



Indicative Estimates of Commodities and Truck Volumes from Container Destinations in Melbourne

Prepared for Infrastructure Victoria

Prepared by the
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Date: 3/02/2017

Acknowledgements

This project was funded by Infrastructure Victoria

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The paper relies on data supplied by a number of parties and it has been necessary to rely on the validity and accuracy of the data. Appropriate professional practice has been used and the estimates contained in this document are expected to be useful for Infrastructure Victoria management and planning purposes.

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List of Terms and Abbreviations

ABS	Australian Bureau of Statistics
Container Freight Station (CFS)	A location where a third party may pack or unpack containers on behalf of the importer or exporter
Container destination	A business at which a full import container is unpacked
Distribution Centre (DC)	A location where a third party may pack or unpack containers on behalf of the importer or exporter and typically involving cross-docking operations
ISCL	Institute for Supply Chain and Logistics
MMR	Melbourne metropolitan region
Primary import container destination	Particular postcodes (and associated suburbs) in which the number of containers (TEUs) unpacked are in or above the 1 – 2% range of the total full import containers (TEUs) for the 2015/16 financial year
Twenty-foot equivalent unit (TEU)	A unit for measuring shipping containers
Wholesale business	A business which buys a large quantity of goods from various producers or vendors, warehouses them, and resells to retailers. Examples are indicated on www.wholesalersnetwork.com and include: Kirk Food – supplies retailers with a range of gourmet foods from various sources; Progressive Office Furniture – supplies a range of ergonomic furniture from various sources.

Executive Summary

Development of a new port for Melbourne, if this occurs, could significantly change the locations where full import containers are unpacked (known as ‘container destinations’) and, thus, the movement of commodities and trucks from the container destinations to the final freight destinations in metropolitan Melbourne, in other parts of Victoria and interstate.

Infrastructure Victoria commissioned the Institute for Supply Chain and Logistics to undertake a study to generate indicative estimates of:

- Commodity and truck volumes from full import container destinations in the Melbourne metropolitan region;
- The main drivers of these container destinations; and the
- Distribution of commodities after the freight has been unpacked.

It was possible to draw on several data sources and procedures from previous Institute for Supply Chain and Logistics research (Port of Melbourne and Port of Brisbane container logistics chains for import containers), and on the Australian Bureau of Statistics estimates of the financial flows between particular business types.

The research findings and estimates are summarised in the following sections.

1. Primary Import Container Destinations and the Role of Distribution Centres and Container Freight Stations

The total number of international and coastal shipping import containers (expressed in twenty-foot equivalent units, TEUs) through the Port of Melbourne in the 2015/16 financial year was 1,035,698 (Port of Melbourne Corporation, 2016) and the estimated Melbourne metropolitan region component of this total flow of freight was 904,303 containers (TEUs).

The container destinations in the Melbourne metropolitan region are located in a large number of postcodes across the region. However, 78% of containers are unpacked at 25 primary container destinations (those each handling around 2% or more of the total containers (TEUs) for the metropolitan region). Further, a significant component of the containers going to these primary destinations is unpacked at Distribution Centres or Container Freight Stations, up to 50% in the Outer Western region.

About 70% of full import containers are staged at transport depots, before passing to the unpack location.

2. Import Commodity Classes and Destinations Across Melbourne’s Metropolitan Regions

The majority of the import commodities are manufactured or processed products, which are likely to be primarily for input to manufacturing or processing businesses (e.g., vehicle manufacturers, metal fabricators), or for distribution through Distribution Centres, Container Freight Stations or to wholesalers (e.g., large volume furniture businesses which distribute to lower volume furniture retailers).

The distribution of container destinations across metropolitan Melbourne varies significantly by commodity class reflecting variations in population, industry and the most suited business locations for Distribution Centres and Container Freight Stations.

3. Container Destination Business Types Other Than Distribution Centres and Container Freight Stations

For containers that are not unpacked at a Distribution Centre or a Container Freight Station, the type and number of trucks required to transport imported commodities from the container destination will vary according to the type of business where the container is unpacked. For example, a steel fabrication business receives imported steel sections and uses these to manufacture storage units. These are then distributed to a range of businesses, using a mix of light to heavy trucks. The Australian Bureau of Statistics “industry ‘use’ tables” and industry consultations indicate that for import containers not unpacked at Distribution Centres or Container Freight Stations:

- The majority will be unpacked at businesses in the associated industry class (e.g., 95% of imported food is unpacked at a food manufacturing/processing business); and
- Small percentages will be unpacked at large volume wholesale businesses (which then distribute to lower volume retailers).

4. Trucks for Transporting Commodities from Container Destinations

The resulting, indicative estimate of truck trips to transport unpacked commodities in the Melbourne metropolitan region in the 2015/16 financial year was 1,878,347 trucks, with the following primary observations.

- About 35% of the truck trips were from Distribution Centres and Container Freight Stations, a large number of which are located in the Outer Western and Outer South Eastern regions of Melbourne. These trips were to a range of businesses in the next stage in the distribution process and to a wide range of locations across the metropolitan region as well as intrastate and interstate. A significant component of the movements in the Melbourne metropolitan region were to major retail businesses (e.g., Coles, Woolworths, Bunnings), which are located in highly populated areas.
- About 60% of the truck trips were from manufacturing or processing businesses. Since many of the imported commodities will be inputs to manufacturing or processing businesses (e.g., steel for steel fabrication, food products for food manufacturing) it is likely that these truck trips were not generated directly from the initial unpacking, but occurred at some time after further processing. Further, the type and number of truck trips required depends on the type of products produced by the business and the purchasing behaviours of downstream businesses and consumers.
- A small percentage (about 5%) of the truck trips were from wholesale businesses. As for manufacturing and processing businesses, the truck trips required to transport unpacked commodities from wholesalers were also likely to be to a range of businesses in the next stage in the supply chain, and to a wide range of locations, primarily across the Melbourne metropolitan region.

5. Inferences for Port Capacity and Location

A significant proportion (about 35%) of import containers through the Port of Melbourne in the 2015/16 financial year was unpacked at Distribution Centres and Container Freight Stations, which are located to optimise the links to the port and to the distribution network for unpacked commodities. About 60% of Distribution Centres and Container Freight Stations are located in the Inner, Outer West and Outer Northern regions of the Melbourne metropolitan region and many are in close proximity to the Port of Melbourne or to arterial road networks leading to the port.

Primary drivers of the location and efficient operation of these important freight facilities are therefore the location, access to, and the capacity of the port.

Efficient road transport links to major retail outlets and to intrastate and interstate locations are necessary for the movement of unpacked commodities. Retail outlets are located in or near population centres and significant population growth is expected to continue in the Outer Western and Northern regions of the Melbourne metropolitan region. The potential relocation of the Port of Melbourne is likely to cause a significant:

- Relocation of the Distribution Centres and Container Freight Stations across Melbourne; and
- Change in the truck movement patterns for the distribution of unpacked commodities to the next stage in the supply chain.

6. Further Assessments

More detailed analyses that Infrastructure Victoria may be interested in pursuing with the Institute for Supply Chain and Logistics include:

- Detailed estimates of the truck trip distribution patterns from import container destinations, in particular from Distribution Centres and Container Freight Stations across the Melbourne metropolitan region;
- Possible relocation of Distribution Centres and/or Container Freight Stations if or when the Port is relocated, and the resulting change in truck trips plus the urban impact (including, for example, from traffic congestion, emissions and urban amenity); and
- Likely future growth in full import containers through the Port of Melbourne and estimate of the timing when capacity is likely to be reached.

1. Purpose

The movement of containerised commodities around Melbourne, from locations where import containers are unpacked (known as ‘container destinations’), and to locations where containers are packed for export (known as ‘container origins’), causes significant commodity and truck movements on the road network adding to road congestion and the associated economic, environmental, and social impacts.

A lack of research has resulted in limited knowledge about the volumes of containerised import and export freight after unpacking and before packing, respectively, and the associated truck movements in the Port of Melbourne logistics chain. Further, development of a new port for Melbourne, if this occurs, could significantly change the container destinations and origins and, thus, the movement of commodities and trucks across the Melbourne metropolitan region (MMR).

Communications between Infrastructure Victoria and the Institute for Supply Chain and Logistics (ISCL) in September 2016 indicated that estimates of the volumes and spatial distribution patterns of commodities unpacked from import containers, and details of the trucks required to move the unpacked commodities would assist Infrastructure Victoria in preparing advice on Victoria’s future container port capacity and location. Further, an understanding of the drivers determining the location of container destinations and origins and the distribution and consumption of unpacked import commodities will aid Infrastructure Victoria’s further investigations.

Infrastructure Victoria subsequently invited ISCL to scope and cost a study to generate indicative estimates of the commodity and truck volumes from full import container destinations in the MMR to a suitable level of detail within the available time and budget. The results of this study are presented in this report.

Note that in this report:

- Container volumes pertain to full import containers and are given in twenty foot equivalent units (TEUs);
- Trucks include light, rigid and articulated trucks (excluding utilities and vans); and
- All TEU and truck values are annual, for either the 2009 calendar year or the 2015/16 financial year, with the year indicated where appropriate.

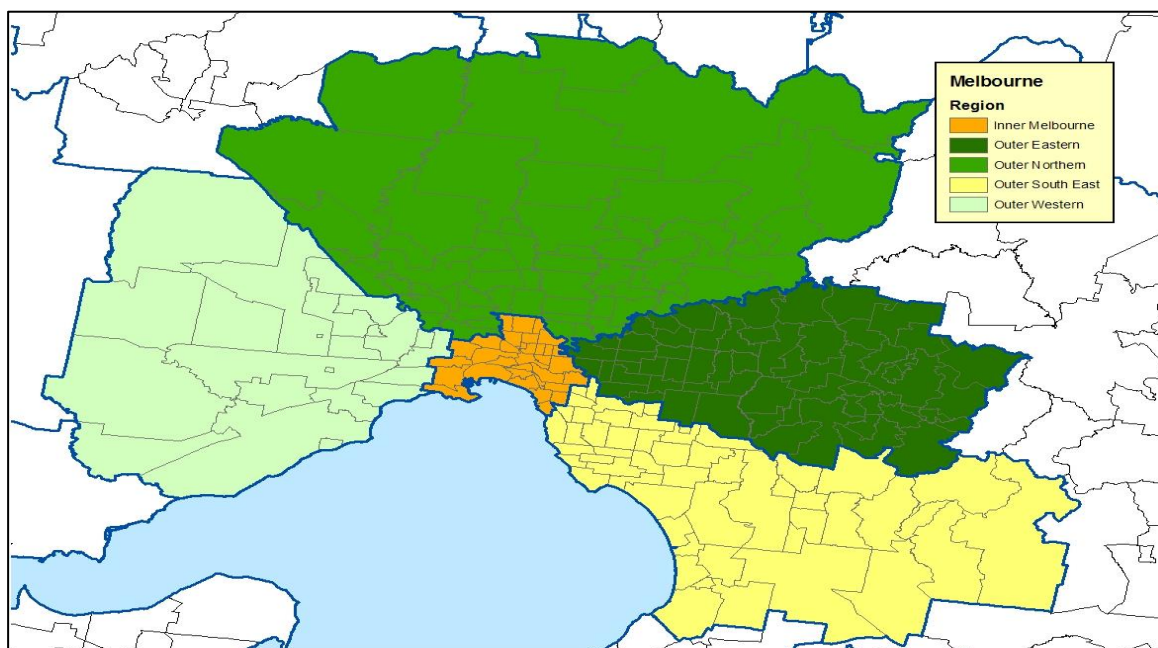
The available data sources and analysis plan are outlined in Section 2 (and Appendix A), the research findings in Section 3, implications of the findings for a new port in Section 4 (and Appendix B), and possible further detailed analyses are outlined in Section 5.

2. Methodology

The ISCL played a major role in a detailed study of the Port of Melbourne container logistics chain in 2009 (Port of Melbourne Corporation, 2009), which provided estimates of the destinations of imported shipping containers and the origins of export containers. Recent ISCL research for the Port of Brisbane (Port of Brisbane, 2013) included a strategic-level assessment of the volumes of commodities and the associated truck movements from the container destinations for imports and to the container origins for exports. The data and procedures from these studies provide a base for this study.

Infrastructure Victoria's immediate interest is to gain a better understanding of the movements of imported commodities and associated truck volumes from the import container destinations. In response, this report relates specifically to full imported international and coastal shipping containers and to container destinations in the five regions of the MMR as indicated in Figure 1.

Figure 1 Location of Postcode Boundaries and Grouping into Regions in Metropolitan Melbourne



Source: Port of Melbourne Corporation (2009)

The study tasks, data sources and analysis procedures are outlined in Appendix A.

3. Research Findings

The findings and estimates relate to:

- ‘Primary’ import container destinations (i.e., destinations of one postcode or two adjacent postcodes handling containers (TEUs) in the order of 1-2% of the total across the MMR, and where distribution centres (DCs) and container freight stations (CFSs) are located) and percentages unpacked at DCs and CFSs.
- Import commodity classes and destinations for each commodity class across the MMR;
- Business types, other than DCs and CFSs, at container destinations, for each commodity class; and
- Number of trucks, by truck class, to move unpacked commodities from the container destinations.

3.1 Primary Import Container Destinations and the Role of Distribution Centres and Container Freight Stations

The estimated number of import containers (TEUs) reported in the Port of Melbourne Corporation (2009) study for each region in the MMR is shown in Table 1. A high proportion of the containers were handled in the Outer West and Outer South East regions. The following tables and charts show that this reflects to some degree the locations of DCs and CFSs.

As noted in Appendix A, the distribution of container destinations across the MMR regions for the 2015/2016 financial year was estimated by multiplying the 2009 distribution of containers (TEUs) across container destinations by the ratio of (total 2015/16 TEUs) / (total 2009 TEUs).

The total number of international and coastal shipping full import containers through the Port of Melbourne in 2015/16 was 1,035,698 containers (TEUs) (Port of Melbourne Corporation, 2016) and the MMR component of this was 904,303 containers (TEUs) (Tables 1 and 2). There are 173 postcode areas in the MMR, implying an average of 5,227 containers (TEUs) by postcode in 2015/16 (Table 2).

Inspection of the number of containers (TEUs) by postcode indicated that there were a significant number of container destination postcodes handling only small numbers of containers, of the order of 100 containers (TEUs) or 0.01% of the total distributed across the MMR. As small estimated volumes will have relatively high variances and are not likely to generate significant truck volumes to move the unpacked commodities, it was appropriate to:

- Identify the ‘primary’ destinations for import containers, that is either individual postcodes or two adjacent postcodes with container destinations of the order of 10,000 - 20,000 containers (TEUs), or 1 - 2% of the total for 2015/16; and
- Group the remaining postcodes in each of the five regions (Figure 1 and Table 1) which individually handled less than the above range of container (TEU) volumes, but collectively handled volumes in the 1 - 2% range, and define a ‘destination’ for each group of suburbs.

Table 1 Full Import Containers¹ for International and Coastal Shipping within the MMR²: 2009 and 2015/16³

Region of Melbourne	2009	%	2015/16
Inner Melbourne	61,224	9%	77,706
Outer West	215,413	30%	273,405
Outer North	156,950	22%	199,203
Outer East	74,076	10%	94,018
Outer South East	204,828	29%	259,970
Total	712,491		904,303

1. Containers are full and measured in twenty foot equivalent units (TEUs)
2. Regions are shown in Figure 1
3. 2015/16 financial year

Table 2 Number of Import Containers (TEUs) Transported by Truck to Primary Destinations and Number Unpacked at DCs and CFSs in 2015/16

Melbourne Metropolitan Region			Primary Container Destinations			
Import Containers (No. TEUs)	No. Postcodes	Average TEU/postcode	Primary Destinations (No.)	Import Containers (No. TEUs)	% of Total Containers (TEUs)	Containers (TEUs) Unpacked at DCs/CFSs
904,303	173	5,227	25	706,530	78%	314,883

The outcomes of this analysis are indicated in Table 2 and Table B1 (Appendix B).

- There were 25 primary import container destinations (one or two adjacent postcodes in which the number of containers (TEUs) unpacked was in or above the 1 - 2% range, Table 2). The postcodes and associated suburb names are shown in Table B1, Appendix B.
- The import containers to these primary destinations account for 78% of the total import containers to the MMR. Further, a significant component (314,883 containers (TEUs) or 45%) of the containers was unpacked at DCs or CFSs (Table 2).
- The number of import containers to the remaining 146 destination postcodes in the MMR was 197,773 (Table 2) or 22% of the total.

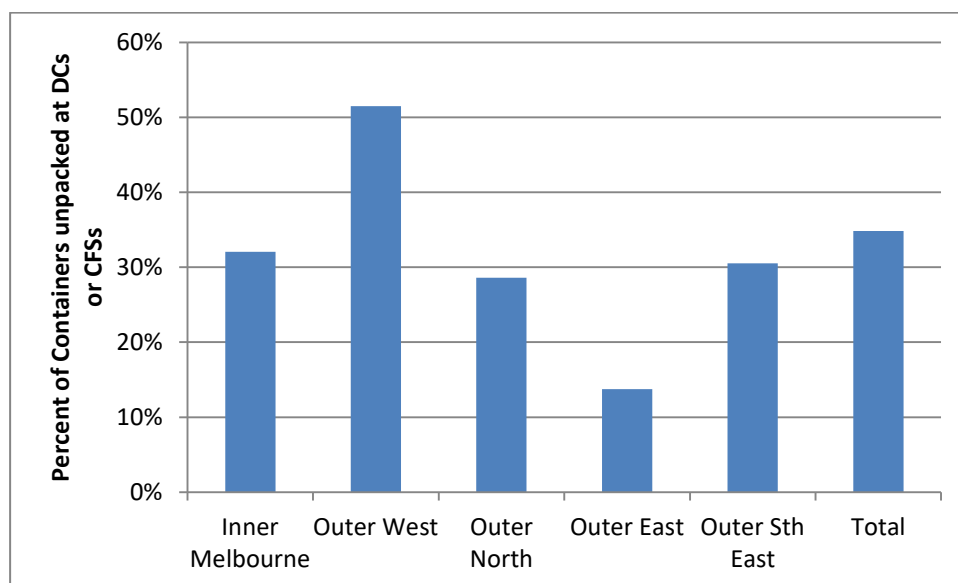
The number of primary destinations according to region is shown in Table 3, together with the estimated number of containers (TEUs) unpacked at DCs or CFSs. As seen in the last column of Table 3 and in Figure 2, a significant component of the total containers is unpacked at DCs and CFSs, with the proportion reaching 50% in the Outer Western region and 30% in the Outer North region, a total of 80% across the West – North freight corridor.

A high percentage (about 70%) of the full import containers are staged at transport depots, before passing to the final container destination.

Table 3 Number of Primary Destinations and TEUs Unpacked at DCs and CFSs

Region	Primary Destinations (No.)	Import Containers (TEUs)		
		Total No.	No. unpacked at DCs and CFSs	%
Inner Melbourne	2	77,706	24,924	32%
Outer West	8	273,405	140,771	51%
Outer North	5	199,203	56,930	29%
Outer East	4	94,018	12,939	14%
Outer South East	6	259,970	79,319	31%
Total	25	904,303	314,883	35%

Figure 2 Proportion of Containers Unpacked at DCs and CFSs by Region



Given the details of container destinations described above, the next stage of the analysis estimated the number of trucks required to transport unpacked commodities from:

- DCs and CFSs in the 25 primary destinations (as listed in Table B1, Appendix B);
- Other business types in the primary destination postcodes; and
- Businesses in the remaining postcodes in the MMR.

3.2 Import Commodity Classes and Destinations across the Melbourne Metropolitan Region

The primary commodity classes for import containers in 2015/2016, drawn from Port of Melbourne Corporation (2016), are shown in Table 4. This data source does not report the distribution of the container destinations across the five metropolitan regions, for each commodity class, but an indication is provided by the Port of Melbourne Corporation (2009) study and is shown in Table 5.

The data show that:

- The majority of the import commodities are manufactured or processed products which are likely to be inputs for manufacturing or processing businesses (e.g., vehicle parts for vehicle manufacturing and metal for metal fabrication), or for distribution through DCs, CFSS or wholesalers (as defined, examples of businesses, in List of Terms); and
- The distribution of container destinations varies significantly across the commodity classes (Table 5) reflecting variations in population and industry, and the locations of large numbers of DCs and CFSS. In particular, the proportion of 'Other Manufactured' commodities going to the Inner region is very low (only 1%) but is much higher in the Outer West, Outer North and Outer South East regions, where there are significant numbers of DCs and CFSS (Table 3).

Table 4 Primary Commodity Classes in Import Containers (TEUs) – 2015/2016¹

Commodities in Import Containers (TEUs) in 2009	%
Household goods	15%
Machinery and vehicle parts	12%
Metal, non-metal and rubber products	10%
Plastic and chemical products	3%
Pulp and paper products	6%
Textile, clothing and footwear products	7%
Other manufactured products	7%
Other commodities (not specified)	41%
Total	100%

¹ Commodity classes and percentages are average for July 2015 and March 2016, reflecting the average for 2015/16 year.

Table 5 Regional Distribution for Five Classes of Containerised Commodities across Metropolitan Melbourne – 2009¹

Imported Commodities	Inner	Outer West	Outer North	Outer East	Outer Sth East
Food	15%	30%	36%	4%	15%
Beverage and tobacco	12%	17%	35%	0%	37%
Chemicals and related products	8%	28%	7%	20%	37%
Machinery	15%	12%	11%	5%	57%
Other Manufactured	1%	38%	26%	12%	23%
Total	7%	31%	23%	11%	29%

¹ Commodity classes and percentage distribution are for a sample period in 2009, from Port of Corporation (2009).

² The commodity classes in Table 5 differ from those in Table 4. Possible reasons for the differences are that there are fewer commodity classes in Table 5, the distribution in Table 5 was based on a relatively small sample of data in 2009 and a high proportion of commodities are in the 'Other' classes, allowing for 'shifts' of some commodities to or from this class over time,

3.3 Container Destination Business Types Other than Distribution Centres and Container Freight Stations

The type and number of trucks required to transport imported commodities from the container destination will vary with the type of business where the container is unpacked. For example, a steel fabrication business could require a mix of trucks, including articulated trucks, while a furniture wholesaler is likely to require light to medium trucks. Therefore, for containers which are not unpacked at a DC or CFS it was necessary to first identify the business types where containers for a particular commodity class are likely to be transported and unpacked. The proportion of containers unpacked at each of these business types was then estimated. The ABS “industry – industry ‘use’ tables” (see Appendix A, Task 5) provided an indication of the ‘downstream’ business types to which commodities will be sent as they are moved along the supply chain. For the full import containers this enabled an estimation of the share of the containers sent from the port to each business type, for each commodity class. Industry consultations indicate that it is likely that if import containers are not unpacked at DCs or CFSs then they will be unpacked at relevant manufacturing, processing or wholesaling businesses (e.g., metal products are unpacked at a metal product manufacturing business). Some might be unpacked at other business types (e.g., retail businesses), but it is reasonable to assume that these businesses will have limited facilities to unpack containers and that there will not be a material number of containers unpacked at these business types.

The estimated share of full containers transported to the relevant manufacturing/processing and wholesale business types are shown in Table B2, Appendix B, for each of the primary import commodity classes in 2015/16 (as listed in Table 4). For each commodity class:

- A significant proportion of the containers are moved to businesses in the associated industry class (e.g., 94% of imported vehicle parts is unpacked at a vehicle manufacturing/processing business); and
- Small proportions are moved to wholesale businesses (with unpacked commodities then moving to retail outlets), with the highest being 18% for Household goods and 16% for Pulp and paper products.

3.4 Trucks for Transporting Commodities from Container Destinations

The procedures outlined in Sections 3.1 to 3.3 generated estimates of the number of full containers (TEUs) transported from the Port of Melbourne to a particular destination and business type.

ISCL investigations undertaken as a part of the Port of Brisbane (2013) study generated estimates of the types and numbers of trucks required to transport commodities once unpacked at a particular business type. Based on these data, estimates of the number of trucks per full container (TEU), for each type of truck are shown in Table 6.

Assuming similar truck types as those found in the Port of Brisbane study (2013), a mix of light, rigid and articulated trucks would be used to transport unpacked commodities from DCs and CFSs, manufacturing and processing businesses and wholesale businesses. While the average number of trucks per container (TEU) is likely to be about two (Table 6) the proportions of each truck type could vary across these

business types, with a higher proportion of articulated trucks required to transport imports which are unpacked at DCs or CFSs.

Table 6 Number of Trucks per Container (TEU) to Transport Unpacked Commodities

Business type	Item	Number of Trucks per Container (TEU)			
		Light	Rigid	Articulated	Overall
DC and CFS	Trucks/TEU ¹	3.5	2.25	1.75	2.0
	Percentage	5%	30%	65%	100%
Manufacturing/processing	Trucks/TEU	3.5	2.25	1.75	2.1
	Percentage	10%	40%	50%	100%
Wholesale	Trucks/TEU	3.5	2.25	1.75	2.1
	Percentage	10%	40%	50%	100%

¹ Trucks/TEU = Number of Trucks per Container (TEU)

Estimates of the number of truck trips required to transport commodities from businesses where containers are unpacked were then obtained by applying the Trucks/TEU rates in Table 6 to the number of containers (TEUs) unpacked by each business type and import container destination.

The resulting estimates of truck trips in the MMR in 2015/16 are shown in Table 7 and in Figure 3.

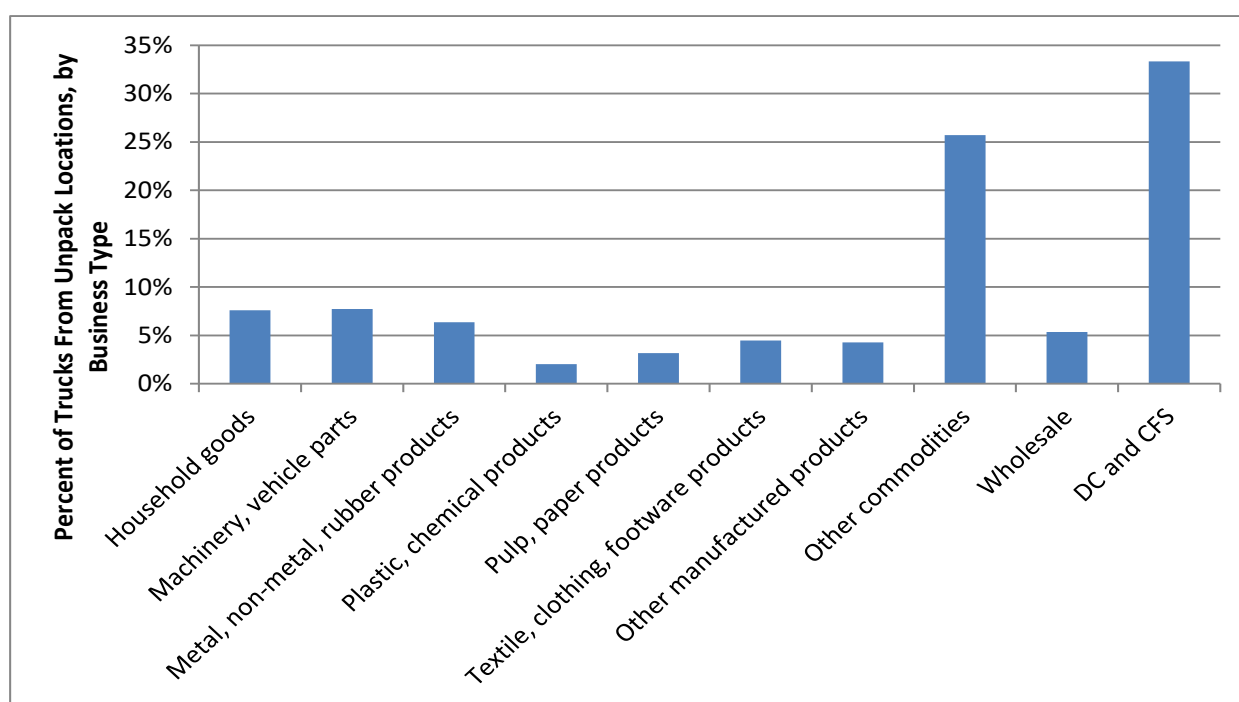
For the trucks required to transport the unpacked import commodities:

- **About 35% of the truck trips were from DCs and CFSs.** As indicated in Table B1 (Appendix B), these are located in a small number of postcodes, particularly in the Outer Western and Outer South Eastern regions of Melbourne. The truck trips from DCs and CFS were to a range of businesses in the next stage in the distribution process and to many locations across the MMR and intrastate and interstate. Significant components of the movements in the MMR were to major retail businesses (e.g., Coles, Woolworths, Bunnings) in highly populated areas.
- **About 60% of the truck trips were from manufacturing or processing businesses.** Since many of the imported commodities will be manufacturing or processing business inputs it is likely that these truck trips were not generated directly from the initial unpacking, but occurred at some time after further processing. Further, the type and number of truck trips required depends on the type of products and the purchasing behaviours of downstream businesses and consumers. As indicated in Table 6 the trucks are likely to be smaller than those used to transport commodities unpacked at DCs or CFSs and will thus have a lower impact on traffic conditions than the truck trips from DCs and CFSs.
- **A small percentage (about 5%) of the truck trips were from wholesale businesses.** As for manufacturing and processing businesses, the truck trips required to transport unpacked commodities from wholesalers were also likely to be to a range of businesses in the next stage in the supply chain, and to a wide range of locations, primarily across the MMR.

Table 7 Truck Trips to Transport Commodities from Container Destinations by Business Type

Industry-commodity	Trucks/TEU	Truck Trips (No.)	%
Manufacture – household goods	2.1	147,734	8%
Manufacture – machinery and vehicle parts	2.1	145,288	8%
Manufacture – metal, non-metal and rubber products	2.1	119,502	6%
Manufacture – plastic and chemical products	2.1	38,010	2%
Manufacture – pulp and paper products	2.1	59,698	3%
Manufacture – textile, clothing and footwear products	2.1	83,821	4%
Manufacture – other products	2.1	80,305	4%
Other commodities (not specified)	2.1	482,486	26%
Wholesale	2.1	100,674	5%
DC and CFS	2.0	625,830	33%
Total truck trips		1,878,347	

Figure 3 Distribution of Truck Trips from Container Destinations Across Business Types



The estimated number of import containers (TEUs) unpacked at each of the destinations in the MMR is shown in Table B3, Appendix B. The resulting estimated number of truck trips required to transport commodities from primary container destinations in Melbourne in 2015/16 are shown in Table 8 and Table B4 (Appendix B), and for each region separately in Figures 5 to 9, with the following primary observations:

- The maximum number of truck trips generated from any postcode was estimated to be 185,518 from the Dandenong postcode in the Outer South East region (Table B3, Appendix B). The charts for

each region were therefore scaled to a maximum of 200,000, to show the relative numbers of trucks across suburbs and regions.

- The percentage of truck trips from container destinations across the five regions is similar to the percentage of the full imports containers (Table 1). This results largely from the fact that average number of trucks per container (TEU) for unpacked commodities are similar across the business types at which containers are unpacked (i.e., an average of about 2 trucks / TEU, right hand side of Table 6).
- The proportion of truck trips generated from containers unpacked at DCs or CFSs in primary container destinations (Table B3, Appendix B) vary widely, from 6% in Ringwood to 93% in Altona North. Regions with primary destinations that have high proportions of truck trips from DCs and CFSs are:
 - Inner Melbourne (e.g., West Melbourne – 58%);
 - Outer Western region (e.g., Altona Nth – 93%, Laverton Nth – 63%); and
 - Outer South East region (e.g., Dandenong – 53%).

Table 8 Truck Trips to Transport Commodities from Container Destinations by Region

Region	Trucks Trips (No.)	%
Inner Melbourne	161,699	9%
Outer Western	561,629	30%
Outer Northern	415,478	22%
Outer Eastern	198,010	11%
Outer South East	541,531	29%
Total	1,878,347	

Figure 4 Distribution of Truck Trips from Container Destinations across Melbourne Regions

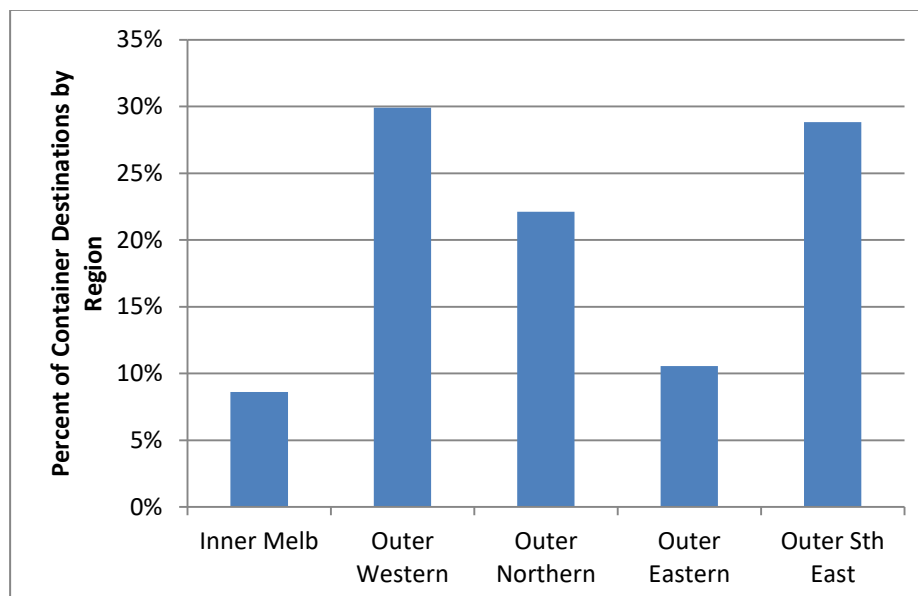


Figure 5 Truck Trips to Transport Commodities from Container Destinations: Inner Melbourne Region

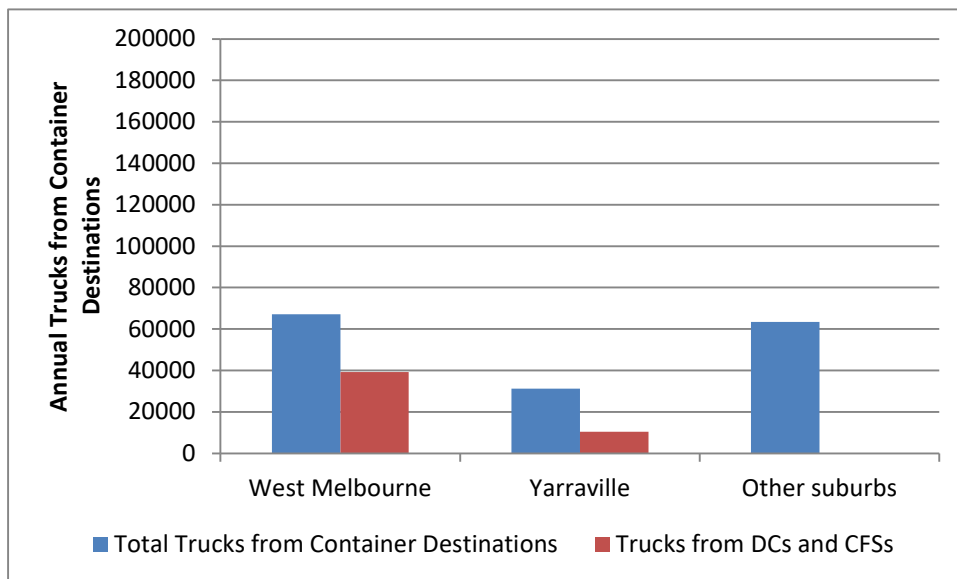


Figure 6 Truck Trips to Transport Commodities from Container Destinations: Outer Western Melbourne Region

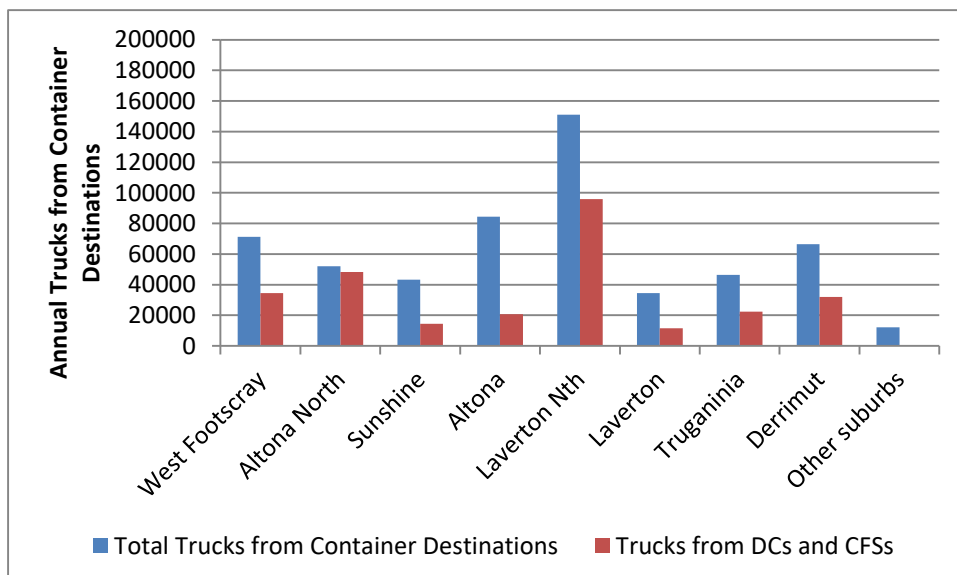


Figure 7 Truck Trips to Transport Commodities from Container Destinations:
Outer Northern Melbourne Region

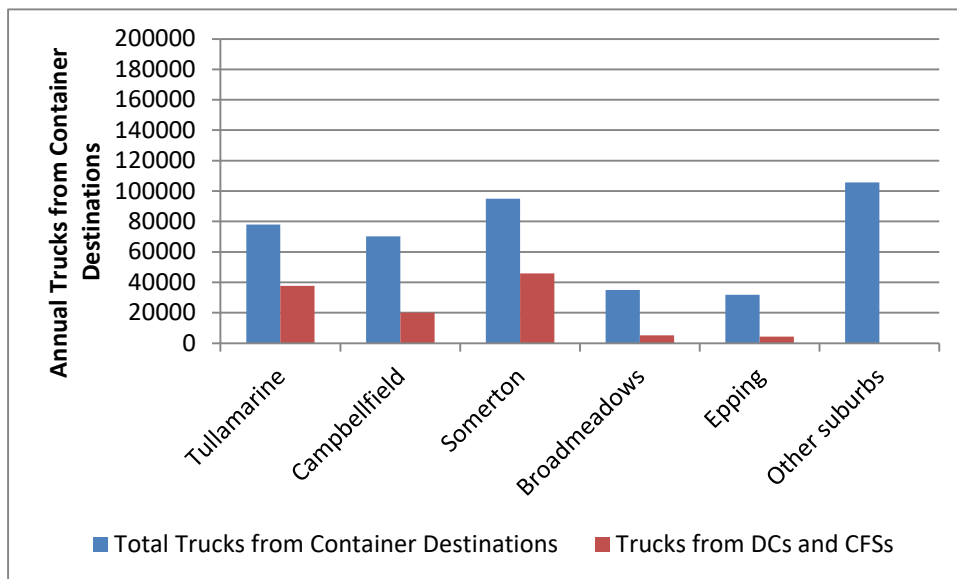


Figure 8 Truck Trips to Transport Commodities from Container Destinations:
Outer Eastern Melbourne Region

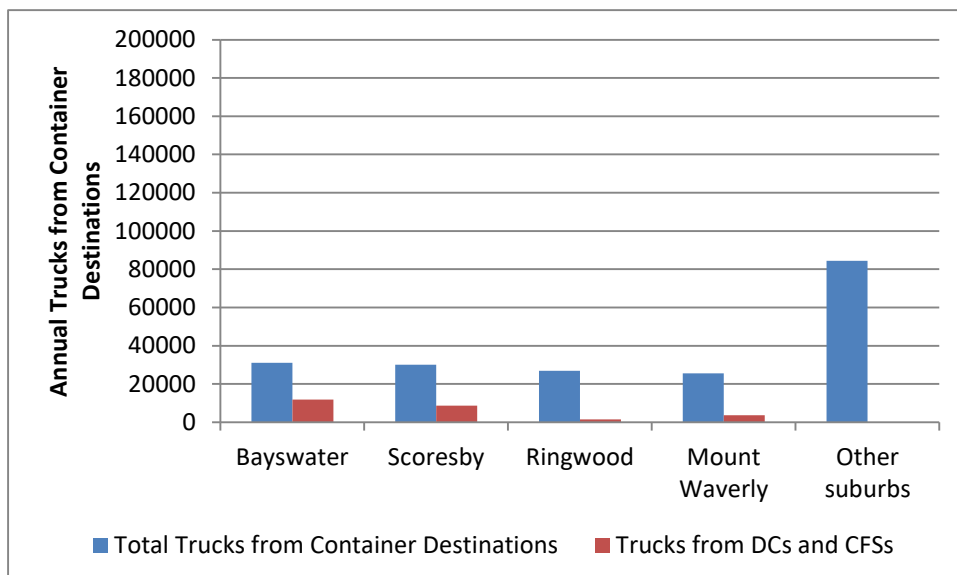
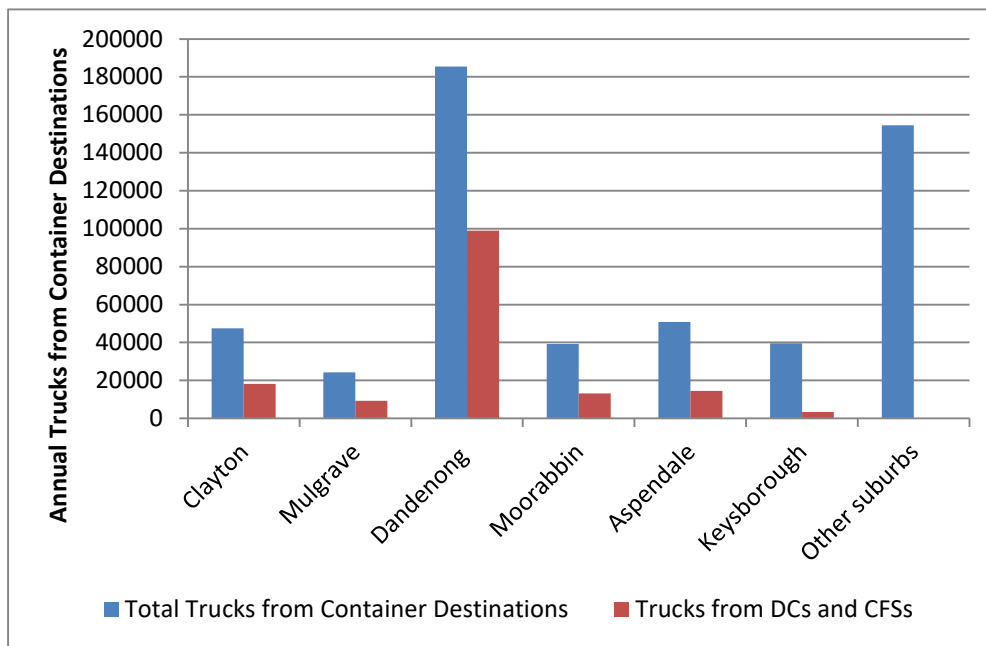


Figure 9 Truck Trips to Transport Commodities from Container Destinations:
Outer South Eastern Melbourne Region



4. Inferences for Port Capacity and Location

A significant proportion (about 35%) of import containers through the Port of Melbourne in 2015/16 was unpacked at DCs and CFSs. By linking more efficiently to the broader distribution networks for imported commodities, DCs and CFSs are important for optimising the logistics chain. About 60% of the primary destinations in which DCs and CFSs are located (i.e., 15 of the 25 primary destinations shown in Table B1, Appendix B) are located in the Inner, Outer West and Outer Northern regions of the MMR, many in close proximity to the Port of Melbourne.

Primary drivers of the location and efficient operation of these important freight facilities are therefore location and capacity of the international shipping port, relative to the road, rail and airfreight infrastructure networks, and often also access to labour. Efficient road transport links to major retail outlets and to intrastate and interstate locations is necessary for the movement of unpacked commodities from the DCs and CFSs. Retail outlets are located in or near main population centres and continued significant population growth is expected in the Outer Western and Outer Northern regions of the MMR. Relocation of the Port of Melbourne could thus cause a significant:

- Relocation of the CDCs and CFSs; and
- Change in the truck movement patterns for the distribution of unpacked commodities to the next stage in the supply chain.

5. Possible Further Port Location Assessment

The above analyses generated indicative estimates of unpacked commodity movements and associated truck trips for the 2015-16 financial year. They also indicated the importance of the location of the port for efficient unpacking of import containers, and subsequent transport to businesses in the supply chains.

More detailed analyses could assist Infrastructure Victoria in determining the optimum timing of, need for, and location of a second container port in Victoria. Particular analyses, with which ISCL could assist, are:

- More in-depth analysis of the movements of import containers and unpacked commodities through the import chain to generate more detailed estimates of the distribution of truck trips from container destinations, in particular from CDs and CFSs.
- Possible relocation of DCs and/or CFSs if the port is relocated, and the resulting change in truck trips and impacts (e.g., traffic congestion, emissions);
- Likely future growth in import containers through the Port of Melbourne and estimate of the timing when capacity is likely to be reached.

6. References

Australian Bureau of Statistics (2016), Input-Output Tables - 2013-14, Table 2. Input by Industry and Final Use Category. Publication 5209.0.55.001 Australian National Accounts.

Port of Brisbane (2013), Port of Brisbane Import/Export Logistics Chain Study. Final Report.

Port of Melbourne Corporation (2009), Port of Melbourne and Dynon Rail Terminals Container Logistics Chain Study. Final Report.

Port of Melbourne Corporation (2016). Historical Trade Statistics.pdf.

www.portofmelbourne.com/about-us.

Appendix A: Study Tasks, Data Sources and Analysis

The study involved the following tasks, data sources and analysis procedures.

- **Task 1.**
Determine relevant container segments and units.
 Full international and coastal shipping containers (not Bass Strait containers) imported through the Port of Melbourne were considered and these are measured in twenty-foot equivalent units (TEUs).
- **Task 2.**
Define suitable import container destination areas in Melbourne.
 The Port of Melbourne Corporation (2009) study considered full container (TEU) movements from the Port of Melbourne to unpack locations (i.e., container destinations) with each destination being one of the postcode areas in Melbourne indicated by the light blue boundaries shown in Figure 1, Section 2. Postcodes and groups of postcodes were used as the import container destination areas in this study.
- **Task 3.**
Estimate the number of full import container movements from the Port of Melbourne to postcode destinations in 2015-16.
 For this study it was reasonable to assume that the spatial distribution of the container destinations in 2015/16 was comparable to the distribution in 2009, as reported by the Port of Melbourne Corporation (2009). Therefore the distribution of container destinations across the MMR regions for the 2015/2016 financial year was estimated by multiplying the 2009 distribution of containers (TEUs) across container destinations by the ratio of (total 2015/16 TEUs) / (total 2009 TEUs).
- **Task 4.**
Estimate the proportion of full import containers through the Port of Melbourne for major commodity segments.
 The Port of Melbourne Corporation (2009) report indicated the primary import commodity segments. These were used to segment the analyses by commodity class and generate estimates of truck movements for the corresponding business class at the container destination. The 2009 proportions by commodity class were assumed to apply for 2015/16.
- **Task 5.**
Estimate the number of full container movements from the Port of Melbourne to container destinations, for primary business types at unpack locations.
 The Port of Melbourne Corporation (2009) and Port of Brisbane (2013) studies showed that significant components of containerised imports are unpacked at distribution centres (DCs) or container freight stations (CFSs). It was therefore necessary to identify the locations and size of DCs and CFSs in Melbourne and estimate the number of containers (TEUs) unpacked at these locations. The remaining import containers are unpacked at businesses which 'consume' the particular commodity (e.g., steel product fabrication). The ABS (2011) "industry – industry 'use' tables" provide indicators of the proportions of commodities which will be distributed to particular manufacturing or processing businesses. The containerised import commodities are largely manufactured or processed products and, for containers not unpacked at DCs or CFSs, the containers can reasonably be assumed to be distributed to businesses in accordance with the ABS 'use' table.

- **Task 6.**

Estimate the number of trucks for commodity movements from the destinations.

Through previous studies ISCL has estimated the truck types (e.g., small rigid, articulated) and average loading, given as trucks per TEU, to move unpacked commodities from the container destinations to downstream businesses. These estimates were applied to the above estimates of containers (TEUs) moved from the destinations, to estimate the number and type of trucks required.

- **Task 7.**

Report the estimates in forms to aid Infrastructure Victoria's assessments.

The consultations and previous ISCL studies indicated that a combination of map, tabular and chart forms would be appropriate.

Appendix B: Supporting Tables

The following tables were generated from the analyses providing supporting, more detailed information for the findings reported in Section 3.

Table B1 Primary Import Container Destinations and Associated Postcodes and Suburb Names

Primary Destination	Suburb Name(s)	Postcode
1	Laverton Nth	3026
2	Laverton	3028
3	Sunshine	3020
4	Truganina (Hoppers Crossing)	3029
5	Derrimut (Werribee)	3030
6	Broadmeadows	3047
7	Campbellfield	3061
8	Somerton	3062
9	Mulgrave	3170
10	Dandenong (including Dandenong South)	3175
11	Footscray, Yarraville	3011, 3013
12	Altona North	3025
13	Altona	3018
14	Brooklyn/West Footscray/Tottenham	3012
15	Port Melbourne, West Melbourne	3207, 3003
16	Moorabbin	3189
17	Epping	3076
18	Ringwood	3134
19	Scoresby	3179
20	Keysborough	3173
21	Aspendale	3195
22	Clayton	3168
23	Tullamarine	3043
24	Bayswater	3153
25	Mount Waverly	3149

Table B2 Industry Types at Container Destinations, for each Import Commodity Class

Commodity Class	Industry at TEU Destination	%
Household goods	Manufacture – household goods	82%
	Wholesale	18%
Machinery and vehicle parts	Manufacture – machinery, vehicle parts	94%
	Wholesale	6%
Metal, non-metal and rubber products	Manufacture – metal, non-metal and rubber products	93%
	Wholesale	7%
Plastic and chemical products	Manufacture – Plastic and chemical products	98%
	Wholesale	2%
Pulp and paper products	Manufacture – Pulp and paper products	84%
	Wholesale	16%
Textile, clothing and footwear products	Manufacture – textiles, clothing and footwear products	91%
	Wholesale	9%
Other manufactured products	Manufacture – other manufactured products	95%
	Wholesale	5%
Other commodities (not specified)	Manufacture - other commodities	95%
	Wholesale	5%

Table B3 Annual (2015/2016) Number of Containers (TEUs) Unpacked at the Container Destinations

Region	Primary Destinations and Other Suburbs	Containers (TEU) to Container Destinations (No.)	Containers (TEU) to DCs and CFSs	
			Total No.	%
Inner Melbourne	West Melbourne	32846	19708	60%
	Yarraville	15011	5217	35%
	Other suburbs	29849		
	Total	77706	24924	
Outer Western	West Footscray	34655	17327	50%
	Altona North	26058	24248	93%
	Sunshine	20832	7291	35%
	Altona	40413	10423	26%
	Laverton Nth	74201	48230	65%
	Laverton	16622	5818	35%
	Truganina	22591	11295	50%
	Derrimut	32276	16138	50%
	Other suburbs	5758		
	Total	273405	140771	51%
Outer Northern	Tullamarine	37924	18962	50%
	Campbellfield	33663	10099	30%
	Somerton	46197	23098	50%
	Broadmeadows	16605	2616	16%
	Epping	15124	2154	14%
	Other suburbs	49690		
	Total	199203	56930	29%
Outer Eastern	Bayswater	14998	5999	40%
	Scoresby	14441	4332	30%
	Ringwood	12719	785	6%
	Mount Waverly	12113	1823	15%
	Other suburbs	39747		
	Total	94018	12939	14%
Outer South East	Clayton	22926	9170	40%
	Mulgrave	11705	4682	40%
	Dandenong	90524	49788	55%
	Moorabbin	18913	6619	35%
	Aspendale	24436	7331	30%
	Keysborough	18739	1728	9%
	Other suburbs	72728		
	Total	259970	79319	31%

Table B4 Annual (2015/2016) Number of Trucks to Transport Commodities from Container Destinations

Region	Primary Destinations and Other Suburbs	Trucks from Container Destinations (No.)	Trucks from DCs and CFSs	
			Total No.	%
Inner Melbourne	West Melbourne	67,088	39,169	58%
	Yarraville	31,181	10,368	33%
	Other suburbs	63,430		
	Total	161,699	49,537	31%
Outer Western	West Footscray	71,258	34,438	48%
	Altona North	52,040	48,193	93%
	Sunshine	43,265	14,491	33%
	Altona	84,444	20,716	25%
	Laverton Nth	151,045	95,858	63%
	Laverton	34,521	11,562	33%
	Truganina	46,452	22,450	48%
	Derrimut	66,368	32,074	48%
	Other suburbs	12,237		
	Total	561,629	279,782	50%
Outer Northern	Tullamarine	77,981	37,687	48%
	Campbellfield	70,146	20,072	29%
	Somerton	94,992	45,908	48%
	Broadmeadows	34,926	5,199	15%
	Epping	31,842	4,282	13%
	Other suburbs	105,591		
	Total	415,478	113,148	27%
Outer Eastern	Bayswater	31,046	11,924	38%
	Scoresby	30,092	8,611	29%
	Ringwood	26,920	1,559	6%
	Mount Waverly	25,490	3,623	14%
	Other suburbs	84,462		
	Total	198,010	25,717	13%
Outer South East	Clayton	47,456	18,226	38%
	Mulgrave	24,229	9,305	38%
	Dandenong	185,518	98,954	53%
	Moorabbin	39,279	13,156	33%
	Aspendale	50,919	14,570	29%
	Keysborough	39,582	3,434	9%
	Other suburbs	154,548		
	Total	541,531	157,646	29%

