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supporting

Build it – but will they come?

A pre-mortem analysis of the Port of Hastings Development Project

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1 About the Institute for Supply Chain and Logistics

The Institute for Supply Chain and Logistics (ISCL) produces highly valued local, national and international relevant industry research and is a catalyst for industry and government collaboration. The Institute provides neutral, independent and expert applied research that integrates logistics and supply chain value creation to improve cities, regions and communities: and our aim is to provide information which will guide sustainable public and private sector investment decision making. ISCL has specialist expertise in maritime and landside logistics import/export supply chains and whole of value-chain development

This technical report supports "Build it – but will they come?", a discussion paper launched on the 9th July 2014. This report focuses on the landside and maritime issues associated with the Port of Hastings project.

2 Introduction

By their nature, supply chains are complex, not only in terms of how the movement of goods is managed, but also in the interactions of the multiple parties involved in facilitating these movements. These activities and parties exist in an environment heavily influenced by external variables, including societal expectations.

The recent debate about the location of an alternative port in the State of Victoria requires clarification and objective discussion. The Institute released a pre-mortem discussion paper in July 2014, inviting interested parties to contribute to the debate and to help to inform government decisions about future port-related infrastructure. This technical paper provides more detail and background information to complement the discussion paper. ISCL has conducted an independent assessment of the requirements to establish a successful container port in the State of Victoria, including issues such as container vessel size, suitability of port location, infrastructure (landside as well as waterside), basic financial considerations, environmental impacts and future land use planning.

The opportunity to establish a new port in an urbanised environment only comes around every 50 years or so, making it imperative to choose the best location for multi-generational sustainable growth in the State of Victoria.

This report draws on a number of documents, but predominantly the Victorian Freight and Logistics Plan (VFLP), published by the Victorian Government in August 2013. The VFLP outlines the Government's long-term strategy to improve freight efficiency, grow productivity and better connect Victorian businesses with their markets, whether local, national or international, to ensure that Victoria retains its status as Australia's "Freight Sate". One of the key objectives of the VFLP is to develop a long-term freight network designed to meet the future freight task, which in 2050 is predicted to be about three times larger than the task today. The proposed development of the Port of Hastings as an origin and destination type

port for containerised freight is a key driver in the strategy, along with new road and rail networks to facilitate the movement of high-volume freight.

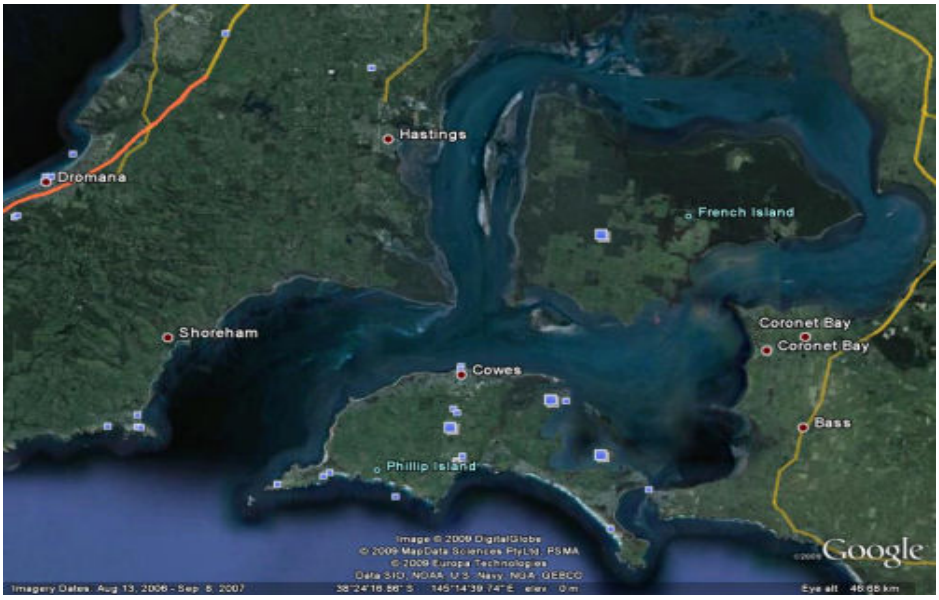
A major objective of the project was to establish whether further research into Port Phillip Bay as an alternative site for a new port is warranted. A briefing note by the Department of Transport (dated 31 May 2013), to the Minister for Ports, states that "the Department does not propose to pursue further work on potential port sites in the west of Port Phillip Bay at this stage". ISCL believes that this decision by the Government was based on a series of incorrect and outdated assumptions and did not take into consideration the needs of the whole import/export supply chain. The notion, "if you build it, they will come", has been promoted by the Government but there is sound evidence to question the validity of this belief, particularly given that efficient, cost-effective landside transport linkages to the port are necessary to handle the proposed increase in freight. ISCL is interested in generating a sustainable environment for supply chains; that is, solutions that meet commercial, economic, and environmental and amenity demands in the context of appropriate legal, competition, and policy frameworks.

Based on the investigations outlined in this paper, ISCL believes further independent comprehensive research is required, involving all stakeholders and government agencies, to determine the optimum site for an alternative container port (and the complementary road and rail feeder networks) in the State of Victoria.

3 Background

The Victorian Government has proposed the Port of Hastings as the site of the next container port once the Port of Melbourne reaches its capacity. Major planning studies are currently underway at the Port of Hastings and its surrounds to plan for implementation (Figure 1). It appears that The Port of Hastings site was chosen for two main reasons: the port (in its current configuration) has reasonable access to relatively deep water, and a large area adjacent to the proposed port is zoned for industrial use.

Figure 1: Western Port Bay and the location of Hastings



In the 1970s, Sir.Henry Bolte reserved land at Hastings for new processing and manufacturing industry and declared the location ideal for Victoria's next major port because Western Port provided good access for large vessels. The Port of Hastings was identified in 2004 with the release of the Victorian Port Strategic Framework. Approximately 3000 hectares of land adjacent to the port has been set aside under the Mornington Peninsula Planning Scheme for port-related use, designated Special Use Zone 1 (SUZ1). Successive Victorian governments through the Port of Hastings Land Use and Transport Strategy (2009), the Victorian Transport Plan and Freight Futures (2008) and Port Futures (2008) confirmed this choice.

The Port of Hastings Corporation (a Victorian statutory corporation) was established in 2004 under the terms of the Port Services Act 1995. Initially it was intended that the Port of Hastings Corporation would become part of the wider Port of Melbourne Corporation. However, with the change of government in 2010 the Port Services Act was altered and a

new state-owned corporation established through the Transport Legislation Amendment (The Port of Hastings Development Authority) Bill 2011 under the Transport Integration Act 2010.

The newly formed Port of Hastings Development Authority (PoHDA) was established in January 2012 to progress and oversee the development of the Port of Hastings as the next container port.

In July 2013 the Victorian Government allocated $110 million for the period to 2017 to fund detailed planning for the new port, with construction to begin in 2018 and be completed by 2022 (or 2027 at the latest).

Under the Port of Hastings Management Agreement, daily port operations are the responsibility of Patrick Ports-Hastings (a division of Asciano Ltd). The Victorian Regional Channels Authority oversees the channel licences for the Port of Hastings. Presently the main trade through the Port of Hastings is the import/export of oil, liquid petroleum gas (LPG) and unleaded petrol (ULP). Around 100 vessels enter the port each year, with vessel size ranging up to 100,000 tonnes. Facilities include:

- Stony Point jetty and depot;
- Crib Point liquid berths 1 and 2;
- Long Island Point liquid berth;
- BlueScope Steel jetty.

The facilities at Stony Point are also used by passenger ferries, the Royal Australian Navy (training vessel), the fishing industry, oil exploration vessels, and tugs and small commercial vessels. BlueScope Steel ceased shipping steel in 2013. There is presently no container freight activity or infrastructure at the Port

4 Australian Container Port Operations

The development of an alternative port in Victoria needs to be considered in the context of other Australian container ports. The annual total container market in Australia is about 7 million containers (Twenty-foot Equivalent Units; TEU) with the following approximate distribution:

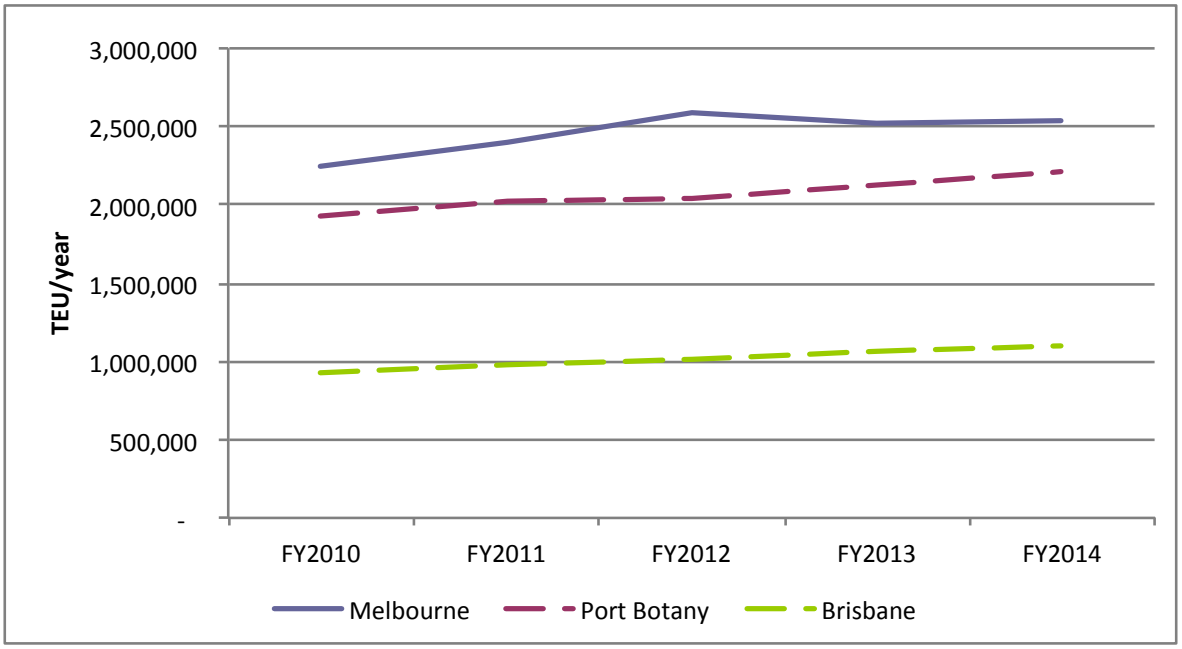
- Port of Melbourne: 2.5 million containers (TEU; including Tasmania's mainland domestic and international traffic);
- Port Botany (Sydney): 2.2 million containers (TEU);
- Port of Brisbane: 1.1 million containers (TEU);

- Port of Fremantle: 700,000 containers (TEU);
- Port of Adelaide: 350,000 containers (TEU).

4.1 Observed and Forecast Container Trade Growth

The observed trends in total TEU volumes (import and export) through the three major eastern seaboard ports over the period from the financial year (FY) 2010 to FY2014 are shown in Figure 2. As is widely recognised, there has been a general upward trend over the period, indicating the 'recovery' following the impact of the GFC in 2008/2009.

Figure 2: Observed volumes (TEU) at Melbourne, Botany and Brisbane ports FY2010 to FY2014



The associated observed year-on-year growth rates over the period for these three ports, and for all major Australian ports combined, are shown in Figure 3. These indicate important, different growth characteristics not shown by the general trend lines in Figure 2. In particular, there have been:

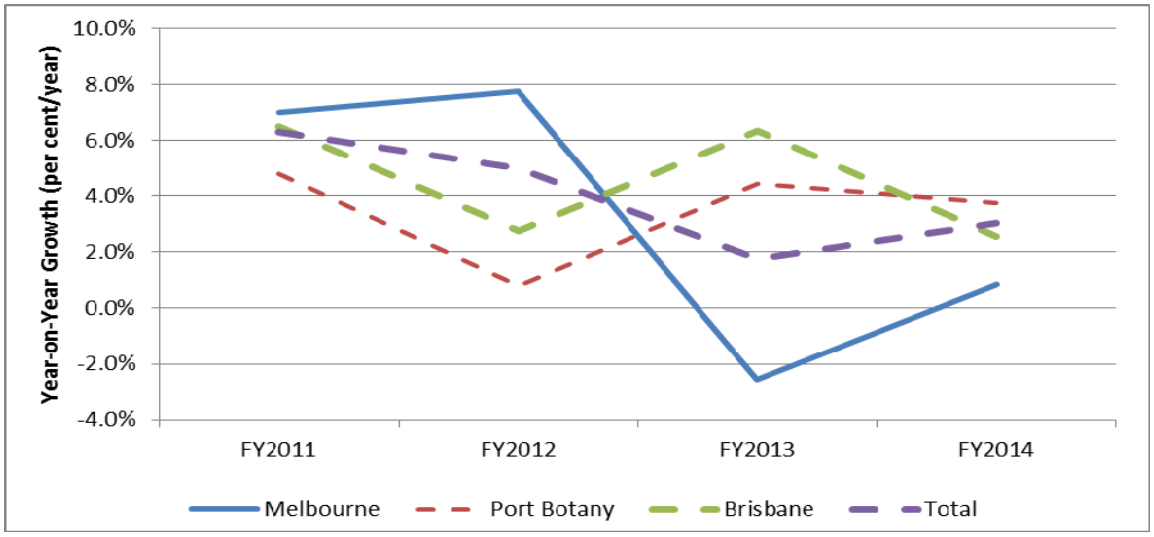
- Significant variances in the annual growth rates for each of the ports;
- General downward trends in the annual growth rates for each of the ports; and
- Tracking of annual growth rates for Melbourne and the two other eastern seaboard ports in the range of 3% to 4% per year by FY2014.

Detailed research undertaken by ISCL in 2013/2014 strongly supports these post-GFC findings (ISCL, 2014). TEU import and export data for Melbourne, Sydney and Brisbane ports

over the period 2000 (pre-GFC) to 2013 were used in the analysis with enhanced statistical demand modelling procedures. The primary findings were that:

- The impact of economic drivers (e.g., gross state product, exchange rates) on TEU volumes has decreased significantly from the pre-GFC to post-GFC period;
- TEU growth rates for Melbourne, Sydney and Brisbane are likely to be well below pre-GFC levels and possibly of the order of 3% to 4% per year, at least in the immediate future.

Figure 3: Observed year-on-year growth in total TEU volumes at Melbourne, Botany, Brisbane and all major ports, FY2011 to FY2014



Reference: ISCL (2014). Import-Export Demand Modelling and Forecasts

Shipping lines will continue to service the capital city ports into the foreseeable future, as 'hubbing' in one port and land bridging to another port has been demonstrated not to be cost effective or feasible in Australia. Until 2012, substantial land bridging (>100,000 TEU per annum) occurred between Melbourne and Adelaide; however, this practice has declined significantly.

Capital city ports service their hinterland (metropolitan, regional and interstate) with most containers destined for, or originating from, a 60 to 70 kilometre (km) radius from the port. It needs to be recognised that container vessels call at more than one Australian capital city port in a voyage. Currently, a number of infrastructure restrictions at the other capital city ports would prevent the ultra-large container vessels potentially calling at the Port of Hastings (up to 18,000 TEU; 16 metre draft) from entering those ports. Current draft limits at the other capital city ports are in the range of 14 to15 metres. It should be noted that, except for Fremantle and Melbourne, all are privately owned ports whose operators have strict guidelines on return on investment. Before large capital investments for additional dredging

or other infrastructure improvement projects can be made, solid business cases must be demonstrated to satisfy the financial requirements of the port's owners.

5 The Port of Melbourne

The current throughput of the Port of Melbourne is about 2.5 million containers (TEU) per annum. Historically, container growth rates have been in the order of 6% to 7%, twice the growth rate of Gross Domestic Product (GDP). However, in the post-GFC period (i.e., from about 2009/2010), there has been significant variation in container growth rates, particularly for imports. In the financial year 2012/2013 the Port of Melbourne Corporation (PoMC) recorded a 2.6% *decline* in container volumes and in 2013/14 growth of only 0.8 %. More realistic container throughput growth rates for Melbourne as well as other Australian capital city ports are forecasted to be around 3% to 4% per annum, in line with GDP growth (see Figures 2 and 3).

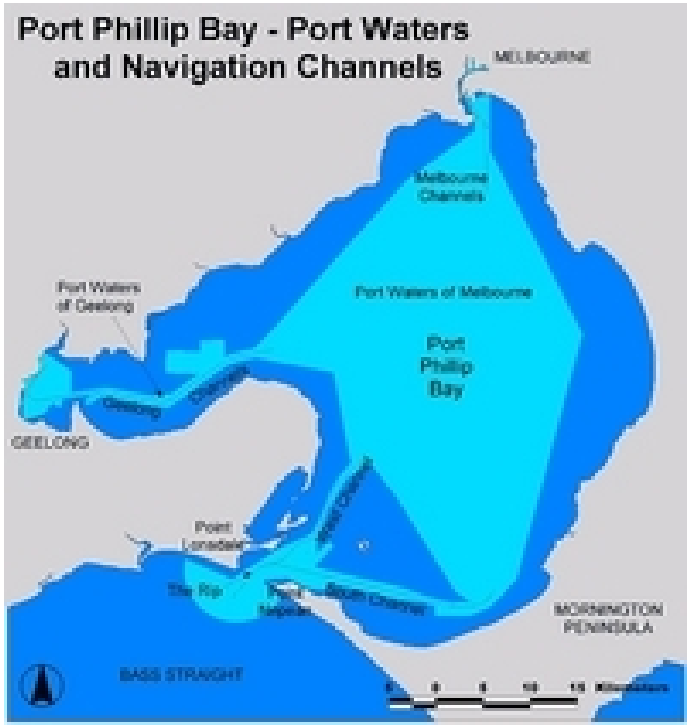
Container volumes (especially import containers) are also highly dependent on population growth in the hinterland. Plan Melbourne (2014) forecasts that Melbourne could grow by another 3.4 million people, to be a city of 7.7 million by 2051. Capacity at the Port of Melbourne is estimated at 5 million TEU, hence it may continue to be fit for purpose for significantly longer than forecasted. About 20% of the total container throughput in Melbourne consists of empty containers (mostly 40-foot) being exported overseas, mainly to Asia. Of the total 2.5 million containers (TEU), approximately 15 per cent originates from, or is destined for, Tasmania, and most of this trade is domestic.

5.1 Approach Channels

The Port of Melbourne (Figure 4) recently undertook a $717 million channel deepening project to allow vessels with a 14 metre draft to safely enter Port Phillip Bay and to navigate the Port of Melbourne approach channels at all times. With the aid of 'Dynamic Under Keel Clearance' and permission from the Harbour Master, this draft can be increased to 14.5 metres. The current passage from the pilot boarding ground (just outside Port Phillip Bay) to Swanson Dock takes about four hours depending on other shipping traffic, vessel size and weather conditions. Currently, vessels enter Port Phillip Heads, navigate the South Channel, and head up the bay to the entrance of the Port of Melbourne channel at Fawkner Beacon.

Entrance through the Heads is occasionally restricted due to adverse wind and tidal conditions and the draft, size and manoeuvrability of the vessel. In addition to the draft restrictions, the access to Swanson Dock has a restricted air draft of up to 52 metres (to enable vessels to pass safely under the Westgate Bridge) and an overall maximum vessel length of 320 metres. Design specifications for the new container terminal development at Webb Dock are for an overall container vessel length of 300 metres, a beam of 42 metres and draft of 14 metres, with no restrictions on air draft.

Figure 4: Port Phillip Bay and the location of the Port of Melbourne



Source: Google Maps
Note: Light blue indicates natural deep water.

5.2 Vessel Size

The average size of container vessels currently calling at Australian ports (including Melbourne) is approximately 4,000 TEU. This has grown in the last 10 years from an average of 2,500 TEU. The current vessel exchange (the number of containers discharged and loaded) in Melbourne (Swanson Dock container terminals) is about 2000 TEU (1350 containers). The largest container vessel to call at an Australian port, including Melbourne (*m/v Hyundai Oakland*), is approximately 6,300 TEU, 293 metres long, 40 metres wide and has a design draft of 14 metres.

The capacity of container vessels has significantly increased over the past three decades but presently the Post Panamax Plus generation (6,000 to 8,000 TEU) is the largest vessel size servicing Australian ports (Table 1). Over this time there has been a belief that eventually all ports must be upgraded to accommodate these large vessels. This may be a false assumption as vessels service markets, not ports, and market size rather than navigational and infrastructure restrictions of a port dictate the size of the vessel sent to a particular port.

Table 1: Container vessel type from 1988 to 2014

Year of introduction	Generation(class) of container vessel	Capacity (TEU)	Design Draft
1988	Post Panamax	4,000 – 5,000	13 metres
2000	Post Panamax Plus	6,000 – 8,000	14.5 metres
2013	New Panamax	12,500	15 metres
2014	Maersk Triple E Class	18,000	14.5 metres

Source: Alphaliner 2014

The water depths at Port Phillip Heads and in the approach channels to the Port of Melbourne generally allow container vessels with a draft of 14.5 metres (with tidal assistance) to safely enter Port Phillip Bay, depending on their overall length and width (i.e. beam). The capacity of these vessels is up to 8000 containers (TEU), but whether they are able to berth at Swanson Dock will also depend on their length and beam. The current restrictions at Swanson Dock are an overall length of 320 metres, a beam of 43 metres, and a draft of 14.5 metres. Normally these Post Panamax Plus vessels would need to exchange (discharge and load containers) up to 60% of their capacity, about 4,500 TEU, to be profitable in an origin and destination port such as Melbourne.

5.3 Landside Interface

The current landside interface with Swanson Dock for containerised freight is well established and efficient. A doubling of capacity at Swanson Dock to 4 million TEU is technically feasible but will require major infrastructure improvements both on the waterside (e.g., quay length, container yard area, stacking density) and the landside. Currently, only a small amount of containerised freight to and from the terminals is carried by rail using the 'on-dock' West Swanson Intermodal Terminal. There are currently two 'near-dock' intermodal terminals at Appleton Dock and Victoria Dock handling containerised freight to and from intrastate and interstate destinations; however, the final transport leg to and from the container terminal is performed by road transport.

There are currently plans in place to establish and expand 'on-dock' rail terminals adjacent to the Swanson Dock container terminals. These are referred to in the VFLP as the Metropolitan Intermodal System. Combined with the proposed establishment of intermodal terminals across wider metropolitan Melbourne, the movement of a substantial volume of the port's container throughput could be performed by rail.

Significant improvements are also planned for the road network, such as a second crossing of the Yarra River by way of the western section of the East West Link (Stage 3), to be able to

cope with a doubling of container numbers and to enable an increased use of High Productivity Freight Vehicles (HPFVs), which are able to carry up to four containers (TEU). Good access is needed to the arterial road network (Monash, Western Ring Road, Tullamarine Freeway and to Geelong and regional Victoria) to access industrial areas for primary and secondary transport legs.

The road network to and from Webb Dock is sufficient for its current traffic volumes but will undergo a major revamp as part of the development of the international container terminal at Webb Dock East and the proposed automotive terminal at Webb Dock West. There is currently no functional rail link into Webb Dock (the existing rail link was decommissioned in the early 1990s) and it is not economically feasible for a rail link to be re-established largely due to urban encroachment

5.4 Webb Dock Development

Recently, a 25-year lease was granted to develop an international container terminal at Webb Dock East with a proposed capacity in excess of 1 million TEU. It is stipulated that truck movements to and from the new terminal are to be minimised during peak commuter traffic hours. The new terminal in conjunction with additional development at the existing container terminals at Swanson Dock provide the capacity for the container volume in the Port of Melbourne to double from 2.5 million to 5 million containers (TEU) in the next 15 to 20 years.

6 The Port of Hastings

6.1 Approach Channels

The approach channels to the Port of Hastings currently have a water depth of 14.8 and 14.2 metres. However, considerable dredging will be needed to construct a terminal with a 9 million TEU per annum capacity (see section 8.2.2). The current approach channel (Western Channel) with a maintained depth of 14.8 metres will require only minimal dredging to make it suitable for ultra-large container vessels (in excess of 12,000 TEU) to enter the port. However, as vessels need to proceed further into the North Arm of Western Port to reach the proposed container terminal, additional dredging will be required for safe passage. Dredging will also be required to create a manoeuvring area for large container vessels adjacent to the container terminal quay.

Consideration will also need to be given to the fact that, under certain tidal conditions, strong currents (up to 6 knots) are prevalent in the approach channels. To ensure safe navigation under these conditions, additional tugs may be needed to manoeuvre large container vessels in the channel and onto their berths. This may take extra time and will incur additional costs for the shipping lines. A safe anchorage area for waiting vessels needs to be dredged as well.

6.2 Vessel Size

The proposed water depth will allow container vessels with a draft of 16 metres and a capacity of up to 18,000 containers (TEU) to enter the Port of Hastings at all times. To make this a commercially viable port call, these vessels would need to exchange (discharge and load containers) 60% of their capacity, or 10,000 containers (TEU) per vessel, and other Australian capital city container ports would also need to be able to handle them as land-bridging to other Australian ports is not available and is too costly. No other Australian port presently has the capacity to handle 18,000 TEU vessels (with respect to channel depth and vessel draft as well as vessel size) and none are planning to accommodate these large vessels in the near future. Moreover, the capital and the environmental approvals required to increase capacity sufficiently to handle larger vessels in capital city ports will prove to be a significant challenge. Additionally, Port Botany and the Port of Brisbane are now in private hands and a strong business case would need to be made before the port owners would invest the large amount of capital required to deepen the approach channels and berth pockets.

A vessel exchange of 10,000 TEU for a single port call in Australia is seen as unrealistic, even in 50 years' time, by most maritime experts. The 18,000 TEU vessels currently trade only on the major east-west shipping routes between Asia and Europe. They can only call at a limited number of ports and a substantial part of the vessel exchange is destined for on-shipment to other ports via barge, feeder vessel or by rail. For example, the Port of Rotterdam, which currently handles these large vessels, services a hinterland in excess of 350 million people in this manner. Australia currently has a population of 23 million people and greater Melbourne has a population of approximately 4.5 million people. Even a doubling of Melbourne and Victoria's population would not be enough to sustain regular vessel calls with exchanges of 10,000 containers (TEU).

To efficiently service the import supply chains of most modern businesses, which operate under a "Just in Time" principle, a regular (at least weekly) shipping service is needed. In the case of export freight it is equally important to ensure the transit time of agricultural products, such as meat and dairy products, to overseas markets is kept to a minimum, which again requires regular and direct vessel calls at each port. This supply chain reality exists across all Australian capital city ports, and a high value is placed on the frequency of vessel calls to meet our export needs.

At a recent conference in Melbourne, representatives from internationally recognised shipping consulting firms such as Drewry and ICF/GHK supported ISCL's contention that it was unlikely that the Port of Melbourne or any other Australian port would ever see 18,000 TEU vessels; the local industry concurs with this.

It should be noted that the newest and largest Maersk Triple E vessels, despite having a capacity of 18,000 TEU, actually have a draft of only 14.5 metres. This would allow them (with tidal assistance), theoretically, to enter Port Phillip Heads. However, their length (400 metres) and width (59 metres) would currently prevent them from doing so. This latest development in vessel size demonstrates that further research is required to determine the dimensions of container vessels that may enter Port Phillip Bay in the future. Only a limited amount of dredging may be required to accept these new ultra-large container vessels.

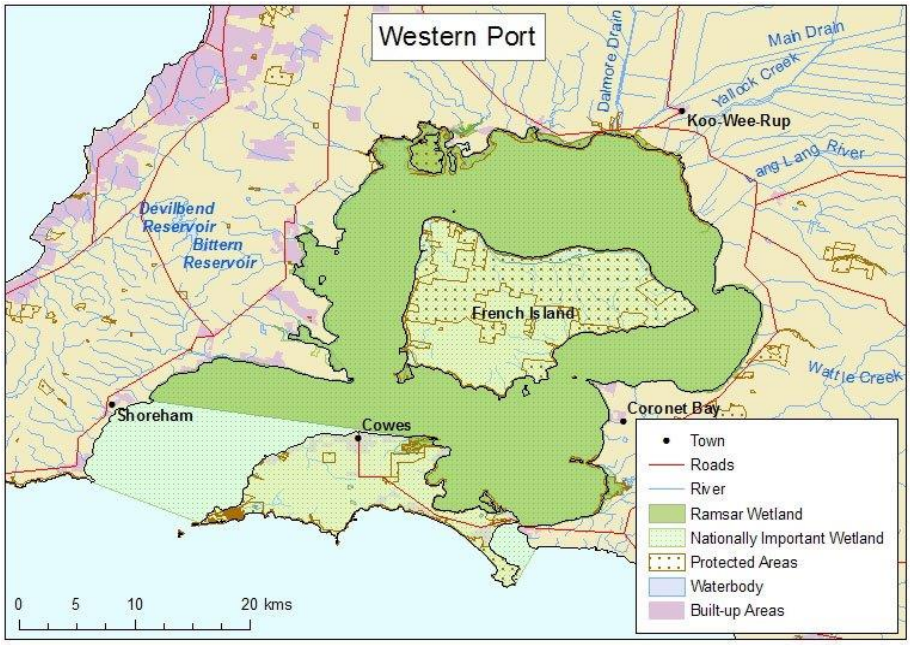
6.3 Land Use and Landside Interface

The proposed capacity for the new container terminal at Hastings is 9 million TEU per annum. This would require a quay line of approximately five km in length and a backup area in excess of 250 hectares with associated infrastructure and superstructure. The proposed site will require substantial reclamation works, marine structures such as wharves, and a tug harbour. Most of the land around the proposed container terminal is suitable for the development of logistics-related industries and is zoned for Special Use. However, major road and rail infrastructure linking Hastings with the metropolitan, regional and interstate hinterland would need to be constructed at great cost.

6.4 Environmental Issues

Western Port is an area of ecological importance: it contains a vast range of environmentally diverse land and marine life and provides roosting and feeding areas for waterbirds. Western Port Bay is listed under the Ramsar Convention on Wetlands (Figure 5), which has international significance. Constructing a 9 million TEU container terminal in this area will require appropriate environmental (and social) risk mitigation measures to ensure the wetlands are protected, which need further research. The vast Ramsar wetlands area contain nationally and internationally sensitive areas of Western Port including all waters around French Island, and Phillip Island from the Nobbies to Cape Schanck

Figure 5: Overview of Ramsar Wetlands in Western Port



Source: Ramsar Wetlands Convention website

7 An Alternative Port in Western Port Phillip Bay

7.1 Approach Channels

The entrance to Port Phillip Bay (Port Phillip Heads) and the South Channel can currently accommodate vessels with a 14 metre draft at all times and 14.5 metres with tidal assistance. Maximum overall vessel length and beam is dependent on the type of vessel (and its manoeuvrability), and tidal and weather conditions; however, vessels in excess of 300 metres in length and 41 metres beam have safely navigated in and out of Port Phillip Bay. These dimensions equate to container vessels of up to 8000 containers (TEU).

To accommodate, in Port Phillip Bay, the ultra-large container vessels specified in the design of the proposed container port would require additional dredging at the entrance to the bay, in the South Channel and, to a lesser extent, in the bay itself. Dredging requirements would be limited and, if necessary, would only need to be carried out if in 15 to 20 years time (determined by the actual container volume and vessel size growth). The amount of dredging, and the method used, will need further detailed investigation. By the time the dredging is required, techniques should be more advanced and lead to minimal disturbance to the seabed and lower levels of turbidity than current techniques.

7.2 Vessel Size

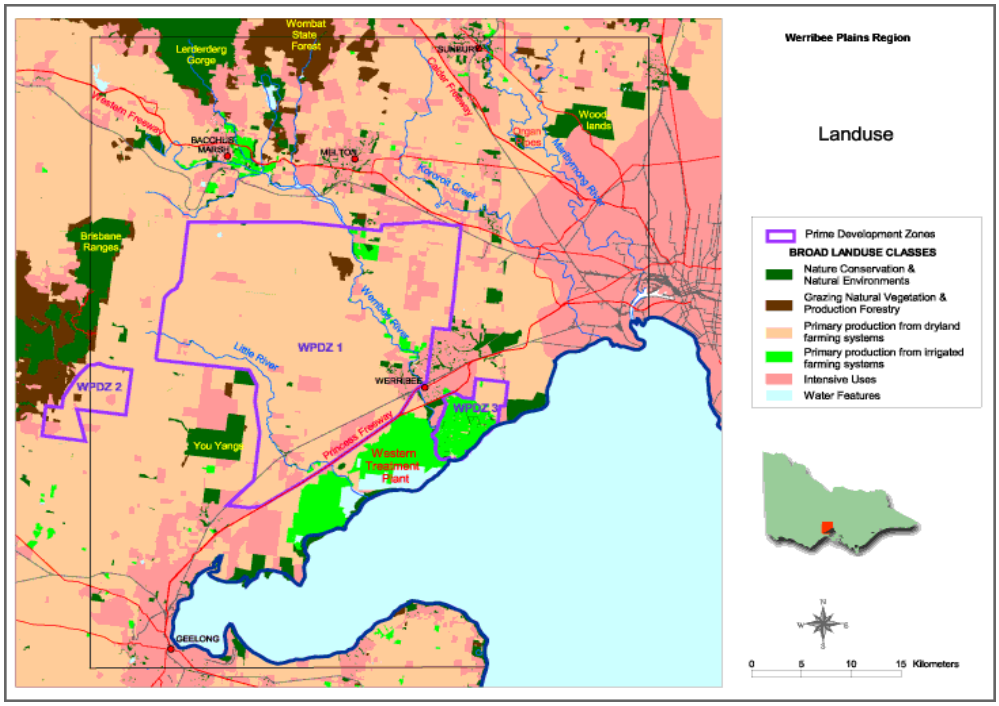
For a port to be developed in Port Phillip Bay on the coast to the west of Melbourne, specifications should be such that container vessels of an overall length up to 390 metres, a

beam of 52 metres and a design draft of 15 metres are able to berth safely; a vessel of these dimensions would be able to carry up to 13,000 TEU and would most likely be the largest container vessel ever to visit Australian ports; the entrance to the bay (Port Phillip Heads) and the South Channel cannot currently accommodate vessels of these dimensions (the maximum size of a container vessel currently able to berth in the Port of Melbourne is described earlier).

7.3 Land Use and Landside Interface

The proposed capacity for the new container terminal is 9 million TEU per annum. This would require a quay line of approximately five km in length and a backup area in excess of 250 hectares with associated infrastructure and superstructure. Any proposed site will require substantial reclamation works as well as marine structures such as wharves, and a tug harbour. Most of the land to the west of Melbourne is flat and suitable for the development of logistics-related industries. Many importers, exporters and large logistics providers are located in the west, and there are fully functioning and effective connections to the interstate and intrastate road and rail networks (Figure 6): there are road connections to the M1, and the planned Outer Metropolitan Ring route through to the Hume Highway. Furthermore, the close proximity to the proposed Western Intermodal Freight Terminal, Avalon Airport and the proposed interstate rail terminal at Beveridge will deliver efficient and cost-effective freight transport. From a whole of chain perspective, freight forwarders need good road, rail, air and sea connections to serve their international customers.

Figure 6: Werribee Plains region land use plan



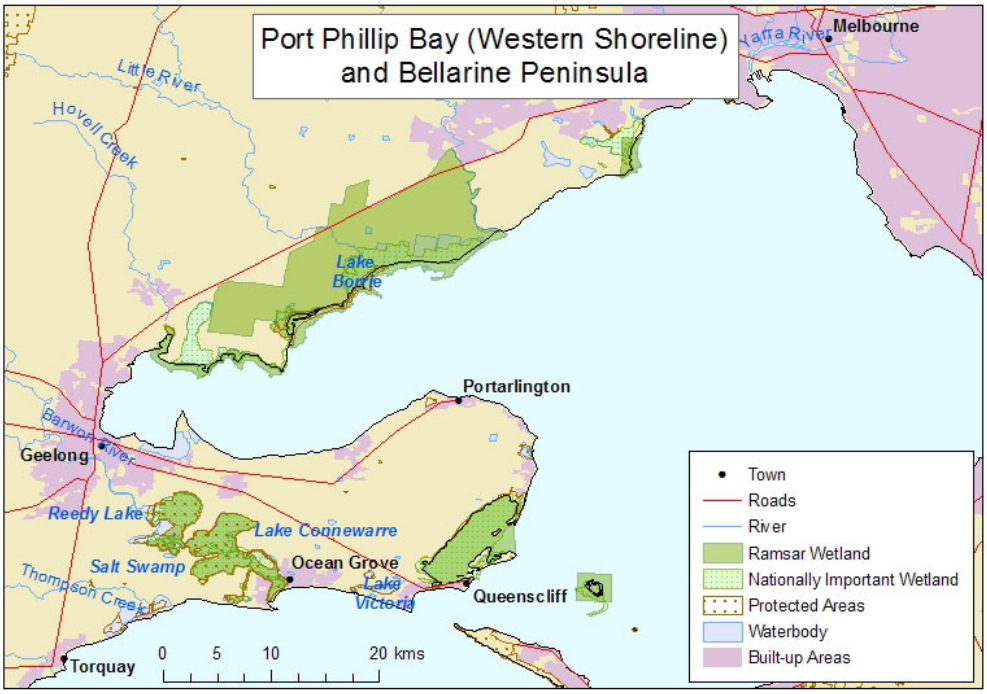
Source: Google maps

7.4 Environmental Issues

An alternative port in western Port Phillip Bay would also need to take into consideration designated areas protected under the international Ramsar Convention on Wetlands (Figure 7). The areas include parts of the shoreline, intertidal zone and adjacent wetlands of western Port Phillip Bay, extending from Altona South to Limeburners Bay, and parts of the shoreline, intertidal zone and adjacent wetlands of the Bellarine Peninsula, extending from Edwards Point to Barwon Heads, including the lower Barwon River wetlands and Mud Islands.

Constructing a container port, for example near Point Wilson, would have an effect on the adjacent areas; however, these effects need to be better understood and will require appropriate mitigation measures. Further research is needed to determine the strategies required. As can be seen from Figures 5 and 7, the Ramsar protected area in Western Port poses a far greater environmental challenge.

Figure 7: Port Phillip Bay and Bellarine Peninsula Ramsar Wetland



Source: Ramsar Wetlands Convention website

8 Other Considerations for Port Development

8.1 Landside Supply Chain Costs

The *Port of Melbourne and Dynon Rail Terminals 2009 Container Logistics Chain Study* (2010; hereafter referred to as *'Port of Melbourne Study'*) shows that 85% of containerised exports originate in the north and west of the state as well as from interstate). Transporting goods across metropolitan Melbourne (in the absence of effective freight road and rail

networks) to and from Hastings, will increase costs, reduce efficiency and negatively impact on import and export business competitiveness.

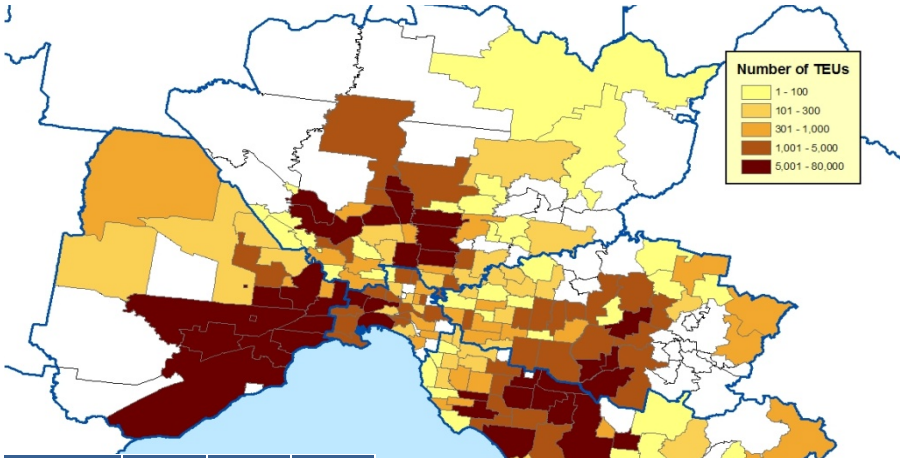
In the case of imports those additional costs will be passed on to the consumer. In the case of exports, the impact is likely to reduce the exporter's capacity to compete in global markets.

8.1.1 Modelling Landside Supply Chain Costs

In the light of these concerns, ISCL has undertaken initial, high-level modelling of costs and other impacts that would be incurred by importers and exporters as a result of establishing Victoria's next container port at Hastings. This analysis is not exhaustive and more extensive work is needed to ensure a fair comparison between the alternative port options, but it goes some way to illustrating the impact of establishing a container port at Hastings on the whole supply chain.

For the modelling exercise we have assumed that the distribution of containers is as documented in the *'Port of Melbourne Study'*, shown in Figures 8 and 9. Container activity is heavily skewed towards the northern and western suburbs of Melbourne, as depicted by the shading, with darker areas indicating a higher concentration of containers. Using the 2011/2012 container throughput volumes, ISCL then calculated the differences in transport costs and emissions if these containers originated from the Port of Melbourne versus the Port of Hastings.

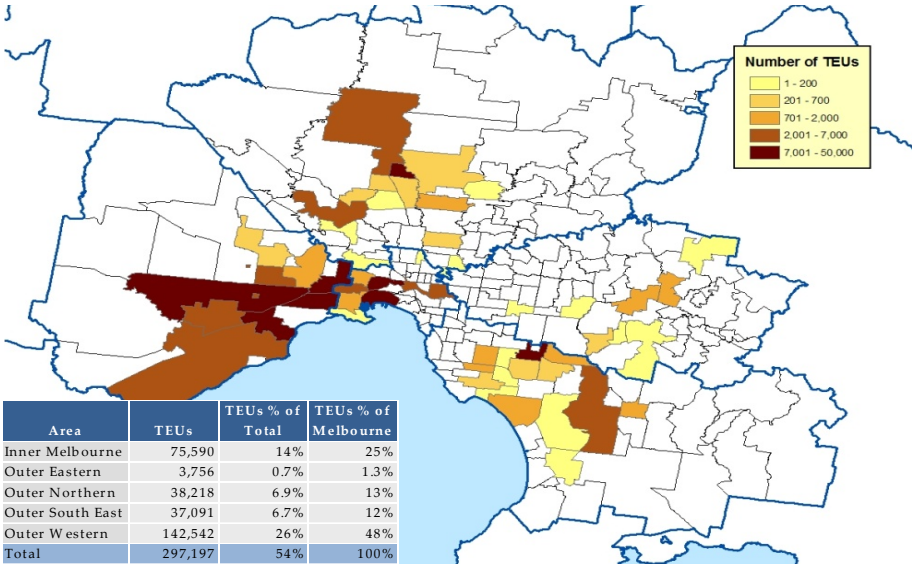
Figure 8: Destinations for full international and mainland coastal import containers (Metropolitan Melbourne)



Area	TEUs	TEUs % of Total	TEUs % of Melbourne
Inner Melbourne	61,321	7.5%	8.6%
Outer Eastern	74,075	9.1%	10%
Outer Northern	157,362	19%	22%
Outer South East	204,827	25%	29%
Outer Western	215,414	26%	30%
Total	713,000	87%	100%

Source: Port of Melbourne Study (2010)

Figure 9: Origins of full international and mainland coastal export containers (Metropolitan Melbourne)



Area	TEUs	TEUs % of Total	TEUs % of Melbourne
Inner Melbourne	75,590	14%	25%
Outer Eastern	3,756	0.7%	1.3%
Outer Northern	38,218	6.9%	13%
Outer South East	37,091	6.7%	12%
Outer Western	142,542	26%	48%
Total	297,197	54%	100%

Source: Port of Melbourne Study (2010)

8.1.2 Travel Times, Costs and Emissions

The estimated travel times, costs and emissions for container movements to and from the port are given in Table 2, with the following implications:

- If all container operations were to move from Melbourne to Hastings today (circa 2014), there would be almost a doubling of truck operating costs, to the order of $246 million per annum and a doubling of truck travel times.
- While there is likely to be some reduction in the Heavy Commercial Vehicles (HCV) volumes and the associated traffic congestion in the inner areas of Melbourne, this will be offset by material increases in container transport costs and, most likely, traffic volumes and congestion in other areas of the city, as trucks seek access to container origins and destinations.
- It is anticipated that a number of distribution centres and logistic providers would move to the Dandenong and Hastings areas. However, the number of businesses moving to these areas would not be enough to offset the overall substantial increase in travel costs and greenhouse gas emissions.
- The VFLP indicates minimal changes to the Melbourne road network in the short to medium term, particularly for North West to South East movements and there is doubt

about the development of the South East Rail Link and the additional dedicated freight rail track.

- The direct impacts mentioned above are likely to have a number of secondary impacts, including:
  - Increased fuel consumption, toll costs and travel times;
  - Increased emissions and air quality degradation, to the order of 113%;
  - 'imbalance' between population and trade-related industrial centres in Melbourne, as more population growth occurs in the west and north-west corridors;
  - The need to consider other more cost-effective trade-related supply chain structures and transport solutions, including the possibility of trade moving to other Australian ports.

Table 2: Travel time, costs and emissions: Port of Melbourne versus Port of Hastings

	Port of Melbourne	Port of Hastings	Variance Percentage (%) increase
Total travel time (hours)	841,697 hours	1,640,405 hours	95%
Total cost ($)	$126,254,476	$246,060,680	95%
Oxides of nitrogen emission (tonnes)	634 tonne	1350 tonne	113%
Truck toll cost ($)	$7,754,743	$10,635,990	37%

The modelling was based on the following data and assumptions:

- Observed full containerised trade for the Port of Melbourne (2011/2012)
  - Import: 1,167,137 TEU
  - Export: 885,146 TEU. (Source: Ports Australia website).
- Estimates of travel distances and times between the respective ports (Melbourne and Hastings) and the 'centroid' (an assumed address which represents the centre of each geographic region and is illustrated in Figure 10) for full import container destinations

and full export container origins. These were calculated by taking the 'shortest path' using Google classic maps and the average posted travel speed for vehicles in the current (2014) road network in Melbourne and Victoria. It should be noted that travel times for trucks moving containers will typically be longer than those for the 'average' vehicle and peak congestion will cause a further increase in these travel time estimates.

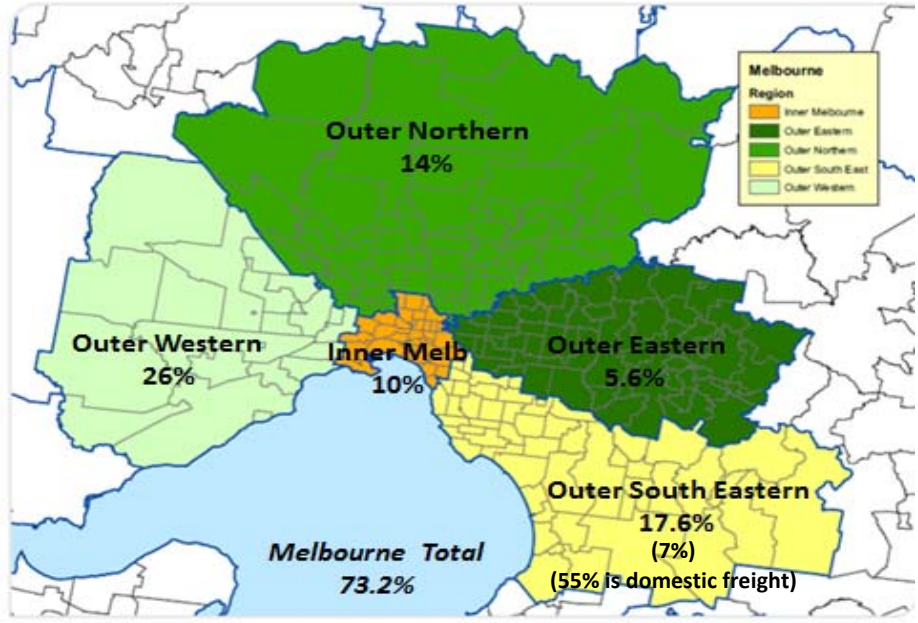
- Origins and destinations for containers in future years are assumed to be similar to current. In reality, if a shift from Melbourne to Hastings occurred it is likely that a number of import/export related businesses would relocate closer to Hastings to optimise their operations. Although relocation would incur significant costs, these are likely to be offset by the benefit of reduced travel time and transport costs.
- Container movement operations on 5.5 days per week;
- Annual container movement equivalent to 282 days;
- Average TEU per truck for metropolitan delivery = 1.2;
- Average TEU per truck for regional Victoria delivery = 1.5;
- Operating cost of truck per hour = $150;
- Fuel consumption rate for container trucks, averaged across unloaded and loaded conditions = 30 L/100 km;
- Oxides of nitrogen emission rate for container trucks = 10 g/km;
- Toll costs as per current rates published by Citylink and Eastlink.

8.1.3 Landside Infrastructure Implications

The *Port of Melbourne Study* indicated that more than 50% of import containers were destined for, and nearly 50% of export containers originated from, areas to the north and west of the Port of Melbourne.

Figure 10 below indicates that approximately 73% of all containers passing through the Port of Melbourne have origins or destinations within the Melbourne Metropolitan area. When the Port of Hastings is operational in 2022, or 2027 at the latest, potentially 50% of these containers may need to be transported by trucks finding their way through the metropolitan road network, via tolled, arterial and local road networks, to reach Hastings.

Figure 10: Port of Melbourne: Container origins and destinations within Metropolitan Melbourne



Source: Port of Melbourne Study (2010)

While the VFLP proposes to plan and construct a series of roads linking the Hume Highway and the Western Ring Road with East Link, these roads are medium to long-term plans and funding has not yet been allocated. It therefore appears unlikely that an efficient road network will be available for the effective movement of container freight to and from the Port of Hastings until longer term plans are actualised.

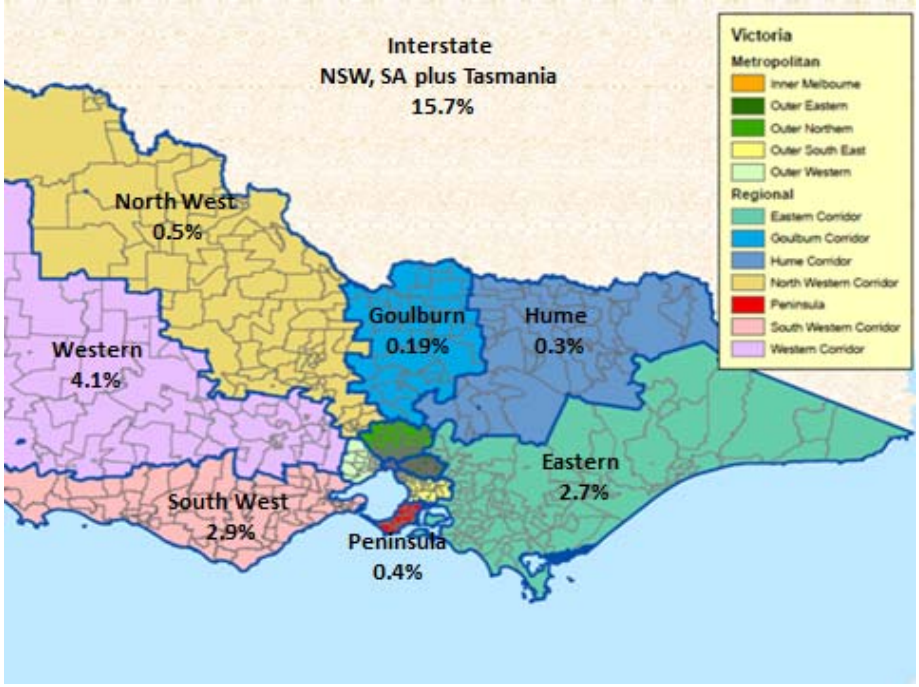
Figure 10 also indicates 17.6% of Port of Melbourne import/export containers have origins or destinations in the Outer South Eastern Suburbs. In 2010 however, the Institute for Supply Chain and Logistics undertook research to disentangle the Port of Melbourne supply chains in this metropolitan area and found most containers (55%) were not connected to the international seaport, but instead were domestic freight (Figure 11).

Figure 11: The proportion of containers with origins and destinations in Outer South Eastern metropolitan Melbourne

Rather than 17.9% of total Port of Melbourne freight, as indicated in Figure 10, only about 8% is actually involved in the international import/export logistics chain. The majority of the containers in the Outer South Eastern Region (55%) move within and are confined to domestic freight chains; they are either transported on rail between Australia's capital cities, or via domestic shipping between Tasmania and the mainland. Domestic container freight systems operate as distinct logistics systems, and are not connected with international import/export supply chains. Therefore, the Outer South Eastern Region is not of great significance as other industrial areas in international import and export trade.

Figure 12 shows the distribution of Port of Melbourne containers with origins and destinations in regional Victoria and interstate: over 70% of Victoria's import and export freight will need to find its way across metropolitan Melbourne to reach the Port of Hastings. In relation to importers and exporters, therefore, the location of Hastings as the next container port is likely to add significant cost and time to the transportation of full and empty containers to and from the port. (Note: this percentage includes containers within the metropolitan, regional and interstate hinterland, and excludes containers with origins and destinations in Outer Eastern Melbourne, Outer South Eastern Melbourne (international import exports only); Hume; Goulburn; Peninsula; and Eastern Victoria).

Figure 12: Port of Melbourne: Regional and Interstate Container Origins and Destinations



Source: Port of Melbourne Study (2010)

The consequences for land transport can be put into context by assuming half of the proposed 9 million TEU capacity for Hastings has a destination or origin on the western side of Melbourne. This would require the movement of 4.5 million TEU, or 1.5 million B-double trucks (at 3 containers (TEU) per truck) or 50,000 freight trains (at 90 containers (TEU) per train). Assuming that the industry works 24 hours a day, 7 days a week (24/7) this would mean nearly 4,200 trucks or 140 trains per day, every day, will have to find their way across Metropolitan Melbourne via the existing road or rail network. The current rail network is not able to cope with this increase in train movements.

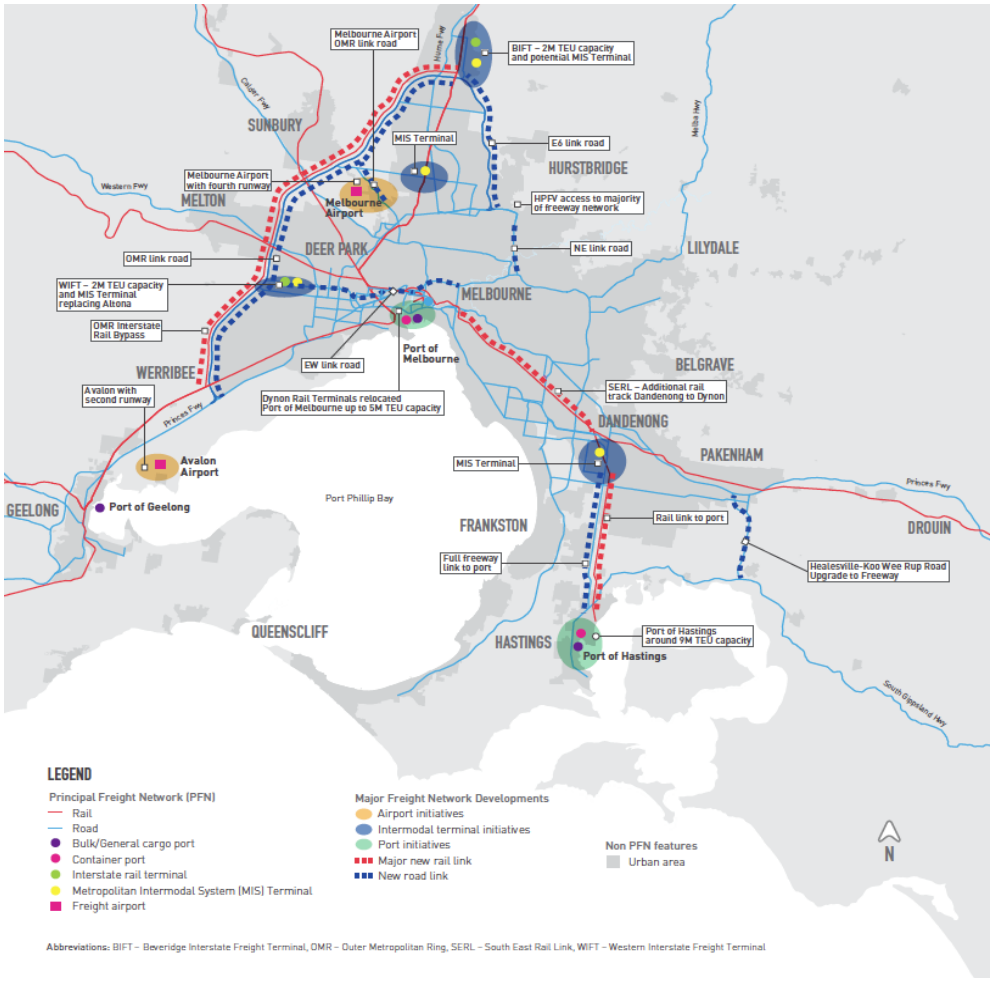
A dedicated rail freight line has been proposed in the VFLP (Figure 13), but whether the proposed South East Rail Link (which would be constructed to cross the Yarra River and travel via Flinders Street Station and Southern Cross Station to reach the Tottenham rail yards) would be able to cope with these volumes is debatable. These freight trains, one every 10 minutes each day, would need to travel from Dandenong, through many commuter railway stations to Caulfield, then pass a series of historic railway stations, through narrow cuttings (which would have to be widened) and through suburbs such as Malvern, Armadale, Toorak, South Yarra, across the Yarra River to Richmond and onwards through the city. The related social issues will also need to be considered.

It is of concern that the Department of Transport Ministerial Briefing Paper (Ref: MBN017007R, May 2013) that resulted in the cessation of investigations into alternative port locations in Port Phillip Bay, argued that the "South East Rail Link (SERL) proposal has

provided the basis of a cost-effective solution to the issue of connecting the port to catchments to the west and north of Melbourne".

The current road network, which is already under severe stress, would also require substantial improvements and increased capacity. Furthermore, current demographic trends and the growth corridor policy for the expansion of Melbourne indicate that the largest population growth in metropolitan Melbourne will be to the west and northwest of the city.

Figure 13: Long-term metropolitan freight network vision (VFLP)



Source: The Victorian Freight and Logistics Plan (2013, page 34)

The likely magnitude of the negative impacts of the shift from the Port of Melbourne to the Port of Hastings warrants further investigation to refine the findings from this initial, high-level assessment. Data and freight-related models held by Victorian Government agencies could be used as a basis for these investigations

8.2 Dredging Requirements

Some initial calculations have been made to determine the amount of dredging required at both locations (Hastings and an alternative port west of Melbourne) in order to allow container vessels with a draft of 15 metres to berth safely at all times. These estimates will require further detailed analysis. No calculations for dredging which may be required in the future (15 to 20 years time) to increase the water depth at Port Phillip Heads have been made.

8.2.1 Dredging at an Alternative Port to the West of Melbourne

A newly constructed container terminal (for example, at Point Wilson) will require an approach channel of approximately 10 km in length to be dredged to a depth of 17 metres and a width of 200 metres; this will allow vessels with a draft of up to 15 metres to use the channel. This water depth will ensure vessels of up to 13,000 TEU can berth at any time. Current water depth in this area is approximately nine metres hence it requires the removal of approximately 20 million cubic metres of spoil. Allowing for a five km long wharf and adjacent berthing pocket another 30 million cubic metres of spoil would need to be removed, resulting in a total of 50 million cubic metres to be dredged. At a cost of approximately $40 per cubic metre, the total cost would be approximately $2 billion. Steaming time to the proposed port will be about the same as to the Port of Melbourne. Safe and protected anchorages for vessels waiting for a berth are currently available in Port Phillip Bay.

8.2.2 Dredging at the Port of Hastings

Whilst Hastings currently has deep water access substantial dredging is required to provide access for vessels with a 15-metre draft (as used in the above discussion of a possible container terminal at Point Wilson), dredging at the Port of Hastings would be needed to remove approximately 6 million cubic metres of spoil in the approach channels. The establishment of a berthing pocket adjacent to the proposed five km long wharf will require the removal of approximately 18 million cubic metres of spoil, bringing the total dredging requirement to about 24 million cubic metres with a total cost of about $1 billion ($40 per cubic metre). It has not been possible to calculate the extent of dredging required to establish a protected anchorage area, as the details are not publicly available.

8.2.3 Dredging at Port Phillip Bay Heads

In the future, if and when required, limited dredging will need to be undertaken at the entrance to the bay and the South Channel to enable container vessels in excess of 8000 TEU (and in excess of 14.5-metre draft), to access the proposed container terminal. Information on costing is not publicly available, dredging maybe necessary in 15 to 20 years, depending on the growth in container trade and vessel size. The amount of dredging required is estimated to be small and will not encroach into existing marine parks.

8.3 'Build it and they did not come' – Overseas Experience

Discussion of the issues related to new port development in Victoria can be informed by the experience of port development overseas. The following are examples where ideological or political considerations over-rode port and landside logistics economics with respect to the size and location of new ports, with either ultimate failure or heavy subsidies required keeping the ports operating.

In the late 1990s the Port of Amsterdam granted a concession to a private operator to build a 54-hectare container terminal on the shores of the North Sea Canal. The terminal was designed using a new concept, an 'indented dock', where container cranes could work both side of the vessels simultaneously. This concept was considered revolutionary and intended to achieve shorter vessel turnaround time. The container terminal was completed in 2001 but was never successful and only a relatively small numbers of containers were handled over the years. Since 2001, there were a number of ownership changes but in 2012 the facility was closed. The City of Amsterdam (owner of the Port of Amsterdam Corporation) provided large financial incentives to establish this terminal, but admitted it was the wrong decision and the City sustained a loss of millions of euros. The private operator on-sold the facility at a great loss.

In 1997 the South Korean Ministry of Marine and Fisheries decided to construct a new port 20 km west of the city of Busan with additional container handling capacity to alleviate congestion at the existing Port of Busan. The government invested billions of dollars and private operators were invited to apply for concessions to operate the proposed container terminal. However, it took over a decade before the new port facility finally achieved enough throughput to become a viable operation. Initially, none of the shipping lines using the container terminal in the old port wanted to move due to the additional costs to the container supply chain of using the new facility.

The German states of Lower Saxony (50.1% stake) and Bremen (49.9% stake) invested US$1.3 billion for a new container port at Wilhelmshaven on the North Sea coast. The port (JadeWeserPort), which opened in 2012, can accommodate container vessels up to 430 metres in length and in excess of 16.5 metres draft. Nearly two years later it has failed to attract any significant container volume with currently only two (small) container vessel calls per week. This was despite the fact that the relatively close Port of Hamburg, which handled 9.3 million containers (TEU) in 2013, was severely congested and can only handle vessels with a maximum draft of 15 metres (with tidal assistance). One of the main reasons for the lack of container freight at JadeWeserPort is that there is only limited commercial activity in Wilhelmshaven's hinterland and most cargo will need further transportation by feeder vessel, railway or road which results in additional costs for the container supply chain.

In Scotland a private operator is proposing to build a new container terminal on the banks of the Firth of Forth (Scotland) to compete for the United Kingdom's container traffic. Whilst supported by the Scottish Government the proponents appear not to understand the economic imperatives of a container terminal.

These examples demonstrate that a number of fundamental conditions must be met for a successful container terminal to be built in a new location:

- Sufficient and well-connected infrastructure on the landside as well as the waterside;
- A pre-commitment from shipping lines that they will use the new facility;
- No additional cost imposts compared to available alternatives.

If the private sector is reluctant to commit to funding the proposed facility, governments and the community should be concerned about the economical viability of the new port.

9 Conclusion

Based on the preliminary findings in this report, further research is warranted to more rigorously assess the options for Victoria's future container capacity (if and when warranted) and establish the most appropriate location for alternative container port development. Critical issues include:

- Pragmatic, assumption-tested forecasts of future container vessel sizes which are likely to serve Australian trades;
- The land use and landside infrastructure requirements and costs for each option;
- Comprehensive whole of supply chain assessment;
- The need for a comprehensive cost-benefit analysis, covering economic, social and environmental factors.

The expected size of container vessels servicing Australian ports in the next 30 to 50 years has not been fully and realistically investigated. Once established, it can be ascertained which vessels are likely to call and what their navigational requirements are. At that point a determination of the suitability of a port in Port Phillip Bay or Western Port can be considered.

Secondly, an in-depth and comprehensive analysis needs to be conducted on the infrastructure requirements (waterside and landside) to safely berth larger container vessels, and to transport the projected container volumes to and from the container terminal from exporters and to importers across the port's metropolitan, regional and interstate hinterland.

And lastly, but most importantly, a comprehensive whole of supply chain cost-benefit analysis is needed to ensure Victorian exporters and importers can utilise any future port development in a cost effective manner to ensure they remain competitive in global markets.

The current choice of Hastings as the location of a new container port appears to be based on the fact that a 'natural' deep-water port is readily available with sufficient back-up port land for the development of a container terminal and related logistics activity. Vessels are sent to markets, not ports, and the development of the 'world's best container port' in the wrong location is unlikely to succeed if landside logistics are not cost effective.

So far, little realistic consideration has been given to the requirements for container movements to and from the port, and the associated economic, social and environmental impacts.

The belief "if you build it, they will come" has been proven time and time again to fail in relation to major infrastructure developments. If the port is built in the wrong location and lacks the necessary road and rail linkages for the efficient movement of freight to and from the port it will not succeed in fulfilling the long-term economic objectives of the government.

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