Compact Port Clusters and Intermodal Efficiency

There has been an explosion of interest in inland container handling facilities as an alternative means of expanding the capacity of on-dock container terminals at seaports. Rising land costs and urban encroachment on port facilities are pervasive, affecting all but the most recently constructed greenfield port sites. Growing community pressures to mitigate the environmental and traffic congestion impacts of port operations have also constrained the ability of ports to expand their capacity.

However, a rush to inland facilities risks sacrificing the efficiency of the inland transportation and handling systems. This is particularly true for intermodal cargo, because both the flow of cargo and the flow of containers must be accommodated.

The Containerization Revolution

The adoption of containerization for handling of marine cargo has been dramatic enough to deserve the title "revolution". U.S. sources usually trace its conception to Malcolm McLean's inauguration of service between new York and Houston in 1956. However, Canadians also claim credit, as the White Pass inaugurated intermodal service using a purpose-built container ship the Clifford J. Rodgers for service between the Lower Mainland and Skagway, Alaska in 1955.1

[1] Wikipedia http://en.wikipedia.org/wiki/Containerization

Containerization offered considerable advantages due to the reduction of handling costs at ports and losses due to cargo damage and theft. A variety of barriers which had to be overcome, including standardization of equipment across continents and service providers, and the first draft of the ISO standards were drafted in 1970. In the U.S., substantial regulatory changes were required to facilitate the creation of integrated intermodal services: "… the United States' present fully integrated systems became possible only after the Interstate Commerce Commission's regulatory oversight was cut back (and later abolished in 1995), trucking and rail were deregulated in the 1970s and maritime rates were deregulated in 1984".[2]

The initial enthusiasm for containerization was based on the IPI model in which cargo was moved intact in ISO marine containers to inland destinations by rail. However, in recent years a number of factors have led importers to prefer destuffing marine containers in the vicinity of the port. The relaxation of commercial vehicle length restriction has been a major factor, with the introduction of 48 and 53 foot truck trailers in the 1980's. The railways followed suit, standardizing their domestic intermodal containers at the same length to take advantage of the increased truck lengths. A 53 foot domestic intermodal container can accommodate 60-70% more cargo, and rail and truck rates are the same as for 40 foot containers. Importers may also prefer to destuff containers close to the port to consolidate shipments for individual stores, or to customize products close to the point of sale.

Land Use and the Evolution of Intermodal Transportation

Competitive pressure for the use of waterfront land is a pervasive problem among North American ports. Growth in traffic and the introduction of larger vessels have necessitated an expansion of the port terminals' land base while urban growth has resulted in encroachment of residential or non-port related commercial activity land uses. This results in rising land prices, and growing pressure for restrictions on port operations to mitigate environmental and aesthetic

[2] Ibid.

impacts. This pressure is particularly problematic for transload and warehousing activities which rely on drayage for regional transportation of containers.

The impact of these factors can be seen most visibly in Southern California. The port complex of the Ports of Long Beach and Los Angeles in San Pedro Bay has the largest share of container traffic among U.S. ports, handling 15.8 million TEU's accounting for 64% of West Coast container traffic in 2006. The majority of import cargo shipped through LA/Long Beach is transloaded to truck or domestic intermodal containers, according to a study by BST Associates.[3] This study disaggregated the traffic into three categories: transload warehouses operated by third party logistics (3PL) companies accounting for 27% of the total; large distribution centres (industrial buildings greater than 300,000 square feet) accounting for 61%; and small distribution centres (industrial buildings less than 300,000 square feet) accounting for 12%.

Transload operations were originally established in relative proximity to the ports, but a variaety of pressures are driving this activity further away:

> *Transload operators are generally located in close proximity to the San Pedro Bay Ports, because it is easier for them to make multiple truck trips between the port terminals and transload facilities. ... However, transload operators indicated that it is becoming more difficult to expand or develop new transload facilities, because several cities (such as Carson, Mira Loma) are restricting further development by trucking firms. When development is allowed, more landscaping is typically required, which further constrains parking areas for trailers and containers on chassis.*

[3] Cargo transloaded to truck or domestic intermodal containers was almost 57% of total imports in 2002, according to Consolidation Activity in the Southern California Area Study by BST Associates For the Alameda Corridor Transportation Authority March 2004, p. 27.

> *There are also restrictions against on street parking, which can further limit facility utilization. In addition, developers want to maximize the size of the industrial building, because there is typically no revenue associated with use of yard areas ..expansions and new facilities are more difficult to establish due to these factors.* [4]

The BST study indicates that 76% of the growth in large buildings between 1990 and 2002 occurred in San Bernardino and Riverside Counties (the "Inland Empire").[5] These large distribution centres are associated primarily with imports by large retailers such as Wal-Mart Stores Ltd. and Home Depot Inc. BST estimated that "The large firms in Inland Empire accounted for approximately 66% of waterborne containers moving through large industrial buildings"[6]; by extrapolation this would account for around 23% of all containers imported through the San Pedro Bay ports.

The growth in distribution centres in the Inland Empire has substantially increased drayage costs and traffic congestion related to port traffic. San Bernardino is almost 70 miles inland from the Ports and all containers are transported by truck. Drayage costs per container range from US$250 to $350 plus fuel surcharges and other additional charges, and a single round trip can take up to 8 hours.[7] Increasing truck traffic related to port operations is a major public issue in Southern California, and environmental and congestion concerns have effectively derailed port expansion plans in recent years.

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[4] Ibid., p. 19.
[5] Ibid., p. 22.
[6] Ibid., p.24.
[7] Travel time is around 2 and a half hours each way due to traffic congestion, plus 2 to 3 hours spent at the terminals at both ends of the trip. Source: Personal communications with a Southern California drayage firm.

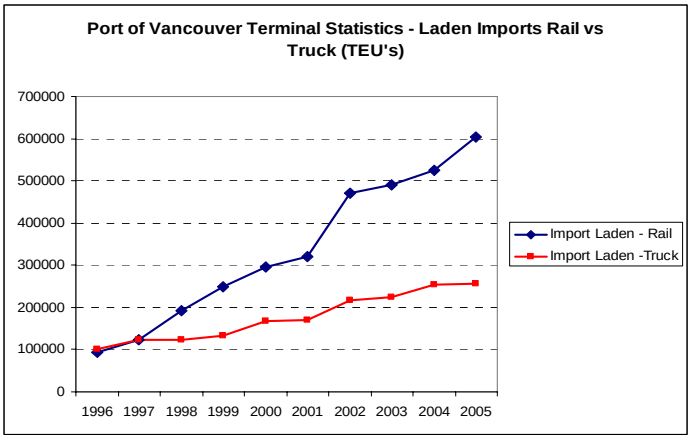
Expansion of distribution centre activity was encouraged by stagnation of drayage rates over many years. Recently rates have started to climb, and it appears likely that a major upward re-adjustment of drayage rates will be required to finance upgrading of the drayage fleet to reduce air emissions. The Clean Air Action Plan for the Ports of Long Beach and Los Angeles calls for all trucks frequently calling at the Ports to be compliant with 2007 emission standards by 2011. If this had to be accomplished through replacement of the entire fleet, the capital costs would probably total between US$1and $2 billion. Resolution of congestion issues would require additional multi-billion dollar expenditures in infrastructure investment to cope with anticipated traffic growth.

These issues have led to a search for a more efficient and environmentally sustainable means of transporting containers from the Ports to inland locations, including options such as dedicated truckways, rail shuttles, and advanced technology such as Maglev trains. All of these options have a high capital cost, and no alternative has been implemented to date in North America which is competitive with drayage by truck.

Other ports have taken a lesson from the example of Southern California and developed programs to avoid the “suburban sprawl’ of distribution centres. In 2004 the Port Authority of New York and New Jersey and the New Jersey Economic Development Authority (EDA) launched the Portfields Redevelopment Project. The partners identified 17 brownfield sites for development adjacent to the port for redevelopment based on their suitability for logistics operations. Participation of the EDA was critical because they were able to provide a number of financial incentives including low cost loans, training grants and support for applications for other government programs. The project has resulted in redevelopment of most of the sites identified in the first phase, and the partners are now working to identify an additional 15 sites for redevelopment.

Container Logistics in BC's Lower Mainland

Marine container shipments to Eastern Canadian markets were predominantly shipped via the Ports of Seattle and Tacoma in the 1980's. The Canadian railways did not offer double-stack rail service until the early 1990's when they undertook projects to increase the clearance in their tunnels through the mountains in B.C.

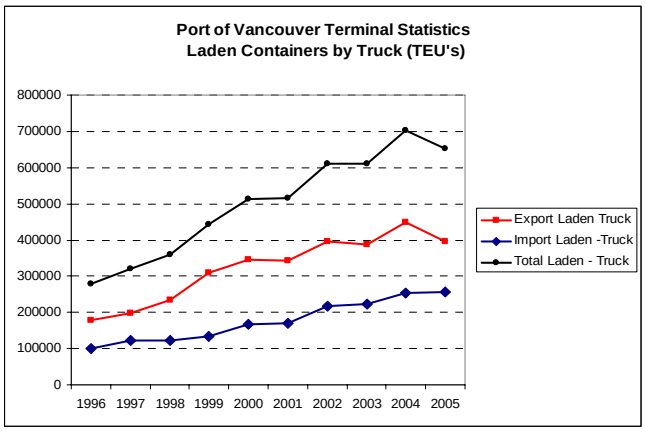


The Port of Vancouver's growth in container shipments through the early 1990's was largely due to the recapture of Canadian Asia-Pacific import cargo traffic, and growth has been sustained in this market by increased demand for Asian imports in Eastern Canada[8]. Consequently IPI traffic has grown more rapidly than regional demand, as is illustrated by the relative volumes of laden import containers transferred from the on-dock container terminals by rail (IPI) and truck.

The volume of laden containers leaving or entering the on-dock terminals by truck indicates the level of transloading activity taking

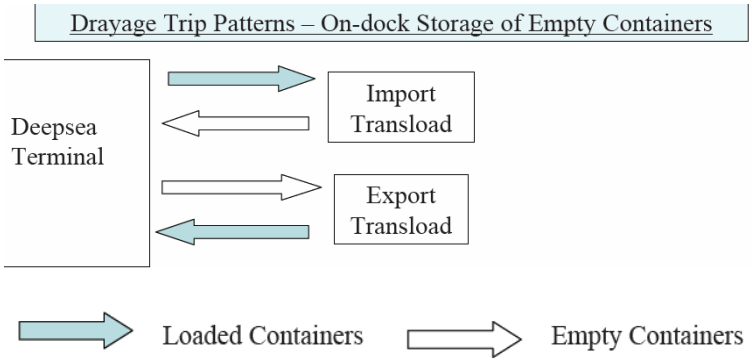
[8] B.C. ports share of Canada's container trade grew from 29% in 1995 to 50% in 2003, according to the BC Ports Strategy Final Report BC Ministry of Small Business and Economic Development, Transportation March 2005.

place in the Lower Mainland. The total grew from 280,000 TEU's in 1995 to 650,000 TEU's in 2005.



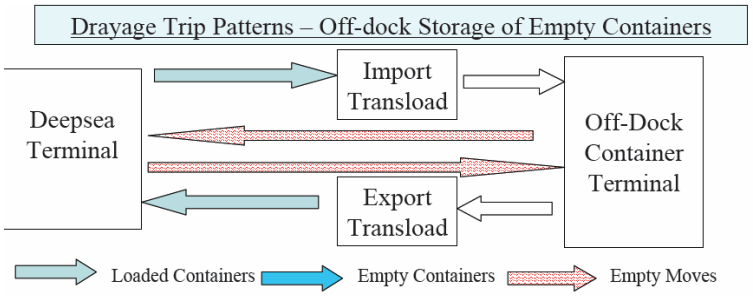
For imports, the use of trucks with 53 foot trailers for regional movements, or domestic intermodal containers for longer haul movements, provides a sufficient decrease in transportation costs to offset the increased costs of transloading in the Lower Mainland. For exports, growth has been driven by the availability of low backhaul rates and increased availability of empty containers due to the growing imbalance between imports and exports on the West Coast of North America.

The increase in transloading has substantially increased port-related truck traffic in the Lower Mainland. Container volumes do not provide an accurate estimate of truck trips because additional trips are required for repositioning of empty containers. The traditional pattern of drayage trips was based on storage of empty containers at on-dock container terminals.



Under this system, every loaded container move requires an additional trip to reposition the empty container.

Since 2003, off-dock storage of empty containers has become the norm, due to restricted capacity at the on-dock terminals. Off-dock storage introduces additional "empty leg" trips (i.e. trips with an empty chassis) between the off-dock and on-dock container terminals.

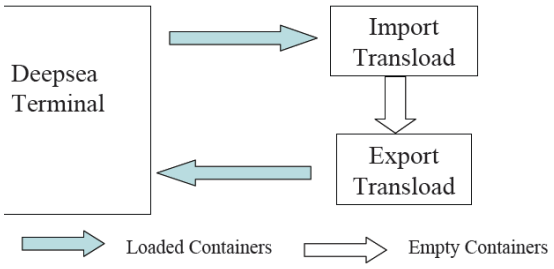


In the Lower Mainland, owner/operators are not paid for these empty trips. The inefficiency introduced by off-dock storage of empty containers was one of the major issues in the withdrawal of services by drayage owner-operators in the summer of 2005. The dispute was resolved by a Memorandum of Agreement which increased driver

compensation in the order of 40%, essentially building these inefficiencies into the rate structure. [9]

Efficiency in drayage trips is facilitated by "clustering" of import and export transload warehouses, and transfer of empty containers directly from importers to exporters . This "triangulation" minimizes travel time with the empty container and reduces the

Drayage Trip Patterns – Triangulation of Empty Containers



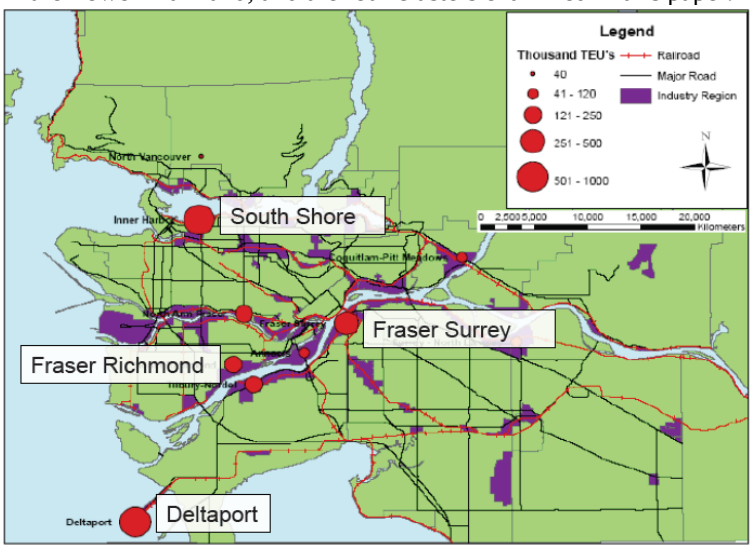
number of truck trips. Empty container storage nearby is necessary as "buffer' to facilitate this exchange. Ideally the import and export transload warehouses could be co-located and eliminate the empty container trip entirely.

In fact, a return to stuffing and destuffing of containers at a CFS at the on-dock terminals would be most efficient from the drayage perspective. The main reason why this is not contemplated – and in the case of the Lower Mainland, the reason for the displacement of empty containers to off-dock storage – is the shortage of land adjacent to the port terminals.

[9] For a fuller description of the impact of off-dock storage in the Lower Mainland, see Off-Dock Storage of Empty Containers in the Lower Mainland of British Columbia: Industry Impacts and Institutional Issues Paper presented at the National Urban Freight Conference; Philip Davies, Long Beach CA, February 2006.

Lower Mainland Port Clusters

The map below shows the distribution of container-handling activity in the Lower Mainland, and the four clusters examined in this paper.



1. Vancouver Port Authority (VPA) Inner Harbour South Shore

The first container terminals in the Lower Mainland, Centerm and Vanterm, were adapted from breakbulk operations in the 1970's. Operations at these terminals included a Container Freight Station (CFS) for loading or unloading containers on site. Centerm's CFS is still in operation while Vanterm's was demolished in 2005 to make room for additional container capacity.

The land base for container activity consists of a narrow strip of land along the South Shore of Burrard Inlet between the Seabus terminal and the Second Narrows Bridge. The South Shore terminals constitute a compact cluster, with the two on-dock container terminals, an empty container storage yard (Marco Marine Containers), and two export transload operations (Columbia

Containers and Coastal Containers) which load containers with specialty grain products for export.

This cluster developed organically as container traffic grew. Marco's primary function started out as container repairs and preparation of containers for export loading. Since 2003 the storage function has become dominant as congestion caused by traffic growth has resulted in the displacement of empty containers from Centerm and Vanterm. While off-dock storage of empty containers still results in a level of drayage inefficiency, the impact is limited due to Marco's proximity to the on-dock terminals. The next closest alternative for large-scale storage of empty containers is Canadian Intermodal Services (CIS) located on Mitchell Island, around 11 km south of the Inner Harbour.

There is virtually no additional land available for container activity on the South Shore without displacement of existing bulk terminals or other established operations. Competition for waterfront land in this area is intense, particularly for residential development. There is also pressure for redevelopment of industrial land which supports backup activities for the port terminals, most notably the False Creek Flats area which currently contains the CN and BNSF rail yards.

2. Vancouver Port Authority (VPA) Deltaport (Roberts Bank)

The Roberts Bank port cluster began with construction of a coal terminal and access causeway in 1968-69. The only traffic handled at Roberts Bank was coal until the Deltaport container terminal began operations in 1998. Built as a green-fields container terminal, Deltaport has no Container Freight Station for stuffing or destuffing containers on site.

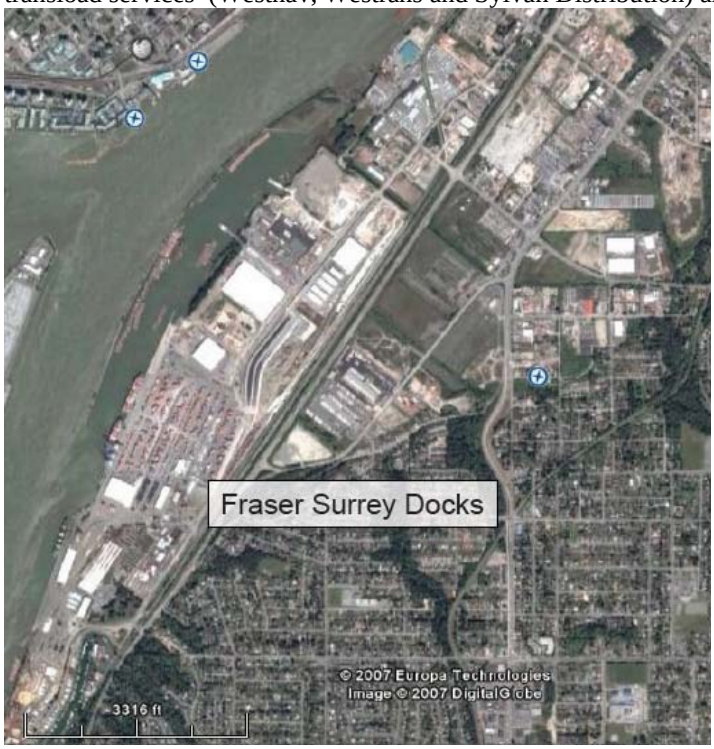
Deltaport has been experiencing intermittent problems since early 2004, and is currently experiencing extreme disruptions due to congestion on the terminal. The terminal is scheduled to be expanded through construction of a Third Berth by 2009. Vancouver Port Authority is planning to call for expressions of interest for a second terminal (T2) at Roberts Bank later this year.

Development of associated container operations was prevented by the provincial Agricultural Land Reserve restrictions on the conversion of the adjacent agricultural land to other uses. A recently announced land claims settlement with the Tsawassen First Nation may clear the way for development of container-related facilities adjacent to the port facilities. The settlement calls for 207 hectares of Provincial land to be removed from the Agricultural Land Reserve, allowing conversion to other uses.

3. Fraser River Port Authority Surrey Properties

The Fraser Surrey cluster is located on the Fraser River and includes a deepsea terminal (Fraser Surrey Docks) handling containers and breakbulk cargo, a number of distribution centres offering export

transload services (Westnav, Westrans and Sylvan Distribution) and .



manufacturing operations Fraser Surrey Docks' container traffic grew from 100,000 TEU's in 2002 to 373,000 TEU's in 2005, with CP Ships as their major customer. However, with the purchase of CP Ships by Hapag-Lloyd this traffic has been re-allocated to Hapag-Lloyd's existing services calling at Deltaport and Vanterm, and Fraser Surrey's container volume in 2006 was only 95,000 TEU's.

This area has substantial opportunities for expansion of logistics operations related to marine containers. The land controlled by the Port encompasses 143 ha (353 acres). The port area includes a deepsea terminal and barge ramp, and is served by four railways (CN,CP, BNSF and Southern Railway of BC). In addition,

construction of the South Fraser Perimeter Road linking Deltaport to Highway 1 will facilitate drayage along this corridor. The land adjacent to the port is currently underutilized, either vacant or devoted to low value uses such as salvage yards. The major impediment to full utilization of the area as a logistics hub is the channel draft of the Fraser River, which limits the size of container ships which can access Fraser Surrey Docks.

However, this area is located in the City of Surrey's South Westminster neighbourhood, and the City has an alternative vision of development. In 2005 this area was rezoned from primarily Light Industrial (IL) and Industrial Salvage (IS) to a variety of other categories to implement the intent of the revised Neighbourhood Community Plan (NCP). The vision for the new plan is to "transform an unattractive and under-utilized industrial area into new industrial neighbourhoods and business districts, public spaces and special residential communities … The Plan envisions a variety of land uses, including commercial, industrial, residential and recreational. The Plan calls for a change along the waterfront from vacant and under-utilized industrial lands to recreation in the short term and to residential/commercial uses in the long term. It also identifies high quality business parks and/or multiple family residential uses around the Pattullo bridgehead area and along the King George Highway corridor."[10] While distribution centres will be allowed, they will be subject to limits on outdoor storage of trucks, trailers and containers under a new IL-1 zoning category which is designed to ensure that "new developments involving truck parking, outdoor storage and stacking of containers, as a principal use, will no longer occur in South Westminster." [11] These restrictions are similar to those implemented by communities in Los Angeles County which have played a part in driving distribution centre activity inland to San Bernardino and Riverside, with detrimental impacts on environmental quality and traffic congestion. In the Lower Mainland, this

[10] Final Plan - South Westminster Neighbourhood Concept Plan Corporate Report File 6520-20, City of Surrey, Dec. 3, 2003.
[11] Ibid., p. 5.

phenomenon is already visible in the development of large import-related distribution centres in Langley, 38 km inland from the South Shore terminals and 44 km from Deltaport.

4. Fraser River Port Authority Richmond Properties

Fraserport's 700 acre Richmond Properties was developed on a former landfill site on the Fraser River in Southeast Richmond. Construction was announced in 1998, and almost all of the available land which is ready for construction has been committed except for a 147 acre parcel which the Fraser River Port Authority has reserved for a deepsea terminal. This cluster comes closes to the ideal in that it incorporates import transload operations (HBC Logistics), export transloads (Coast 2000, Westrans and shortly Euro Asia) and an off-dock container terminal (Coast 2000) for storage of empty containers.

Development at this site was facilitated by ownership of the land by the Fraser River Port Authority, which limited conflicts with local authorities over land use. To reach its full potential, the Fraser Richmond cluster needs improved road access and expanded rail service.

Conclusions

This paper has highlighted changes in the intermodal transportation system which have led to the re-emergence of compact areas in close proximity to port terminals as a efficient means for handling of containerized cargo. However, limited availability of land in port areas and local government land use decisions have led to "suburban sprawl' of these activities further inland from ports, resulting in reduced efficiency in inland transportation and negative environmental and social impacts. While this process has begun in the Lower Mainland, alternatives still exist to avoid these impacts through conversion of land from other uses (as at Deltaport) or redevelopment of existing brownfield sites (as at Fraserport's Surrey and Richmond properties). The prerequisite for taking advantage of these opportunities is the adoption of land use policies which promote these solutions.