



FREMANTLE PORT

CONTAINER MOVEMENT STUDY 2012



Government of Western Australia
Department of Transport

FREIGHT AND LOGISTICS COUNCIL
OF WESTERN AUSTRALIA

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INTRODUCTION

A new study to provide current information on the origin and destination of containers travelling to and from Fremantle Port was completed in March 2012.

The work was undertaken by Fremantle Ports, the WA Department of Transport, Main Roads WA and the Freight and Logistics Council of Western Australia. It updates information from the March 2004 Origin and Destination Study which has provided the basis for Fremantle Port-related supply chain infrastructure decision making since that time.

The main aim of the recent study was to gain an up-to-date understanding of the transport, storage and distribution of full import and export containers as well as the movement of empty containers. The findings will assist in improving industry planning and understanding, particularly in terms of :

- inland origins and destinations of full containers (i.e. pack and unpack locations);
- mode of transport used;
- staging of containers between container origins and destinations (both location and use); and
- timing of elements of the inland logistics chain - both day of the week and time of day.

Some other major Australian ports have also recently carried out similar studies and these presented an opportunity to obtain valuable comparative data.



STUDY METHOD

The project focused primarily on six phases of the port's inland container logistics chain:

1. Import Full Containers from Container Terminal to Unpack Point;
2. Import Empty Container from Unpack Point to Dehire at Empty Container Parks;
3. Where relevant, movements of Empty Containers from Container Terminal to Empty Container Parks (Import Repositioning);
4. Export Empty Containers from Empty Parks to Packing Point;
5. Export Full Containers returned from Packing Point to Container Terminal; and finally
6. Empty Containers from Empty Parks to Container Terminals (Export Repositioning).

In addition it collected and analysed data on container sizes, types and weights.

Following a 72 hour trial to test the response rate from participants and validate the quality of data received, the main survey was undertaken over two weeks in the second half of August 2011. It involved 49 participants, including 37 road operators, and was followed by data collection, validation, consolidation and analysis.

The 49 participants in the full study were in five categories:

- container terminals;
- empty container parks;
- quarantine approved premises;
- road operators; and
- rail operators.

The totals were annualised using 2010/11 full financial year totals as the benchmark and were broken down into the individual phases of the supply chain cycles for import and export containers.

The study covered data for 78% of the full containers into and out of Fremantle Port's two container terminals at North Quay.





GENERAL BACKGROUND INFORMATION FROM THE STUDY

The growth of container trade at the port can be seen in Figure 1, with a record trade total in 2010/11 of nearly 600,000 twenty foot equivalent units (TEUs).

Each container is moved by either road or rail at some point in the import or export cycle (transshipments being minimal in Fremantle).

Figure 1 – Fremantle Container Trade Growth since 2000/01 (TEU)

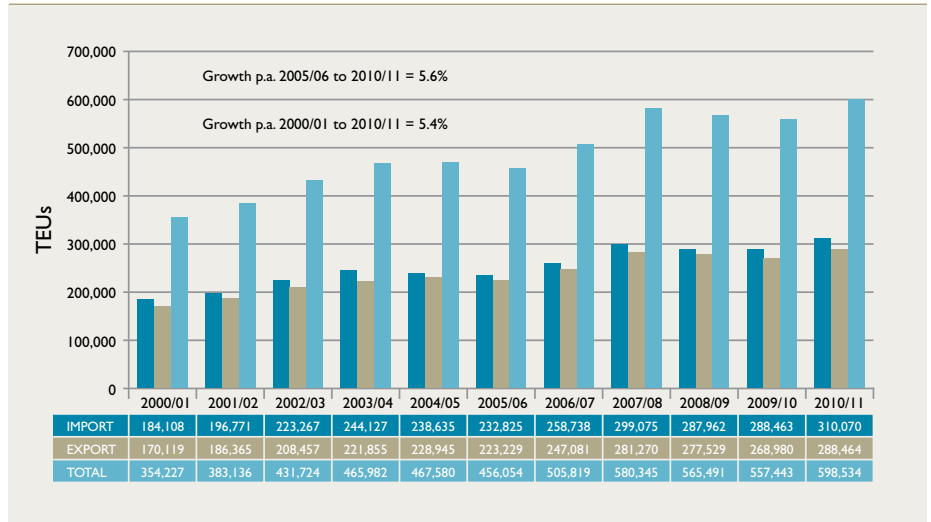
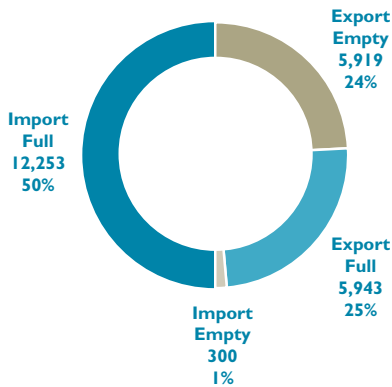
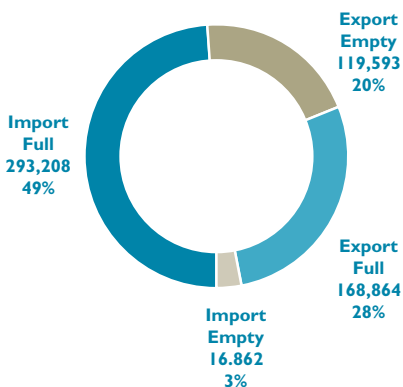


Figure 2 – Volume Container Terminals – Comparison between 14 Day Full Survey and Financial Year 2010/11 (TEU)

14 Days Full Survey (TEUs)



FY 2010/11 (TEUs)



Within each of the six phases noted above, a container may be moved a number of times, that is, picked up from one location and delivered to another. In the report, these are referred to as container movements.

The annualised number of import container movements reached nearly one million, while on the export cycle, it was just under 500,000. The marked difference between import and export container movements is due, in part, to the higher number of movements per container within the import cycle (average 2.9 movements per container) versus the export cycle (average 2.6 movements per container) and the lower overall number of full container exports.

Of all the containers observed, about half were full imports, one quarter were full exports and the other quarter were empties exported to meet requirements elsewhere in the world. These are similar proportions to the full year 2010/11 (Figure 2).

In contrast to the 2004 study, this recent survey found that relatively little container packing and unpacking activity takes place outside the Perth metropolitan area.



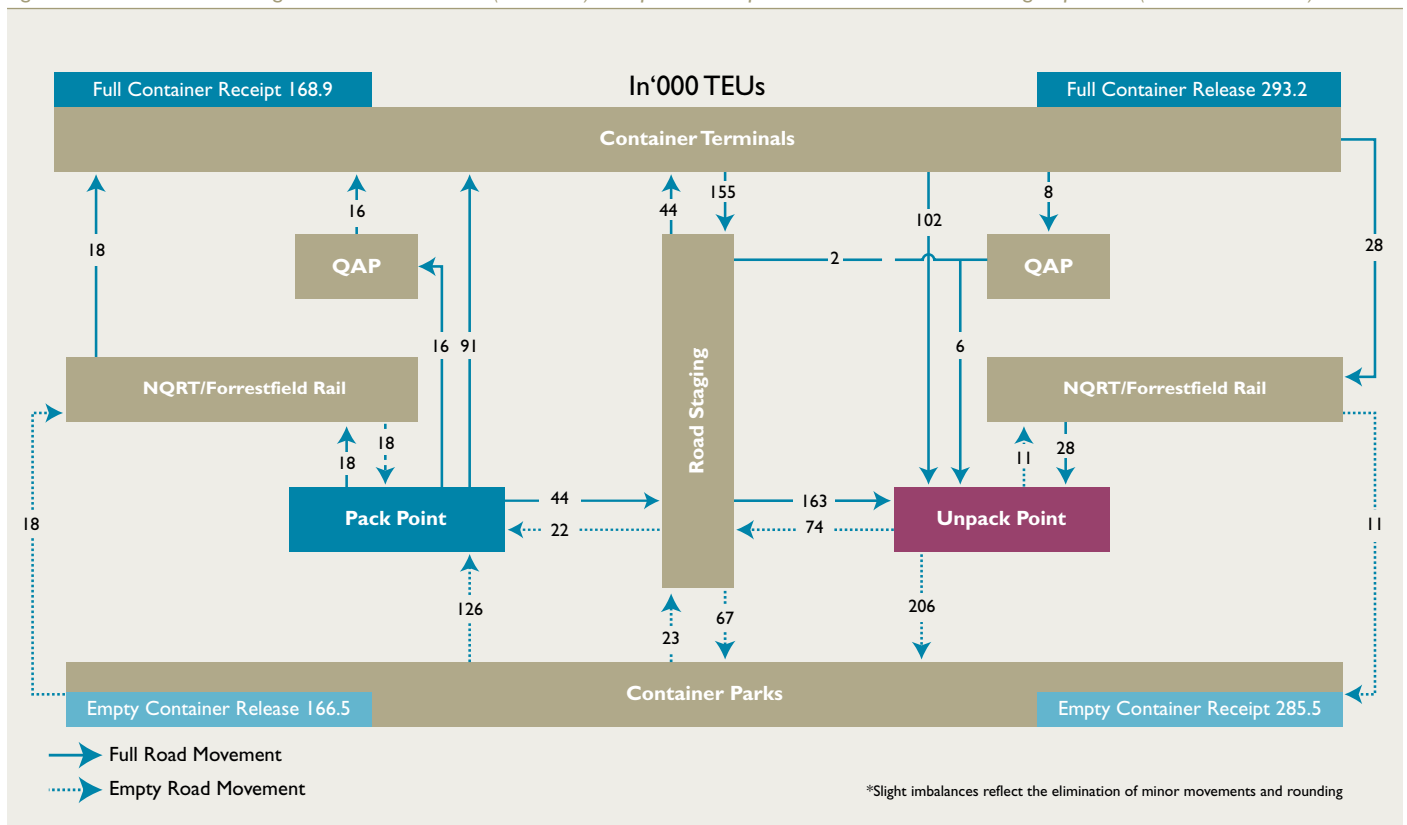
LOGISTICS CHAIN REPRESENTATION

The various container movements (TEU terms) are shown in Figure 3 below. The movements to the left of centre form the Export Cycle, while those to the right represent the Import Cycle.

This Logistics Chain Movement diagram is provided here to give an overview of all the key flows within the Port's landside container supply chain. It demonstrates the complexity of the overall chain, with a number of movement variations possible in the import and export cycles. It clearly confirms the perception of the growing importance of staging in the import chain in recent years, with only just over a third of the containers (as TEUs) going directly to an unpack point. Importantly, it also shows that direct deliveries are still an important factor in the export cycle (54% of TEU movements).

The vital role played by empty container parks, as the final repository or the initial starting point for the import and export chains respectively, is also clear, with nearly all containers passing through empty parks at some stage in the cycle.

Figure 3 – Fremantle Ports Logistics Chain Movement ('000 TEU) – Import and Export Trade Containers Excluding Reposition (Annual Estimation)



MAJOR FINDINGS

Imports

Currently, it is estimated that some one million container movements occur in the import cycle annually.

As expected, unpack locations are concentrated in core industrial zones (Table 1). Two thirds of all unpacks take place in just 10 industrial suburbs. Apart from the port precinct, the two major concentrations are around the Welshpool/Kewdale/Forrestfield and the Canning Vale/Jandakot/Bibra Lake areas. Half of all unpacks take place in a band between 20-30km from the port (Figure 4). Ninety per cent of unpacks recorded during the survey took place within 30km of the port and only two country locations were in the top 50 unpack locations.

When the unpack volumes are grouped, 98% were located in the metropolitan area, and 80% on the southern side of the city.

The role of road operator and rail staging, representing container moves to an interim location before final delivery, appears to have increased from 52% (2004 survey) to 65%. Road operator depots account for approximately 50% and rail and quarantine checks account for the other 15% .

Nearly all staging takes place in only 10 suburbs. Nearly 85% of all import road staging takes place in four key suburbs (North Fremantle, Welshpool, Kewdale and Bibra Lake).

Staging overcomes the pressures that can occur within the system when many road operators attempt to obtain their containers at the same time. Staging allows for a more even spread of pick ups from, and deliveries to, terminals and a greater guarantee of delivery times to customers. Delivery times to unpack locations still show, however, a preference to receive containers earlier in the day.

Figure 4 - Unpack Destinations of Imports by Statistical Local Area

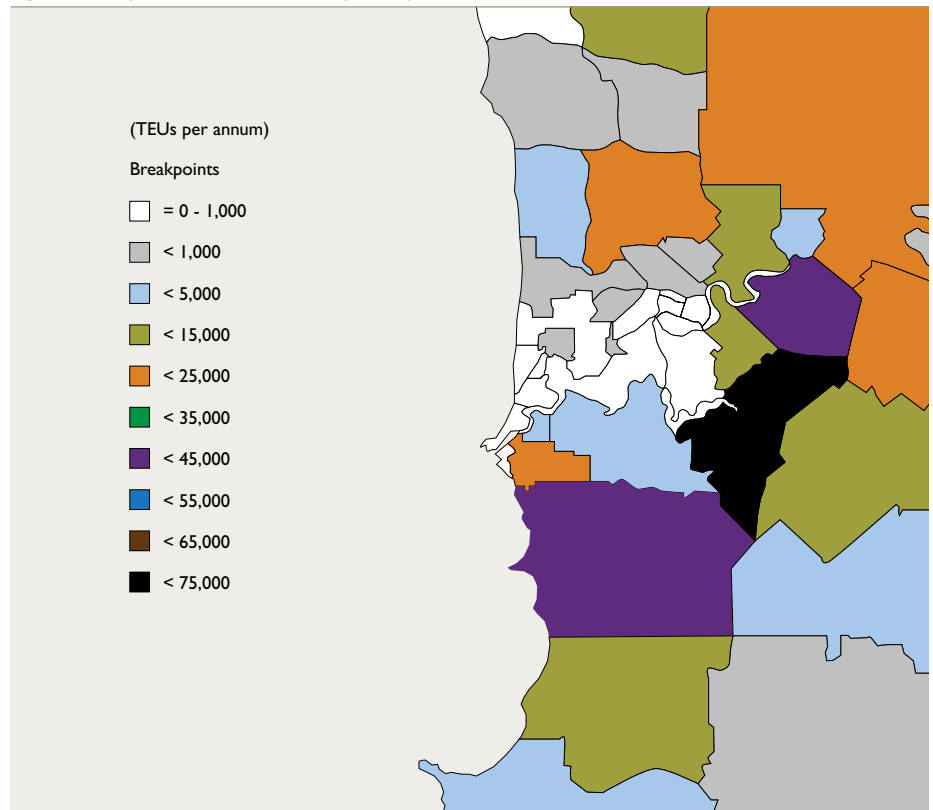
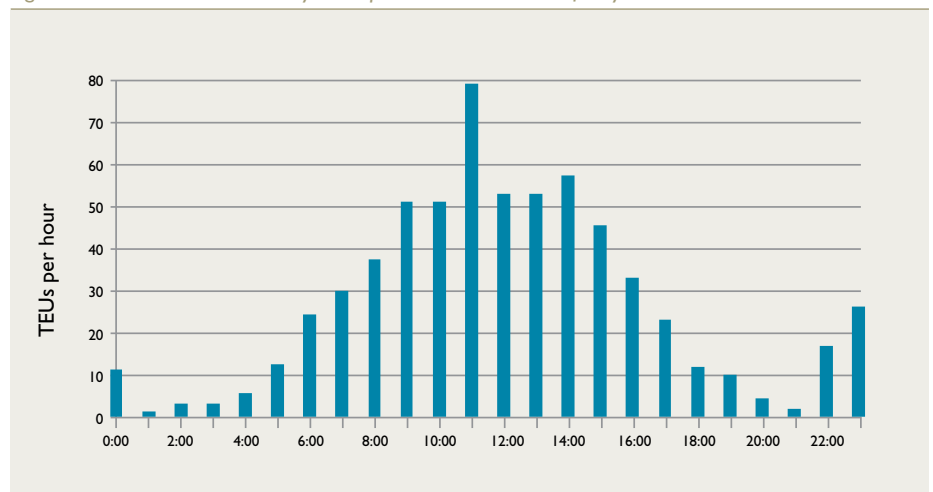


Table 1 – Distribution of Unpack Locations

Location	2004	2011
Bayswater/Morley/Malaga	6%	8%
Inner Harbour	3%	6%
Kewdale/Forrestfield/Welshpool	39%	35%
Canning Vale (*note: 2003 totals included in Kewdale)	*	10%
Kwinana/Rockingham/Naval Base/Henderson	2%	3%
O'Connor/Spearwood/Bibra Lake	14%	16%
Outer Perth	5%	10%
Perth Central	11%	10%
Country	20%	2%
Total	100%	100%

Figure 5 – Full Container Delivery to Unpack Location - Time of Day





The limited number of booking slots available at the on wharf container terminals per hour is, however, assisting the Perth market slowly to mature in terms of the level of after hours unloads occurring. While there is a significant and steady decline in numbers of deliveries to unload locations after midday, encouragingly there is a noticeable level of activity still occurring between 6:00pm and midnight, after which it effectively ceases until around 6:00am (Figure 5).

Trade growth means it is increasingly more difficult to get morning booking slots at Fremantle Port's North Quay container terminals to pick up containers for direct delivery to clients. With demand for slots outstripping availability, rail is proving to be a highly effective means to ensure deliveries to clients at the core times they require them.

Exports

With loaded imports representing approximately half of containers observed in the study, and loaded exports accounting for approximately one quarter of containers, it follows that movements related to loaded exporters were approximately half that of imports.

As was the case with imports, the Kewdale/Forrestfield area retained its importance as an export origin area. The next largest loaded container exporting area was, however, the Henderson/Kwinana precinct. The port precinct played an even more important role for exports than for imports and the Bibra Lake area a significantly lesser one (Figure 6).

The top ten exporting localities accounted for just over two thirds of all exports. One of these ten localities was non-metropolitan. Regional locations further showed their importance to the economy, taking six of the top 20 pack locations and 14 in the top 50.

This study has shown, however, a significant shift away from packing in non-metropolitan areas. Seventeen per cent of export packing takes place outside the metropolitan area. As an example, the 9% noted for the Lower Western region of the State in this study is a dramatic shift from the results of the March 2004 study, where the study methodology of the time noted that 24% of loaded exports were packed in this region (Table 2).

Table 2 – Distribution of Pack Locations

Location	2004	2011
Bayswater/Morley/Malaga	2%	2%
Inner Harbour	2%	9%
Kewdale/Forrestfield/Welshpool	16%	25%
Canning Vale (*note: 2003 totals included in Kewdale)	*	5%
Kwinana/Rockingham/Naval Base/Henderson	5%	26%
O'Connor/Spearwood/Bibra Lake	18%	8%
Outer Perth	9%	7%
Perth Central	5%	2%
Country	43%	16%
Total	100%	100%

Figure 6 - Pack Locations of Exports by Statistical Local Area

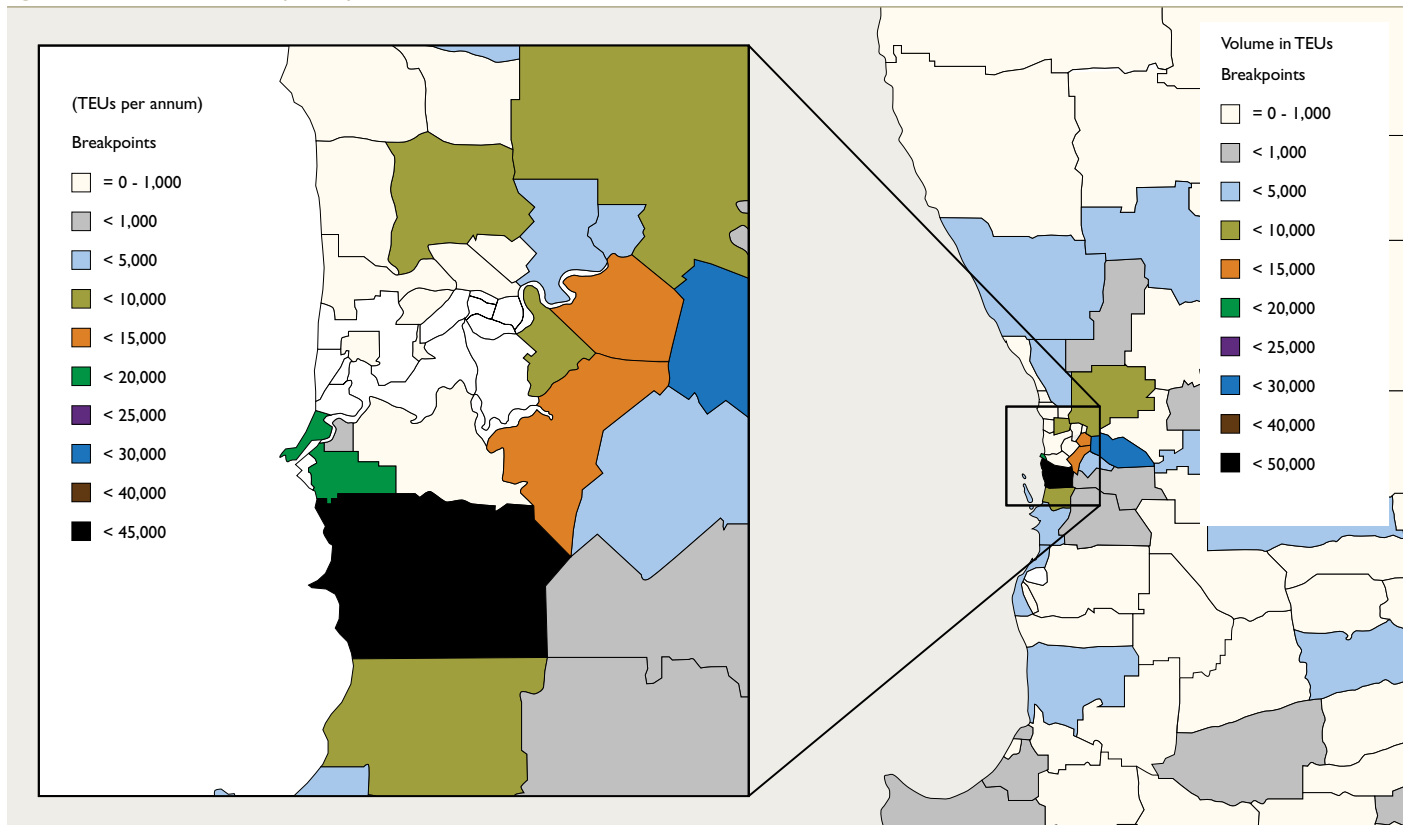
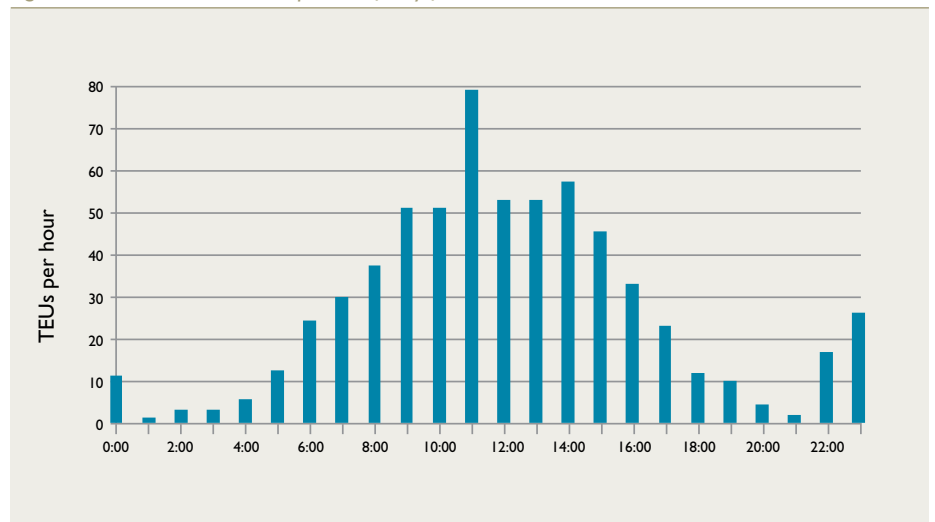


Figure 7 – Full Container Pick Up Time of Day from Pack Location



The staging for exports is interesting. Proportionally more export containers move by rail compared with import containers and movements by rail introduce an element of staging. While less staging of exports takes place than occurs with imports, nearly half had some degree of staging between the pack point and terminal delivery.

Results of the survey also show that the export cycle is more complicated than often stated, as many of the exports are raw materials which are transported to the metropolitan area for packing and shipment in containers.

Initial indications are that nearly half the export packs involve empty containers, which arrive at the pack location and are packed that day while still on the truck ready for immediate delivery back to a terminal. For these packs empty containers are not held on site.

Figure 7 above indicates that while there is an increasing build up of pick up activity until mid morning, there is, with one exception (11am), a steady level of activity from 9am to 3pm.

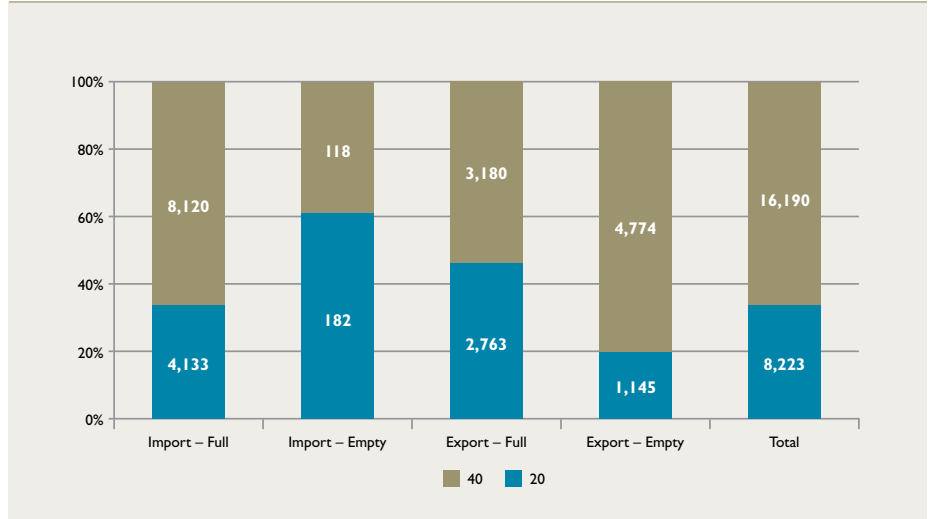
Positively, although limited, some export pick-up activity takes place during the night. There is a surge around 10pm to midnight, largely as a result of rail terminal departures, thereby promoting more effective use of terminal assets.



Container Type Use

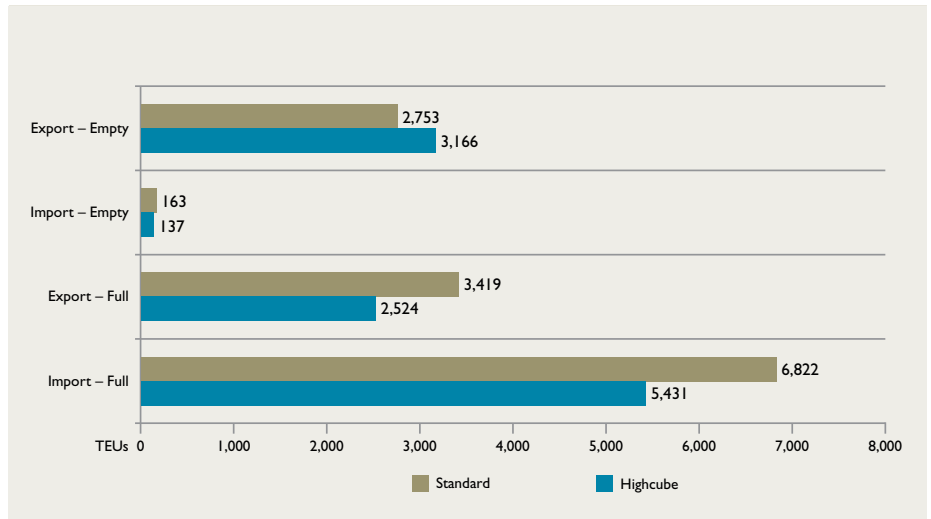
In TEU terms, two thirds are 40' equivalents. In terms of physical containers, however, both 20' and 40' containers are handled in equal numbers (Figure 8).

Figure 8 – Proportion of Equipment Type at Container Terminals (TEUs)



There is a significant number of “high cube” containers (9’6”) in use for about 44% of full imports and 42% of full exports. As can be seen from Figure 9 below, the result is that comparatively more high cubes tend to be exported empty.

Figure 9 – Breakdown of High Cube and Standard Container Type at Container Terminals (TEUs)



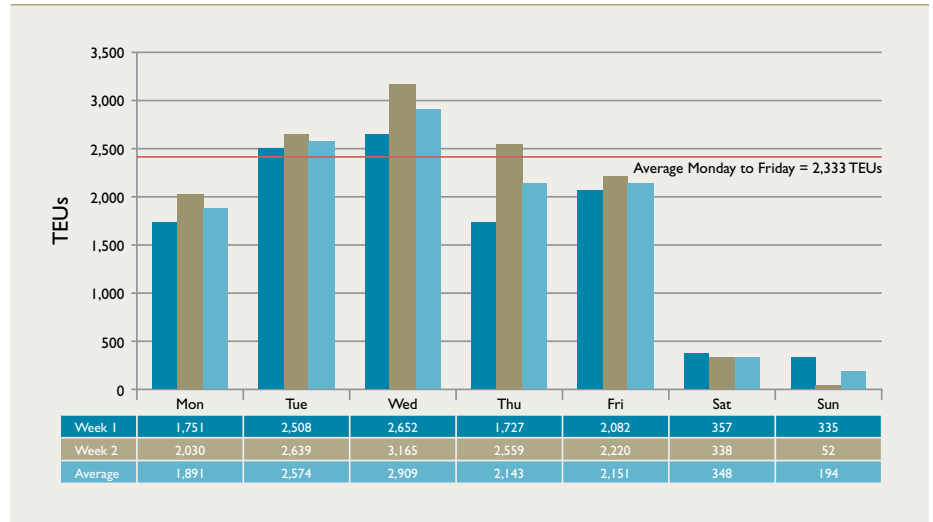


Container Terminals

Wednesday was clearly the busiest day in and out of the container terminals, not Monday and Friday as may have been thought (Figure 10).

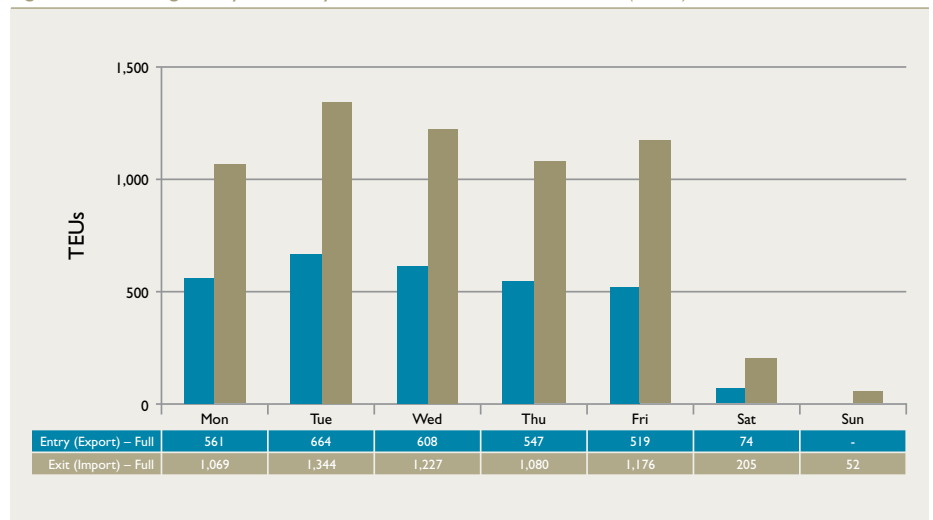
This was because most large scale transfers of empty containers occurred on Wednesday between empty container parks and container terminals (“bulk runs”).

Figure 10 – Average Daily Volume at Container Terminals (TEUs)



During the study period, excluding bulk runs, Tuesday was the busiest day (Figure 11). Friday was the lowest volume day for exports, despite a stated belief that exporters, and therefore transport operators, attempt to make ship cut-offs on Fridays for vessels which sail on weekends. This appears not to be the case.

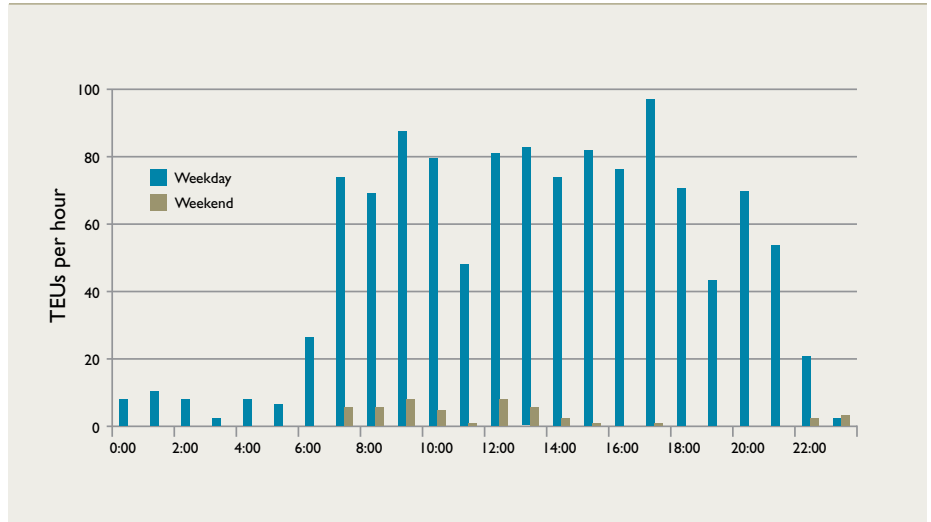
Figure 11 – Average Daily Full Entry and Exit at Container Terminals (TEUs)



Due to the stevedoring container terminals both having booking systems during this period, the level of container movement activity was largely consistent throughout the core working day for full imports (Figure 12), noting that the container terminals operated from 0600 to 2300 hrs for receipt and delivery during the study period.

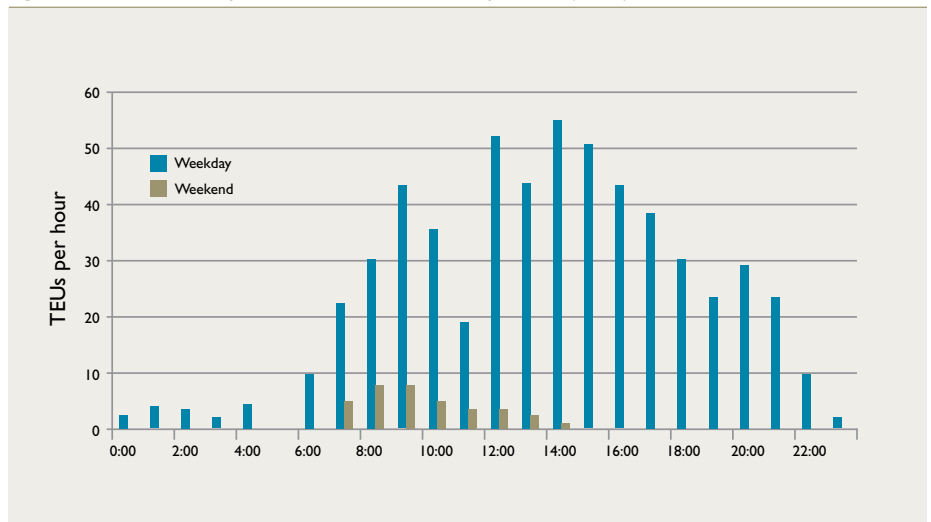


Figure 12 – Time of Exit from Container Terminals - Import Full (TEUs)



As shown in Figure 13, export deliveries to terminals basically build to the middle of the day and then decline until shift end.

Figure 13 – Time of Entry at Container Terminals - Export Full (TEUs)



The limited activity after 10pm, in both figures, when the terminals complete the afternoon/evening receipt and delivery shift, means there is a lengthy period of inadequate use of facilities by the entire supply chain. This presents a significant opportunity for high volume full activity (by road operators) and bulk empty activity (by container parks) to make available peak period capacity.

The limited weekend activity reflects the general weekday, two-shift operations of the terminals up to just before the time of the study. This has begun to change, as reflected in the figures presented, with some weekend activity occurring to the point where Saturday morning receipt and delivery (R&D) shifts are now a regular feature in Fremantle, with Sunday mornings also progressively being used more often.



Empty Container Parks

The vital role of empty container parks in the supply chain is clearly shown in the Logistics Chain Movements diagram (Figure 3), showing that a hire or de-hire from or to an empty container park is nearly always a requirement in either the import or export cycle. With around 90% of empty container park holdings still contained in or close to the port, it shows the requirement placed on the chain in having to repeatedly come to the port area.

Half of all movements at empty container parks are to dehire empties. One quarter are to pick up export boxes and another quarter are bulk runs of empties from the parks to container terminals (nearly all export boxes). This means that half of all the boxes that come into the port are sent out empty.

Figure 14 – Average Daily Volume per Day at Empty Container Parks (TEUs)

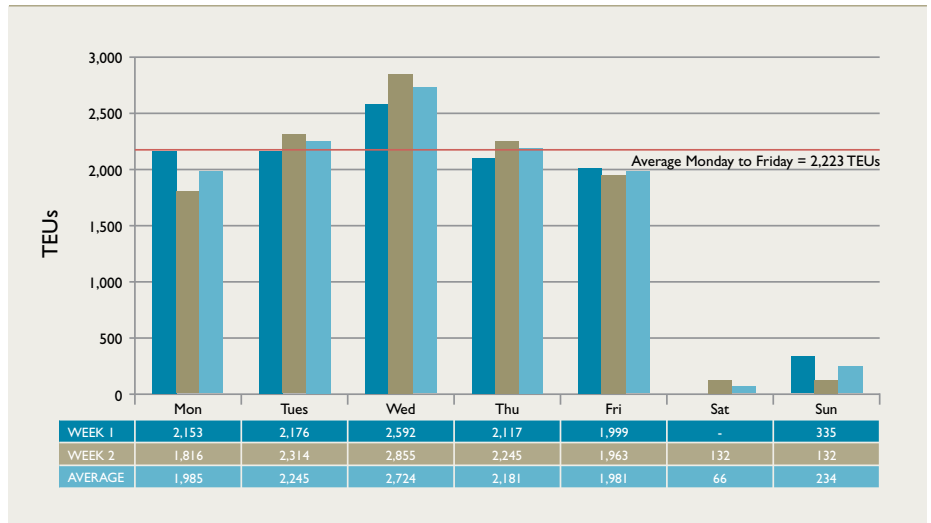
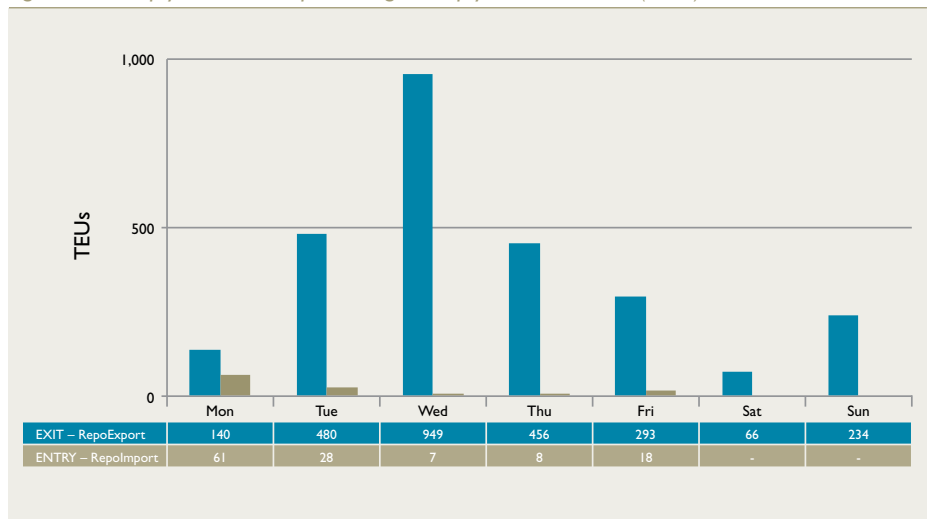


Figure 15 – Empty Container Relocation at Empty Container Parks (TEUs)

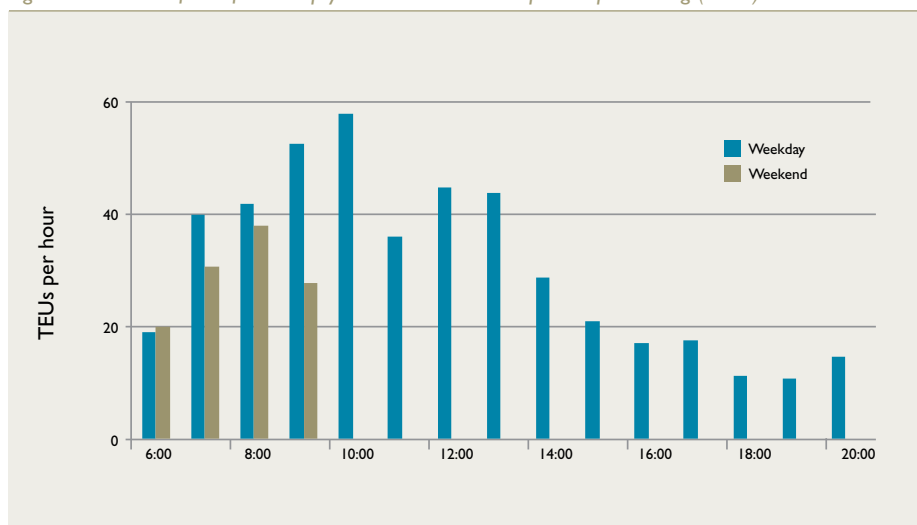


Again, Wednesday is the busiest day of movement activity at the ECPs, due to bulk runs as shown in Figures 14 and 15.

Bulk run activity, usually starting in the morning and ceasing from early afternoon onwards, generally draws empty container park resources away from R&D during these times (Figure 16).



Figure 16 – Time of Exit from Empty Container Parks - Export Repositioning (TEUs)



This is expected to change with the recent announcement that major parks will move to after R&D hours bulk runs and introduce a system requiring road carriers to notify their arrival, according to slots made available by the parks.

Rail

Rail operates two services a day from the North Quay Rail Terminal, located within the port precinct, to an intermodal terminal in Forrestfield.

Twelve per cent of the total number of containers travelled by rail during the study period. Full exports were notably higher with 18% moving by rail.

The distribution pattern for containers moving by rail was very restricted with over 96% of imports and 86% of export volume being within a band 20-30km radial distance from the port, showing that the market for rail is tightly centralised around the Forrestfield terminal. Only a small number (3%) of exports came from localities 50km to a maximum of 100km from the port.

Nearly 20% of imports (18.3%) and over 40% of exports (41.8%) in the 20 to 30km band travelled by rail. This shows rail's attractiveness in situations where the intermodal terminal is located close to critical mass customer base locations and where first/final distribution distances are shortest. It provides an indicator that an overall target to have 30% of container freight on rail is not unrealistic provided the appropriate infrastructure is available near the key logistics loading/unloading points.

While still to be confirmed, initial indications from the first stage of this study show that rail is very efficient in moving containers from and to customers. Ninety percent of containers taken from terminals transit through the North Quay Rail Terminal and out to Forrestfield to allow pick up within 24 hours. In total, when comparing all containers moved at some point by rail to those purely moving by road through a road operator staging facility (the majority of containers, as this study has shown), the time taken by rail appears to be the same to customer as by road.



Container Weights

The average net weight in a transported 20' import container does not differ from that in a 40' container (both nearly 17.5t).

Interestingly, although the very heavy import weights (25t and above) tended to be more in 40' containers (one quarter of all 40's), 20' containers took more of the mid-range weights of 15-25 tonne (one third of 20' containers were 20-25t), and twice as many 40' containers were likely to be in the 5-15 tonne range as 20' (i.e. the larger containers were being used for lighter loads).

WA seems to largely export heavier containers. Well over 90% of all containers were above 15t. Two thirds of all 40' exports were 25t and above.

Final

The study has produced valuable insights into Fremantle Port's landside logistics supply chain. It allows comparison with many of the results obtained in the original March 2004 study. It complements work performed by other ports in Australia.

By designing the study to allow repeatability, the intention is to carry out follow-up studies in future years to build on the understanding gained of the port's supply chain and identify trends.

The study team wishes to thank all the participants and supporting partner organisations for their valued contributions to this study.



