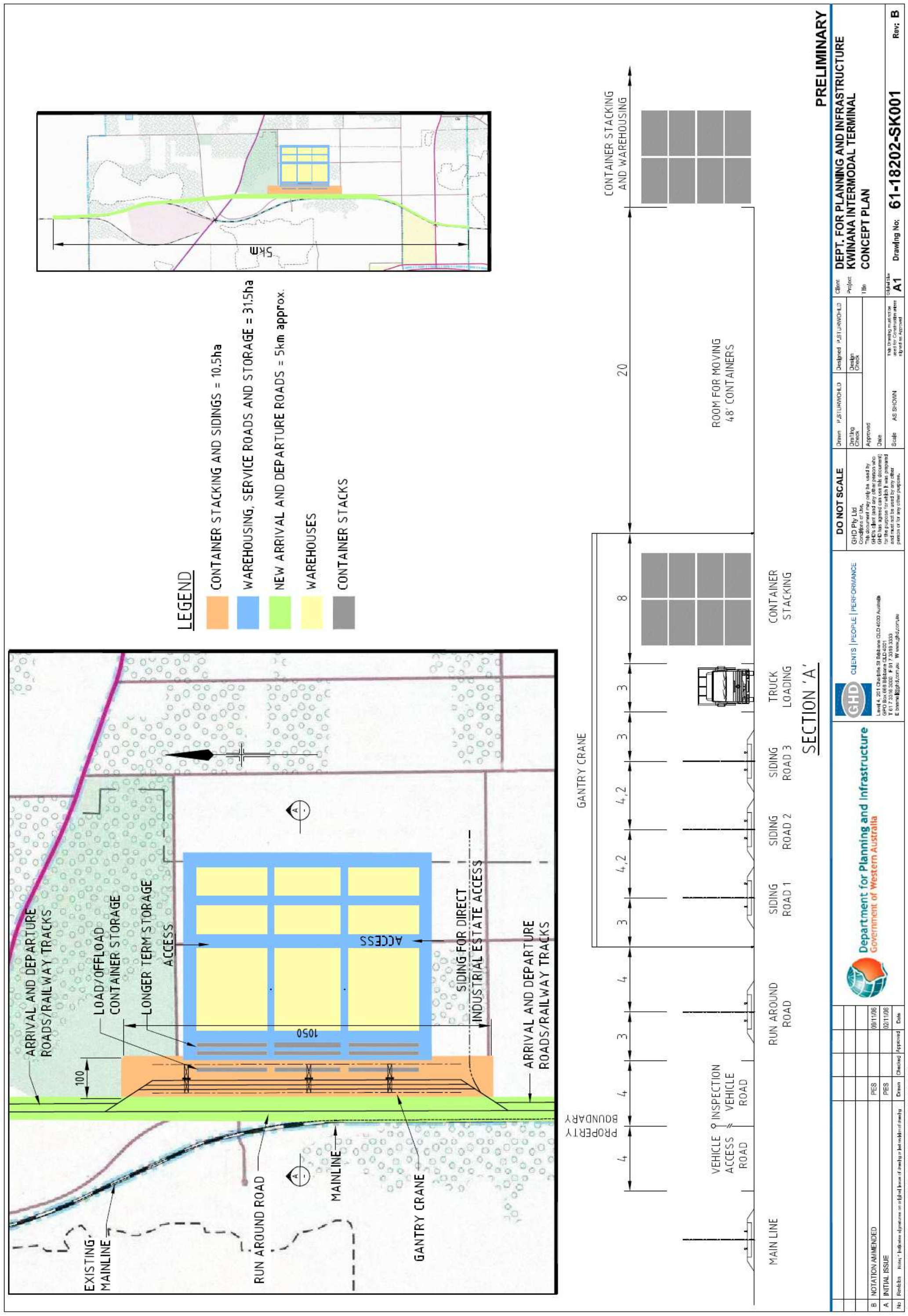
Throughput(TEU/yr)	Warehousing	Container storage	Rail Areas	25% (Circulation roads, car parking, misc)	Total Yard Area (ha)
200,000 Facility	10.5	3.5	12.0	6.5	**33**
400,000 Facility	21.0	7.0	18.0	12.9	**59**
600,000 Facility	31.5	10.5	18.0	15.0	**75**
1,200,000 Facility *	42.0	14.0	36.0	23.0	**115**

[60] Warehousing refers to the storage and further processing of goods, it may have a simple deconsolidation of goods from a container, to a storage and then distribution to the next stage in the supply chain or it may involve value adding activities such as product transformation or assembly prior to the next stage of shipment.

4.7 Intermodal terminal site layout

The layout of an intermodal terminal with a capacity of 600,000 TEU per annum including the arrival and departure rail links, container storage and warehousing is shown at Figure 33.

FIGURE 33 POTENTIAL LAYOUT OF A 600 000 TEU TERMINAL AT KWINANA



4.8 Ownership and management models

In Australia, there are a number of different models for the ownership and management of intermodal terminals. There does not appear to be a consensus on which of these models is the most appropriate although it is likely that the most appropriate model will vary with the location, scale and role of the terminal.

The central concern is the need to balance the incentive to invest in terminal facilities with the desirability of encouraging and supporting competition and innovation in the provision of above-rail services. This places the question of access at the heart of the decision on ownership and management models. Once again, there is little consensus, even on the threshold question of whether multi-party access to intermodal terminal's is desirable and practical. Amongst those who hold the view that it is, there is still disagreement over the circumstances under which multi-party access should be ensured; and how it can best be secured.

At least five different models can be distinguished. These are summarised in Table 28.

TABLE 28 TERMINAL OWNERSHIP AND MANAGEMENT MODELS

Model	Description	Example
1. Unregulated integrated commercial	The terminal is owned (or leased) by an above-rail operator and developed as an integrated part of its rail operations without any obligation to provide access to third party operators.	SCT Logistics at Forrestfield
2. Regulated integrated commercial	The terminal is owned (or leased) by an above-rail operator and developed as an integrated part of its rail operations but is subject to formal regulation by an economic regulator that requires it to provide access to third-parties on reasonable terms.	South Dynon, post the Sale of Patrick to Toll when terminal access and services will be manage by Essential Services Victoria
3. Structurally separate unitary unregulated	The terminal as a whole is owned by/leased to a specialist terminal operator who is unrelated to the rail operators likely to use the terminal. The operator is not required by regulation or lease conditions to provide access to all parties, but it is generally expected that it will be in its interests to do so.	AUSTRAK at Somerton in Victoria leased the terminal to PO Ports who then use Pacific National or QR for rail service
4. Structurally separate unitary contractually regulated	As for the previous model, but in this case the lease requires that access be provided to competing above-rail operators on a non-discriminatory basis.	Acacia Ridge as it is now operated by P&O Ports as a multi user facility[61]
5. Modular unregulated	In the case, the terminal is divided into several sub-terminals, each of which may be leased to competing above-rail operators or to a specialist terminal operator who makes the sub-terminal available to above-rail operators on a common user basis.	None at this time in Australia, New terminal at Kewdale could be an example if lease is set out that way

There are no doubt other models, and it is possible to mix and match elements of each of the above.

For a major metropolitan terminal, which would be difficult to replicate, some form of open access arrangements appears essential. Model 1 is therefore unlikely to be appropriate. Model 4, on the other hand, runs the danger of excessive intervention: it is generally desirable to keep regulation to a minimum and if the principle of structural separation is applied super-imposing formal access regulation is likely to

[61] QR has signed a three-year deal for P&O to operate the Acacia Ridge inter-state rail terminal, the gateway to the Queensland market. The agreement should be finalised by early June.

QR chief executive Bob Scheuber said the arrangement at Acacia Ridge was likely to become the model for QR's expansion into the national rail container market.

QR, through its acquisition of Australian Railroad Group, already operates trains between the Port of Melbourne and P&O's intermodal terminal at Somerton in northern Melbourne.

Mr Scheuber said QR chose P&O to run Acacia Ridge because of its expertise in running terminals.

The Acacia Ridge deal follows QR's success in winning back control of the terminal from the Toll-Patrick Corp joint venture Pacific National through the Federal Court.

Mr Scheuber said QR planned to develop Acacia Ridge into a multi-user terminal that would be open to competitors such as PN. PN is now the major user of the terminal.

be unnecessary. Model 2 has the disadvantage that it often leads to continued tension between a regulator and the terminal operator. As a consequence, it may discourage or delay investment by the terminal operator, and will almost certainly imply significant overhead costs associated with managing the regulatory process. There is some doubt also as to the practical effectiveness of regulation under these circumstances.

Models 3 and 5 therefore appear the most appropriate for a future intermodal terminal in Kwinana. The choice between these two will depend on the scale and physical structure of the terminal development. For small terminals, the benefits of economies of scale and operational flexibility will almost certainly outweigh any benefits from heightened competition and the ability of operators to tailor operations to their specific requirements. Model 3 would therefore be preferable. However, for a large terminal, if the physical layout of the terminal makes the development of efficient sub-terminals possible, Model 5 becomes an attractive alternative.

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http://www.drewry.co.uk/www/Main.nsf/Home!OpenForm

http://www.mainroads.wa.gov.au/NR/mrwa/run/start.asp

http://www.landcorp.com.au/portal/page?_pageid=33,1,33_738256&_dad=portal&_schema=PORTAL

http://www.wapc.wa.gov.au/Publications/default.aspx

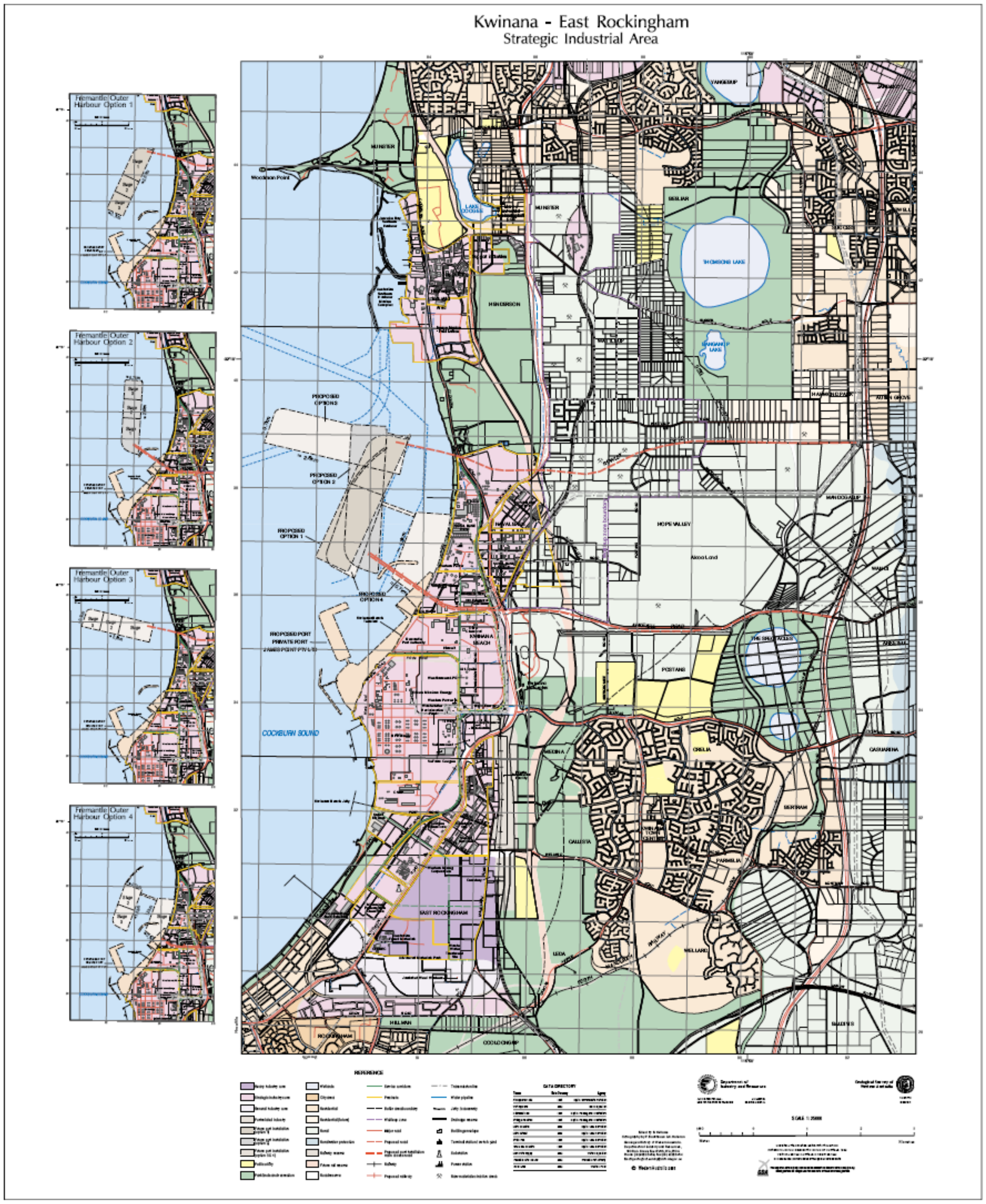
http://www.freight-village.com/

(http://www.mainroads.wa.gov.au/NR/rdonlyres/7DE6FC8F-A376-49FE-9B99-11BA1F5B3D54/453/frhs9999.pdf)

http://www.kic.org.au/SiteContent/Industry/KIarea.asp

Appendices

Appendix A - Map of Kwinana



Appendix B - Industries located in the Kwinana Industrial Area

- A&C Chemicals
- Air Liquide WA
- Alcoa World Alumina Australia
- Australian Fused Materials
- Bayer Crop Science
- BOC Gases
- BP Oil Refinery (Kwinana)
- CBI Constructors
- Chemeq
- CIBA Specialty Chemicals
- Co-operative Bulk Handling (CBH)
- Cockburn Cement
- Cockburn Power Station
- Coogee Chemicals
- Crushing and Mining Equipment
- CSBP
- Doral Specialty Chemicals
- ELI Ecologic
- Fremantle Ports
- Freo Machinery
- HIsmelt Corporation
- HPS Technology
- Kwinana Cogen
- Multiplex Degremont Joint Venture
- Nalco Australia
- Nickel West, BHP Billiton
- Nufarm Australia
- Nufarm Coogee
- OneSteel Market Mills
- Shinagawa Thermal Ceramics
- Skilled
- Summit Fertilisers
- Terminals West
- Tiwest Joint Venture
- Tyco Water
- United KG
- United Farmers Co-operative
- Water Corporation
- Wesfarmers Kleenheat Gas
- Wesfarmers LPG
- Western Power

Source*:* http://www.kic.org.au/SiteContent/Industry/KIarea.asp

Appendix C- Functional road types and criteria

Primary Distributors
These provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic. Some are strategic freight routes and all are National or State roads. They are managed by Main Roads.
District Distributor A
These carry traffic between industrial, commercial, and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property. They are managed by Local Government.
District Distributor B
Perform a similar function to type A district distributors but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with a traffic demand in excess of that originally intended. District Distributor A and B roads run between land-use cells and generally not through them, forming a grid which would ideally space them around 1.5 kilometres apart. They are managed by Local Government.
Local Distributors
Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. They are managed by Local government.
Access Roads
Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by Local government.

Source: (http://www.mainroads.wa.gov.au/NR/rdonlyres/7DE6FC8F-A376-49FE-9B99-11BA1F5B3D54/453/frhs9999.pdf)

Appendix D - Freight Task to and from the Kwinana Region

Commodity	Origin	Destination	Mode	Current Tonnes	Future Tonnes
Alumina	Pinjarra	Kwinana	rail	1,000,000	1,000,000
Ammonium Chloride	Kwinana	Capel	road	2 000	2 000
Ammonium Chloride	Kwinana	Geraldton	road	2 000	2 000
Ammonium Chloride	Kwinana	Muchea	road	2 000	2 000
Ammonium Nitrate	Kwinana	Kewdale	road	30 000	30 000
Anhydrous Ammonia	Kwinana	Kalgoorlie	rail	unknown	unknown
Bauxite	Kwinana	Kwinana	rail	8 000 000	8 000 000
Caustic Acid	Kwinana	Goldfields- Esperance	road	6 000	6 000
Cobalt Briquette	Leonora	Kwinana	rail	2 000	2 000
Coke	Kwinana	Kalgoorlie	rail	unknown	unknown
Coke	Kwinana	Kwinana	road	unknown	unknown
Copper Sulphide	Kwinana	Kewdale	road	unknown	unknown
Cyanide	Kwinana	Fremantle	road	22 000	33 000
Cyanide	Kwinana	Kewdale	road	5 000	5 000
Export Container	Kwinana	North Fremantle	unknown	45,000	45,000
Fertiliser	Kwinana	Perth Metro	road	150 000	220 000
Fertiliser	Kwinana	Kewdale	road	40 000	40 000
Fertiliser	Kwinana	Picton	road	20 000	20 000
Fertiliser	Kwinana	Esperance	road	10 000	10 000
Fertiliser	Kwinana	Albany	road	6 000	6 000
Fertiliser	Kwinana	Narrogin	road	5 000	5 000
Fertiliser	Kwinana	Geraldton	road	4 000	4 000
Fuel	Kwinana	Perth Metro	road	8 000	8 000
Grain	Rural WA	Kwinana	rail	5 500 000	unknown
Hydrochloric Acid	Kwinana	Goldfields- Esperance	road	1 000	1 000
Import Container	North Fremantle	Kwinana	unknown	15,000	15,000
Lime	Kwinana	Collie	rail	0	100 000
Lime	Kwinana	Wagerup	road	150 000	150 000
Lime	Kwinana	Kwinana	road	25 000	25 000
Liquid Zanthe	Kwinana	Goldfields- Esperance	road	7 000	7 000
Mineral Sands	Gnangara	Kwinana	road	300 000	300 000
Mineral Sands	Henderson	Kwinana	road	90 000	90 000

Commodity	Origin	Destination	Mode	Current Tonnes	Future Tonnes
Mineral Sands	Kwinana	Bunbury	road	27 000	27 000
Mineral Sands	Kwinana	Kemerton	road	15 000	15 000
Mineral Sands	Muchea	Kwinana	rail	150 000	150 000
Mineral Sands	Muchea	Kwinana	road	141 000	141 000
Nickel Concentrate	Kwinana	Fremantle	road	20 000	20 000
Nickel Matte	Kalgoorlie	Kwinana	road	98 000	108 000
Nitrate	Kwinana	Kalgoorlie	rail	unknown	unknown
Salt	Kwinana	Picton	rail	118 000	118 000
Silicate	Kwinana	Bunbury	road	4 000	4 000
Sodium Aluminate	Kwinana	Bunbury	road	18 000	18 000
Sodium Cyanide	Kwinana	Kalgoorlie	rail	128 000	128 000
Sodium Cyanide	Kwinana	Southern Cross	rail	unknown	unknown
Sodium Cyanide	Kwinana	Murchison	road	17 000	17 000
Sulphuric Acid	Kalgoorlie	Kwinana	rail	560 000	560 000
Sulphuric Acid	Kwinana	Leonora	rail	500 000	500 000
Unknown	Kwinana	Kalgoorlie	rail	unknown	unknown
Urea	Kwinana	Picton	road	1 800	1 800

Source: Meyrick and DPI 2004, Analysis of the WA Freight Task Strategic Commodities for Rail.

Appendix E - Sensitivity Testing of LOS Modelling

The LoS bands shown in this report are, inevitably quite broad, and the estimation of future traffic volumes is, itself, subject to uncertainty (for example, fuel price and availability) and what is known as 'modelling error'.[62]

One way of assessing the potential impact of this is by undertaking sensitivity analysis. In this case, it is particularly important that such analysis be undertaken, because:

- Several factors may combine to reduce road traffic growth (eg fuel price and availability; travel behaviour change programs), although the impact of fuel price and availability will be modified to some extent by improvements in vehicle fuel efficiency.[63]
- For 2031, there are a large number of intersections shown as LoS E. It is important to know where in the LoS E range these come. Those that are the least critical will drop to LoS D if traffic volumes are reduced for testing purposes.

We have undertaken sensitivity testing on the basis of:

- 5 per cent reduction in traffic volume on all roads for 2011; and
- 10 per cent reduction in traffic volume for 2031.

As well as providing a measure of sensitivity, these reductions can also be related to the potential impact of TravelSmart household programs across the Perth Metropolitan Area. TravelSmart household typically achieves car trip reductions in the range 5-15 per cent across the whole target population.[64]

- The current TravelSmart strategy aims to reach 50 per cent of the metropolitan population by 2010 – a 5 per cent reduction in estimated traffic is 50 per cent of the mid-point of the car trip reduction range. Where it has been measured, the reduction in car-km of travel exceeds the reduction in car trips, as people also substitute nearer destinations, without sacrificing participation in activities.
- If TravelSmart household were extended to the whole population, the likely outcome would be 10 per cent reduction in car trips.

No separate consideration has been given to freight and commercial traffic.

A 5 per cent lower traffic level in 2011 does not make a notable difference to the Level of Service, but would still be an important stepping stone towards a 10 per cent lower traffic level for 2031, which demonstrates some significant reductions in the number of locations operating at LoS E or F, most notably on northern roads outside the Reid/Roe ring and on Garratt Road/Grand Promenade.

These amounts of car use reduction appear to be what is feasible through voluntary travel behaviour change, without any external stimulus such as pricing or regulation. It is almost certain, however, that oil and gas prices will continue to increase rapidly in real terms (i.e. relative to incomes) and that motor vehicle travel will become more expensive – at least until such time as alternative fuels become widely used and available, which could be 20 or more years away. In the meantime, rising fuel prices will reduce the rate of traffic growth.

62 Models are, by definition, a simplification of reality and are based on sample data that has its own potential for sampling and non-sampling errors. The process we have used for estimating future traffic volumes reduces, but cannot eliminate, such 'errors'.

63 However, it is worth noting that a substantial part of the improvements in engine fuel efficiency over recent years has been offset by the energy requirements of additional features, such as air conditioning, increased engine capacity and increased use of larger/heavier vehicles (especially 4WDs for urban use).

64 Where estimated, reductions in car travel have tended to be greater than the reduction in car trips, but there is no clear relationship. Reduction in car trips is a more robust measure.

What is known of the impact of fuel prices on car travel (largely based on earlier periods of oil price rises) suggests that a doubling of the price of petrol would result in a 30 per cent reduction in car travel. However, this impact will vary according to the ability of individuals to adapt their travel behaviour.

FIGURE 34 LEVEL OF SERVICE 2011: BASE CASE (LEFT) AND WITH 5% TRAFFIC REDUCTION

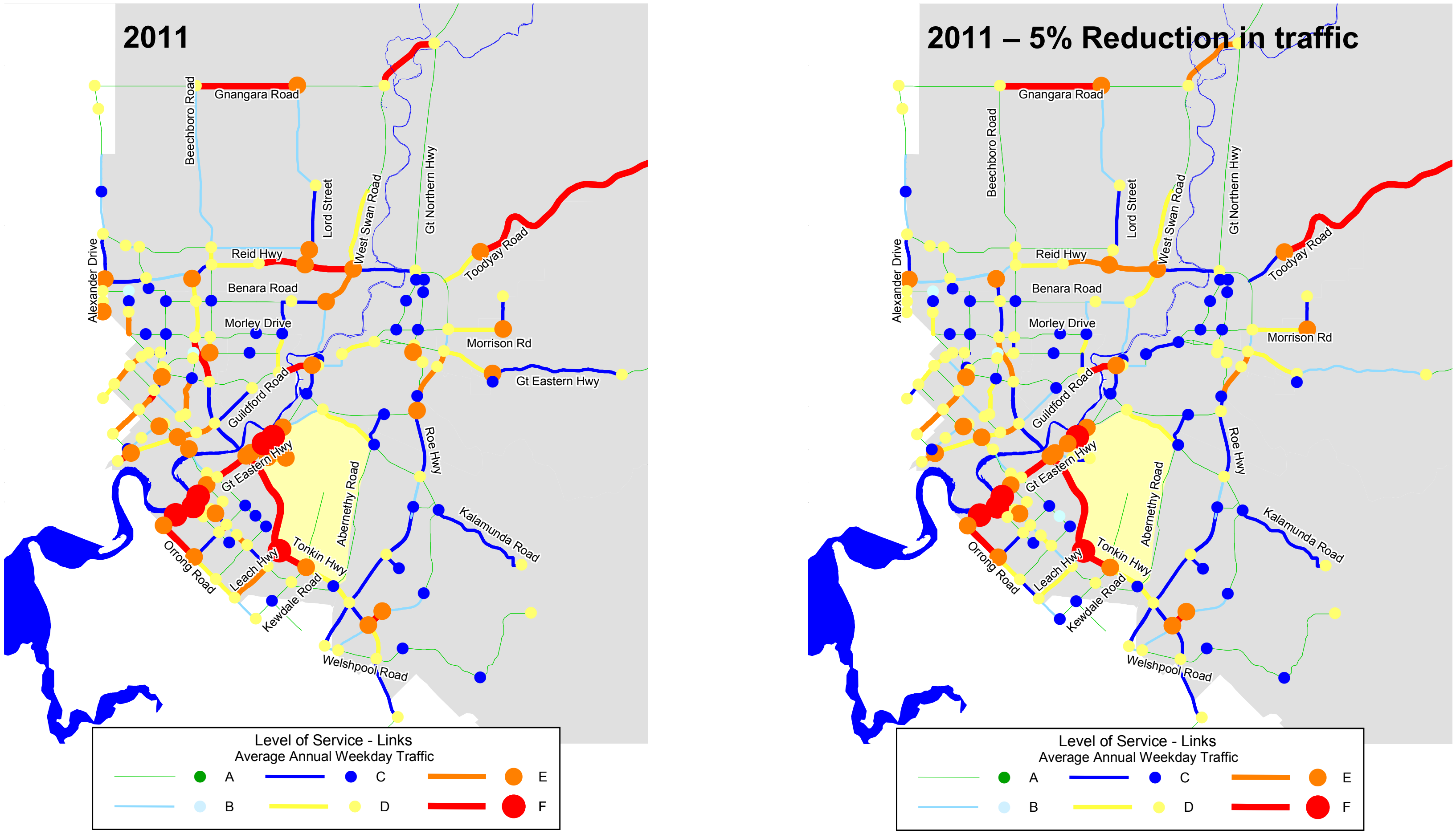


FIGURE 35 LEVEL OF SERVICE 2031: BASE CASE (LEFT) AND WITH 10% TRAFFIC REDUCTION