

Port of Portland  
Marine Economic Impact Study:  
Container Transportation Cost-Benefit Analysis

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Prepared for:  
Port of Portland

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in association with  
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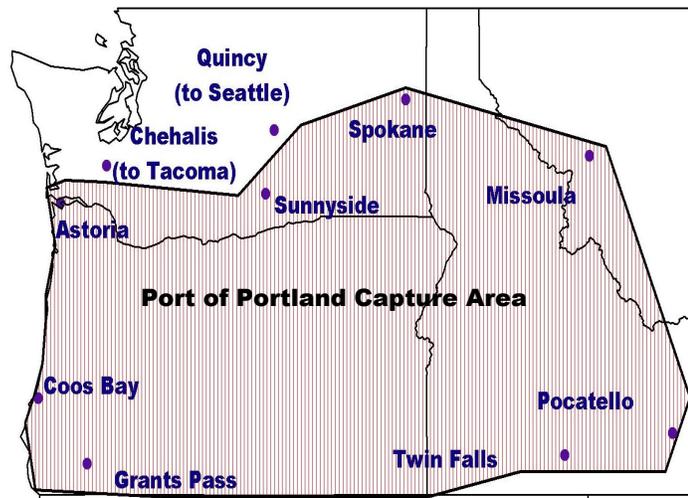
# 1. Introduction

## 1.1 Purpose of this Study

The Port of Portland's (Port's) mission is to "provide competitive cargo and passenger access to regional, national, and international markets while enhancing the region's quality of life." The purpose of this study is to better measure the Port's success in meeting one aspect of this mission – providing competitive access to world markets to the region's container cargo shippers.

To this end, the Port has contracted with HDR, Inc., to develop a model that estimates the net benefit to regional container shippers resulting from Portland container operations. The model compares the transportation costs faced by these shippers today ("with Portland" scenario) with the costs they would face using their least expensive shipping option in the absence of a Portland service ("without Portland" scenario), the difference representing the net shipper benefit. These benefits are derived from both the lower costs related to the use of Portland facilities and the reduction in rates related to competition provided by the existence of these facilities.

The study categorizes benefits by commodity type and location, providing the Port with a tool for estimating not only their overall value, but also the extent to which these benefits accrue to specific geographic areas and producer groups. The study further provides the Port with a model of regional freight flows and the ability to identify specific companies involved in the import and export of containers. This information will aid the Port in its transportation planning efforts and enable the Port to better tailor its services to meet shipper needs.



The Port's capture area is the area where transportation costs are lower to Portland than to competing ports.

The study is not meant to be a comprehensive examination of the benefits (and costs) associated with the Port's operations. It does not attempt to measure the benefits accruing to shippers utilizing the Port's grain, mineral bulk, breakbulk or automobile facilities, nor does it attempt to measure the direct and indirect benefits associated with regional jobs and investment related to Port activities. The scope of this study also precluded any analysis of environmental benefits and costs associated with the Port's operations. Some of these costs and benefits are covered in detail in concurrent studies commissioned by the Port.

The study begins with a brief history of containerization and its role in the Port's operations. The second section discusses the outputs of the model and their relevance to shippers and the region. The third section provides technical background on the data, assumptions, and methodology employed by HDR and Port staff in preparing the analysis including the process of review by an independent Peer Review Panel.

## 2. Background

### 2.1 History of Containerization

Prior to containerization, the handling process for waterborne general cargo—called breakbulk cargo—was slow, piece-meal, and repetitive. All products other than bulk commodities (e.g., grain, fertilizers, etc.) were moved individually, sometimes on pallets or in boxes. Boxes were loaded one by one into a truck and then driven to a port. Once at the dock, each item, box, or pallet was systematically unloaded and then hoisted into the hold of the ship. At the destination, the freight was similarly unloaded and put on a truck or train for delivery. Transitions between other modes of transport, such as railroads, only compounded the inefficiency.

In addition to being slow due to excessive handling, the extended loading and unloading process exposed the cargo to potential damage and pilferage. By the 1960s, it was obvious that breakbulk shipping technology could not keep pace with the demands of a growing world trade.



Standard 40-foot ocean container loaded on a road chassis. American President Line (APL) is one of 14 container carriers calling Portland's Terminal 6.

The solution was to unitize cargo into standard sized ocean containers that allowed ocean carriers and ports to invest in mechanized systems and equipment to automate the transport process and raise productivity. The ocean containers were designed to fit neatly above decks and into specially constructed holds on container vessels. These containers could be lifted and placed quickly on and off vessels by container cranes; the same containers could further be locked onto trailer chassis and rail cars. Using containers, cargo could be moved quickly over great distances, with little re-handling, and with efficient transfer between modes.

This new system of cargo movement was first used in the North Atlantic in the mid-1960s and rapidly spread to trade routes and ports worldwide. Productivity was dramatically improved. Whereas general cargo berths typically handled 100,000 to 150,000 cargo tons per year, the new container terminals were able to handle 1,000,000 to 2,000,000 tons per year.<sup>1</sup> Vessels that used to spend weeks at berth could now be loaded and discharged in a day.

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<sup>1</sup> Martin Stopford, *Maritime Economics* (London: Routledge, 1997), 342.

## 2.2 Impact of Containerization

“Globalization” of the world economy is an oft-used phrase that summarizes profound changes in worldwide manufacturing and distribution processes – changes that, to a large degree, have been made possible by the invention and development of container shipping. Container shipping has changed the way we transport goods around the world. By enabling easier access to the exchange of goods, it has opened up new global markets for export and import. For shippers from Portland and throughout the Pacific Northwest, containerization has provided the mechanism to expand to international markets without sacrifice to the quality of distribution and without incurring a major penalty in high freight costs.

Containerization has also facilitated “just in time” (JIT) production through its schedule reliability, low costs, high security, and faster transport times. Today, many Pacific Northwest manufacturers depend on container shipping to be supplied with steady streams of components and parts.

Container shipping has been an important factor in reducing logistics costs from 15.7 percent of U.S. gross domestic product in 1980 to 9.9 percent in 1999. This improved efficiency has been a catalyst to the economic boom of the past decade.<sup>2</sup> Container traffic accounted for 17 percent of all international seaborne trade tonnage in 1980. By 1990, that percentage had risen to 42 percent, and today exceeds 60 percent. This is a true measure of the significance and increasing role played by the container shipping in the world economy.<sup>3</sup>



A containership calling Portland's Terminal 6.

## 2.3 Containers and Portland

**History.** The first containers moved over the Port of Portland's docks in the early 1960s. The first dedicated berth equipped with a shoreside container crane went into operation in 1968 at Terminal 4. Portland's container capabilities were enhanced in 1970 with the construction of the downstream portion of Terminal 2, which featured two shoreside container cranes. In 1974, Terminal 6 was completed as a two-berth, three-crane, dedicated container facility.

**Terminal 6.** Today, Terminal 6 is the Columbia-Snake river system's primary deep-draft container terminal and has been expanded to a three-berth, seven-crane container facility, covering 175 acres. It is served by a 53-acre, on-dock intermodal rail yard, with capacity for 83 double-stack rail cars. Terminal 6 has an annual capacity of approximately 400,000 TEUs,

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<sup>2</sup> Cass Information Systems and ProLogis, *11<sup>th</sup> Annual State of Logistics Report* (2000), 2; available from [http://www.cassinfo.com/bob\\_press\\_conf\\_2000.html](http://www.cassinfo.com/bob_press_conf_2000.html); Internet.

<sup>3</sup> Drewry Shipping Consultants Ltd, *Container Market Outlook* (London: Drewry Shipping Consultants Ltd, 1999), 22.

expandable to 500,000 TEUs with the addition of adjacent land.<sup>4</sup> In 1999, the facility handled slightly less than 300,000 TEUs, although in 1995 it handled more than 330,000 TEUs, prior to the economic woes in the Asian Pacific Rim. As the economies in those countries have begun recovering, so have the container volumes over Terminal 6.

**Capture Area.** Terminal 6 serves a regional market area that includes Oregon, Southwest Washington, Eastern Washington, and Idaho. This capture area is illustrated by the map on Page 1 of this report.

**Delivery/Receipt Mode.** Of the cargo exported from Terminal 6, between 20 percent and 25 percent is delivered to the terminal by barge, 10 percent to 15 percent by rail, and the remaining 60 percent to 70 percent by truck. The rail cargo is non-regional, originating in Chicago and points to the east and south. The import cargo arriving via Terminal 6 is primarily regional and almost all of that cargo is transported from the terminal by truck.

**Commodities.** A wide variety of containerized commodities are exported from Portland. Agricultural and forest products comprise most of what is exported. Export agricultural commodities include alfalfa, hay cubes, fresh fruit, onions, frozen French fries, frozen meat, dry peas, and ryegrass straw bales. Forest product commodities include paperboard, kraft linerboard, lumber, newsprint, medium density fiberboard, and wood pulp. Other commodities exported from Portland by container include metal scrap, mining equipment, computer equipment, frozen fish, and asphalt shingles.

Container commodities imported to Portland include footwear, apparel, computer equipment, tires, furniture, auto parts, pine lumber, toys, component parts for televisions and printers, hardware, light fixtures, and pineapples.

**Trade Routes.** As is true with other West Coast container ports, Portland's container trade is primarily with Pacific Rim countries. Portland's container trade with East Asia accounts for approximately 85 percent of Portland total container volume. The remainder of Portland's container trade is divided between Southern Europe, Australia/New Zealand, and South America.<sup>5</sup>

**Direct versus Indirect.** Not all container cargo moving to or from the Portland capture area is shipped directly via Terminal 6; a portion of this cargo is shipped via other ports, i.e., Seattle, Tacoma, and Oakland. The movement of this "indirect" cargo to other ports is attributable to a variety of factors, including, but not limited to, carrier preference, transit times, and overseas

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<sup>4</sup> TEU: Twenty-foot equivalent unit; a standard measure of container capacity based on the length of the container: one 40 foot container equals two TEUs, while one 20 foot container equals one TEU. Container activity can also be measured by box count, where each container, regardless of length, equals one. For the purposes of determining transportation and handling costs, box count is the more useful unit of measure and is therefore used as the basis for analysis in this study.

<sup>5</sup> Other trades, such as Hawaii, Northern Europe, and Africa, are not served directly from Portland. There is accordingly no Portland-related benefit to regional shippers participating in these trades, and these trades are therefore excluded from consideration in this study. These excluded trades are believed to comprise less than ten percent of the total regional container cargo base.

port requirements. As is discussed below, the benefit of Portland container operations accrues to shippers of both direct and indirect cargoes.

## 3. Findings

### 3.1 Summary Impacts

**Total.** HDR identified a substantial benefit to the region's shippers attributable to Portland's container facilities. Current shipping costs for all containers using the Port's operations amount to \$59.7 million per year. The cost of shipping these goods in the absence of Portland service is estimated to be \$127.6 million, resulting in a benefit of \$67.9 million.

**Import versus Export.** Benefits can also be broken down based on whether the shipper is importing or exporting through the port. Imports account for 24% of the containers moving through the port and generate approximately 21% of the total benefits at \$13.9 million. Exports account for 76% of the containers moving through the port and generate approximately 79% of the total benefits at \$54.0 million.

**Direct versus Indirect.** Another important distinction is the benefits accruing to shippers whose cargo is directly served by the port versus shippers whose cargo benefits indirectly from the port in the form of competitively lowered rates. While it is obvious that shippers currently using the Port of Portland benefit from its container service, there are also benefits that accrue to regional shippers who ship cargo through alternative ports such as Seattle and Tacoma.

Ocean carriers attempting to serve shippers in the Portland capture region through these alternative ports must equalize inland transportation costs to compete with ocean carriers calling Portland directly. Seattle and Tacoma ocean carriers typically accomplish this equalization through a variety of pricing mechanisms, typically by accepting cargo in Portland and absorbing the cost of drayage to the Puget Sound.

Thus, shippers in the Portland capture region enjoy the benefit of reduced transportation costs resulting from Portland container service, even though these shippers may move part or all of their container cargo via alternative ports. For the purposes of this study, benefits derived in this manner are referred to as "indirect," while benefits derived from cargo shipped directly via Portland are termed "direct."

Direct containers accounted for 112,215 of 177,767 containers included in the model. Shippers of these containers received \$44.2 million or 65% of the total benefit. Indirect benefits accounted for \$23.7 million or 35% of the total benefit. Figure 1 summarizes the cost and benefit estimates developed by HDR for this analysis.

<b>Figure 1: Summary of Annual Shipper Benefits</b>								
	# of Containers		Costs "With" Portland		Costs "Without" Portland		Net Shipper Benefit <sup>2</sup>	
	Count <sup>1</sup>	%	(millions \$)	%	(millions \$)	%	(millions \$)	%
<b>All Cargo</b>	<b>177,767</b>	<b>100%</b>	<b>\$ 59.7</b>	<b>100%</b>	<b>\$ 127.6</b>	<b>100%</b>	<b>\$ 67.9</b>	<b>100%</b>
<b>By Direction</b>								
Import	42,126	24%	\$ 10.7	18%	\$ 24.7	19%	\$ 13.9	21%
Export	135,641	76%	\$ 48.9	82%	\$ 102.9	81%	\$ 54.0	79%
<b>By Direct &amp; Indirect</b>								
Direct <sup>3</sup>	112,215	63%	\$ 36.2	61%	\$ 80.4	63%	\$ 44.2	65%
Indirect <sup>4</sup>	65,552	37%	\$ 23.5	39%	\$ 47.2	37%	\$ 23.7	35%
<b>By Known &amp; Unknown</b>								
Known	165,996	93%	\$ 55.7	93%	\$ 119.1	93%	\$ 63.4	93%
Unknown <sup>5</sup>	11,771	7%	\$ 4.0	7%	\$ 8.4	7%	\$ 4.5	7%

1. "# of Containers" based on box count as opposed to TEU.  
2. "Net Benefit" is equal to the difference of the "With" Portland and "Without" Portland transportation costs.  
3. "Direct" benefit calculated from cargo moving directly via Portland.  
4. "Indirect" benefit calculated from cargo moving via alternate ports.  
5. "Unknown" benefit calculated from cargo originating from and destined for the Portland capture region, but not having a known exact point of origin or destination.

### 3.2 Impacts by Commodity Type

The benefits measured by the model can be categorized in order to show the degree to which shippers of different commodities benefit from the Port's operations. As Figure 2 demonstrates, benefits generated by agricultural and wood products account for the majority of the benefits attributable to the Port. Appendix A contains a breakdown of the costs and benefits, by commodity, based on two-digit harmonized codes.

<b>Figure 2: Top 10 Commodities by Shipper Benefit</b>			
Commodity	Shipper Benefit		
	Imports	Exports	Total
<b>Total</b>	<b>\$13,935,870</b>	<b>\$ 53,988,136</b>	<b>\$ 67,924,006</b>
Misc. Grain, Seed, Fruit (includes hay)	\$ 131,776	\$ 17,801,476	\$ 17,933,252
Wood Products	\$ 3,899,124	\$ 7,262,927	\$ 11,162,051
Paper and Paperboard	\$ 127,280	\$ 8,284,226	\$ 8,411,505
Vegetables	\$ 398,559	\$ 5,736,883	\$ 6,135,442
Wood Pulp, Waste Paper	\$ 19,442	\$ 4,993,148	\$ 5,012,589
Preserved Food (includes frozen potatoes)	\$ 37,449	\$ 3,221,984	\$ 3,259,433
Iron/Steel Products	\$ 712,116	\$ 465,248	\$ 1,177,364
Other Base Metals, Etc. (primarily scrap metal)	\$ 26,002	\$ 1,093,632	\$ 1,119,634
Machinery	\$ 933,063	\$ 162,949	\$ 1,096,012
Rubber (primarily tires)	\$ 829,884	\$ 11,082	\$ 840,966
All Other	\$ 6,821,175	\$ 4,954,582	\$ 11,775,757

### 3.3 Impacts by Region

HDR also categorized the model results by State and by County. Figure 3 quantifies the benefits attributable to shippers located within each state that falls at least partially within the Port's capture area. While Oregon shippers receive most of the benefit provided by the Port, the benefits clearly extend

well beyond Oregon’s borders. The relatively high numbers from Idaho and from Washington reflect the far reach of the Port’s capture area into those states primarily as a result of low-cost barge transport.

<b>Figure 3: Summary by State</b>					
<b>State</b>	<b>Shipping Cost with Portland</b>	<b>Shipping Cost w/o Portland</b>	<b>Shipper Benefit</b>		
			<b>Import</b>	<b>Export</b>	<b>Total</b>
<b>Total</b>	<b>\$ 59,667,906</b>	<b>\$ 127,591,913</b>	<b>\$ 13,935,870</b>	<b>\$ 53,988,136</b>	<b>\$ 67,924,006</b>
Oregon	\$ 34,250,319	\$ 87,173,650	\$ 11,173,386	\$ 41,749,946	\$ 52,923,331
Washington	\$ 11,824,270	\$ 17,229,566	\$ 546,448	\$ 4,858,848	\$ 5,405,296
Idaho	\$ 9,633,454	\$ 14,726,590	\$ 534,270	\$ 4,558,865	\$ 5,093,136
Montana	\$ 8,516	\$ 12,675	\$ -	\$ 4,159	\$ 4,159
Unknown	\$ 3,951,347	\$ 8,449,432	\$ 1,681,766	\$ 2,816,318	\$ 4,498,085

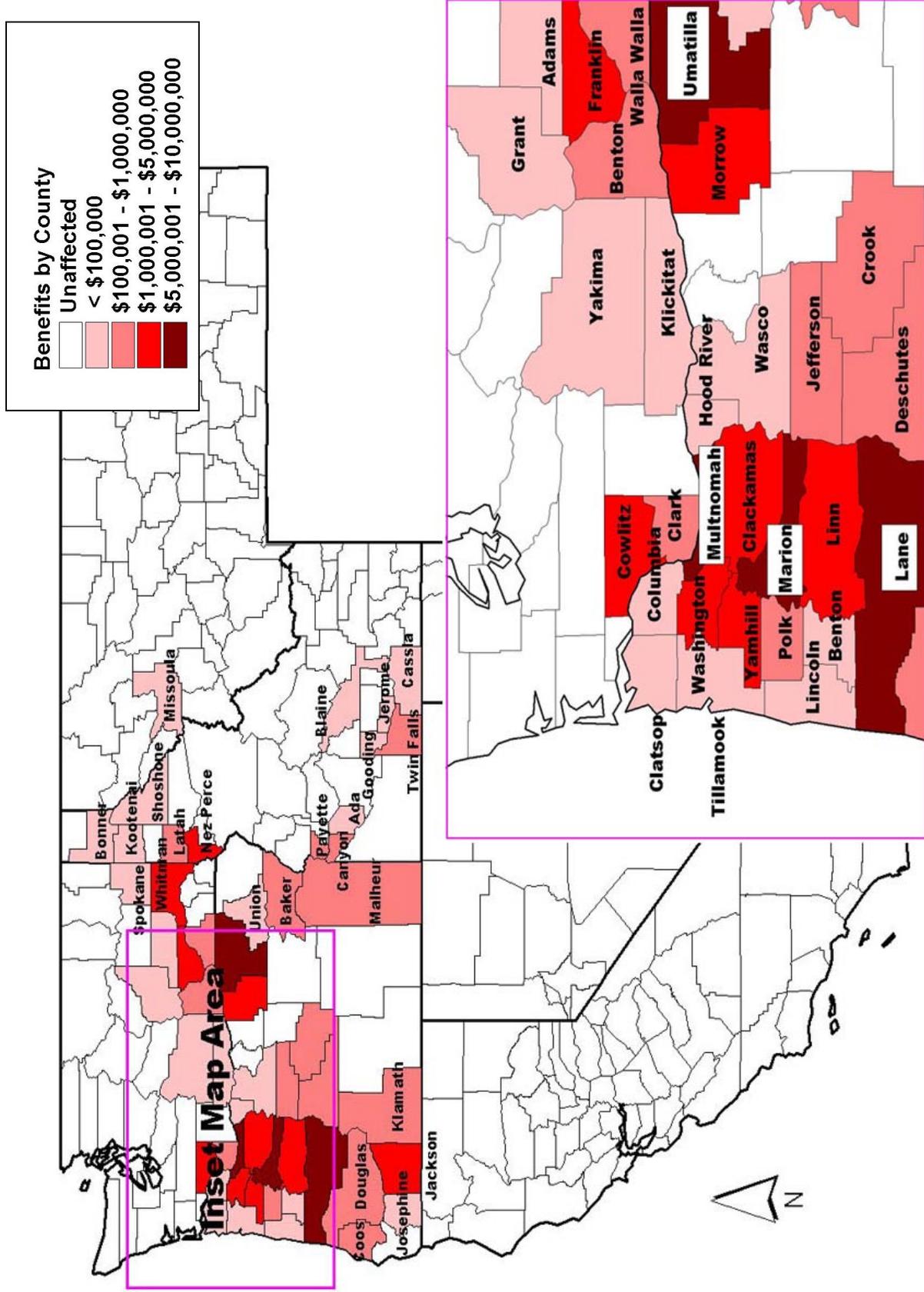
Figures 4 and 5 provide a more detailed breakdown of the spatial distribution of benefits by attributing benefits to shippers in individual counties. This map and table demonstrate that the primary beneficiaries of the Port’s services are located in the Willamette Valley, and north into Washington as far as Cowlitz County. In addition, the agricultural production centers along the Snake and Columbia rivers show significant benefits as far east as Nez Perce County in Idaho.

The benefits of the Port are widely dispersed across the region and accrue to shippers in both rural and urban areas. Figure 4’s list of the top 15 counties includes all three Portland Metro area counties as well as counties representing rural areas in eastern Oregon, Washington and Idaho. Substantial benefits can also be attributed to shippers in counties in southwestern parts of Oregon and Washington where the import and export of wood products are important components of the local economies. Counties in northeastern Washington and south-central Idaho are affected, but the levels of benefit are much lower because they are on the edge of the Port’s capture area. While a great deal of traffic from these areas moves through the port, transportation costs to the least-cost alternative port are comparable to the costs for shipment via Portland. Appendix B provides a complete list of the benefits accruing to counties within the six-state study area.

**Figure 4: Top 15 Counties Benefiting From the Port of Portland**

Rank	County	Shipping Cost with Portland	Shipping Cost w/o Portland	Shipper Benefit		
				Import	Export	Total
	Total	\$ 59,667,906	\$127,591,913	\$ 13,935,870	\$ 53,988,136	\$ 67,924,006
1	Multnomah, OR	\$ 4,689,955	\$ 14,619,268	\$ 4,894,650	\$ 5,034,663	\$ 9,929,313
2	Marion, OR	\$ 5,827,050	\$ 15,547,358	\$ 81,598	\$ 9,638,710	\$ 9,720,307
3	Lane, OR	\$ 5,237,854	\$ 13,717,240	\$ 161,544	\$ 8,317,842	\$ 8,479,386
4	Umatilla, OR	\$ 3,914,863	\$ 9,038,875	\$ 330	\$ 5,123,682	\$ 5,124,012
5	Linn, OR	\$ 2,479,568	\$ 7,263,646	\$ 171,417	\$ 4,612,662	\$ 4,784,078
6	Clackamas, OR	\$ 2,187,803	\$ 6,015,635	\$ 2,466,390	\$ 1,361,442	\$ 3,827,832
7	Nez Perce, ID	\$ 2,406,055	\$ 6,066,249	\$ -	\$ 3,660,194	\$ 3,660,194
8	Morrow, OR	\$ 2,287,758	\$ 5,089,146	\$ 11,314	\$ 2,790,075	\$ 2,801,388
9	Washington, OR	\$ 1,200,579	\$ 3,267,340	\$ 832,207	\$ 1,234,555	\$ 2,066,762
10	Jackson, OR	\$ 1,779,873	\$ 3,609,459	\$ 1,682,565	\$ 147,021	\$ 1,829,586
11	Franklin, WA	\$ 2,038,582	\$ 3,439,345	\$ 8,192	\$ 1,392,571	\$ 1,400,763
12	Yamhill, OR	\$ 760,330	\$ 2,027,383	\$ 5,578	\$ 1,261,474	\$ 1,267,052
13	Whitman, WA	\$ 1,024,004	\$ 2,188,448	\$ -	\$ 1,164,444	\$ 1,164,444
14	Cowlitz, WA	\$ 4,353,624	\$ 5,375,890	\$ 50,627	\$ 971,638	\$ 1,022,266
15	Clark, WA	\$ 407,013	\$ 1,169,142	\$ 484,804	\$ 277,324	\$ 762,128
	All Other	\$ 19,072,994	\$ 29,157,489	\$ 3,084,656	\$ 6,999,839	\$ 10,084,494

Figure 5: Benefits by County



## **4. Study Approach and Methodology**

This section provides a technical description of the assumptions, methods, and data that HDR and Port staff used in the preparation of this analysis. While they are listed sequentially, assumptions, methods, and data collection all proceeded in parallel. The approach used for this study is summarized in the following steps:

### **4.1 Review Existing Information and Reports**

HDR and Port staffs were largely familiar with existing data sources related to origin and destination information, rates, and least cost modeling. However, analysts from both organizations began this study with the collection of sample data to identify areas where data might not be available and to assist in the development of assumptions and methodology.

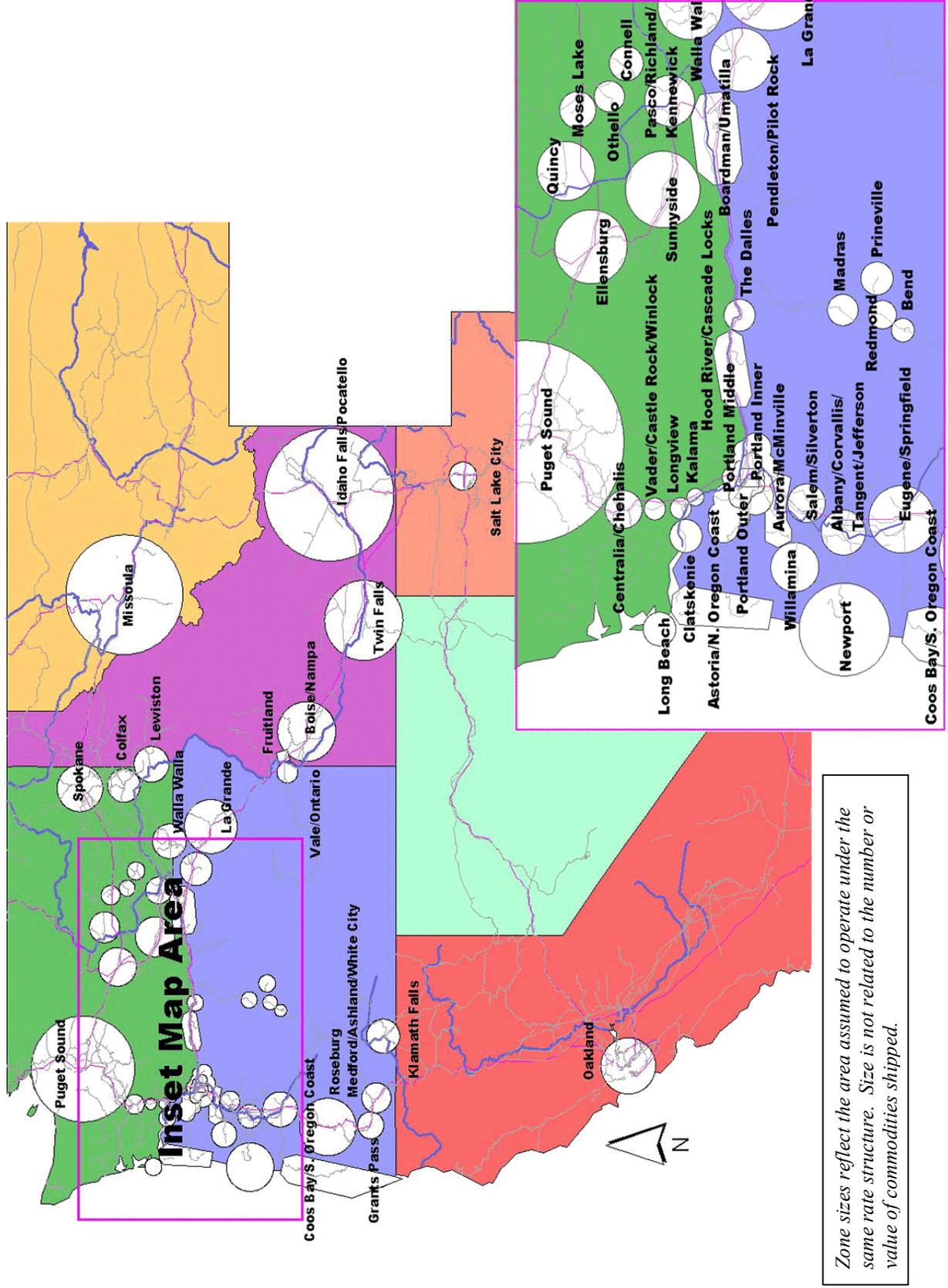
### **4.2 Develop Study Methodology**

The foundation for HDR's analysis is a least-cost transportation model that identifies the lowest cost destination, route, and transportation mode between cargo origin and destination points and the container ports of Portland, Seattle, Tacoma, and Oakland. This model takes as its inputs: origins and destinations, volumes, container characteristics, and transportation rates and calculates the likely routing and subsequent shipper benefit resulting from each container. This process is described in greater detail below.

#### **4.2.1 Identification of Origin Zones**

In cooperation with the Port, HDR identified fifty "origin zones" in areas that could reasonably be served by the Port of Portland. The intent of these zones was to simplify the model by limiting the number of origin points, while at the same time covering all of the major cargo generating areas shipping to the Port. Figure 6 presents a map showing the fifty zones. The size of the zones reflects the area that could be considered to operate under the same trucking rate. These zones are generally small for high traffic areas near the Port where there is substantial competition and more detailed rate information available from carriers. Zones that are more distant from the Port tend to encompass a larger area, reflecting the more general rate quotes provided for longer distance trips. Appendix C provides a table documenting the distribution of benefits among the 50 origin zones.

Figure 6: Origin and Destination Zones



### 4.2.2 Develop Rate Tables

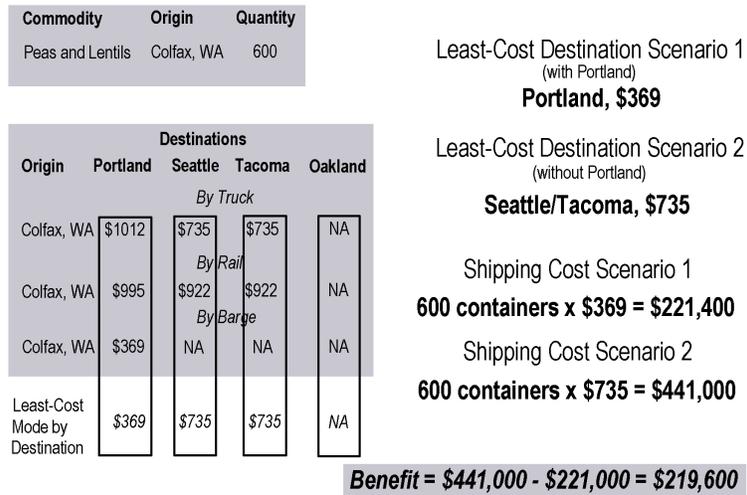
HDR developed a matrix of transportation rates between each of the origin zones and the destination ports based on interviews with transportation providers, shippers, and logistics companies. Where applicable, HDR also identified truck rates between origin zones and loading points for rail and barge. The end result of this research was a series of tables showing rates from each of the origin points to each destination port for all of the available transportation modes. The truck rate table included rates from all of the origin zones to the destination ports, as well as to Boardman, Pasco, and Lewiston for loading on barge, and to Spokane, Lewiston, and Salt Lake City for loading on rail. Tables for rail and barge were limited to rates between the loading points identified above, and all applicable destination ports.

### 4.2.3 Identify Least-Cost Mode and Destination

From these rate tables, the model selects the least expensive mode for shipment to each port. Figure 7 shows a schematic of the model's route and destination selection process. For the example shipment from Colfax, barge is the least cost mode for Portland, while truck provides the least-cost mode for shipment to Seattle and Tacoma.

No rates for shipment from Colfax to Oakland were available. Next, the model compares the rates for each port, and chooses the least cost destination for each origin zone. The model completes this operation for two scenarios: Scenario 1 which includes Portland as a destination, and Scenario 2 which selects the least cost port from a comparison of rates to Seattle, Tacoma, and Oakland. Finally, the model computes the benefit provided to each shipper by comparing the lowest rate with Portland as an option and the least-cost alternative to Portland. These benefits can then be summarized based on commodity type, origin zone, origin state, and many others.

**Figure 7: Schematic of model operation**



### 4.3 Develop Study Assumptions

Where empirical data was not available to support the study, the study team developed assumptions to substitute for missing information. While this is common practice, it is essential that all assumptions are logical and supportable. The following techniques were used to support the assumptions used in this study:

- Supplementation and corroboration of publicly available information with representative shippers, transportation providers and ports,

- Comparison of results with other relevant studies, and
- Review of inputs and methodologies used in the analysis by a technical study team and a three-member peer review panel.

Study assumptions are summarized below:

#### **4.3.1 Assumptions Related to Rates**

The model developed by HDR for this analysis relies on rate information collected from published information, interviews with transportation service providers, and in some cases rates generated from the distance between origin and destination points and the time required to deliver goods between those points. Even when considering just one origin and one destination point, these rates can vary widely on a seasonal basis and are also subject to differences by carrier, commodity type, and many other factors. In order to simplify all of these variables to a manageable level, HDR developed a series of important assumptions related to the rates incorporated in the model. These assumptions are:

*All rates in the model are based on rates that include one direction full plus the cost of repositioning an empty container to the origin point.* This assumption has some limitations, particularly in heavy-traffic corridors where frequently available backhauls and lowered repositioning costs could significantly reduce the rates identified in the model. The only corridor included in the model where these reduced rates might apply would be between Portland and Seattle. In order to test the impact of this assumption, HDR completed a sensitivity analysis in which cargo moving in the corridor between Seattle and Portland was allowed to travel for the one-way full rate without paying a repositioning fee. This sensitivity analysis indicated that the reduced rates between Seattle and Portland would reduce the benefit attributed to the Port of Portland by approximately \$6.1 million. However, the consensus of the Peer Review Panel was that the model should be consistent across all routes, and that there was no good way to capture the different rates that might be available in the Portland/Seattle corridor. Therefore, the model uses the one-way full plus repositioning cost for all origin and destination pairs.

*For truck, no rate differences are assumed for 20', 40', refrigerated, and high cube containers. Separate rates are calculated for regular and super chassis loads. Separate rates are calculated for 20' and 40' containers traveling on barge and rail.* While some truck carriers specify different rates for containers of different lengths and container types, others insist that weight is the only important factor in determining rates for trucking. This is substantiated by the fact that ocean lines generally provide the containers, and so the trucking firm faces no additional charges for different container types. Since a truck can only carry a single container of 20' or 40', the distance and equipment requirements are the same for both lengths. A 20' container can weigh as much or more than a 40' container and so rates are not differentiated for 20' and 40' containers based on weight. The only factor present in the model that substantially changes the cost for trucking firms is weight. Heavy-duty chassis and increased fuel costs add a significant cost to the moves of heavier containers. Because they carry large numbers of containers at one time, both rail and barge offer separate rates for 20' and 40' containers. These separate rates are accounted for in the model.

Where rate quotes were not available for truck, rates were calculated based on the matrix provided below. A fuel surcharge of 10% was also added when the interviewee did not indicate a specific charge. HDR identified a number of different dollar-per-mile values during phone interviews with trucking firms throughout the PNW. Per-mile rates vary widely with the distance being hauled, terrain, and volume of goods being moved. Because of the complexity involved in calculating these rates, the Peer Review Panel provided the following rate matrix for calculating costs (Figure 8). Rate quotes were available for all of the routes directly serving Portland, Seattle, and Tacoma. Calculated rates were only necessary for movements serving Pasco, Boardman, and Spokane. Fuel surcharges varied from 4% to 12%, significantly affecting the quoted rate price, but 10% was the most commonly used surcharge. Because these surcharges vary over time, they add a degree of uncertainty to the rates. In past years, the fuel charge would have been non-existent across the entire region, whereas now it varies considerably.

<b>Figure 8: Truck Cost Calculation Matrix</b>	
<b>Trip Type</b>	<b>Rate</b>
Local Move	\$75
Under 100 miles round-trip	\$45/hour
Regular Chassis 100-225 miles round-trip	\$1.35/mile
Super Chassis 100-225 miles round-trip	\$1.55/mile
Regular Chassis 225+ miles round-trip	\$1.30/mile
Super Chassis 225+ miles round-trip	\$1.50/mile

When modeling truck/barge and truck/rail rates, total rate includes roundtrip throughput fee at upriver ports and inland rail terminals. Because this fee is charged only for those containers that change modes, it is appropriate to include in the rate for the truck barge moves. Throughput fees for rail were assumed to be included in quoted container rates for rail. This assumption was based on information provided by rail operators, and by others familiar with rail rates and practices. HDR included the published throughput fee for shipments by barge.

Where multiple rates are available, the lowest available rate is used. In cases where multiple rates exist for a specific corridor, the lowest rate was selected. This assumption was made for truck because, while many different firms may serve a particular route, some firms may have a competitive advantage in a specific corridor allowing them to substantially reduce rates. These carriers are likely to get the business for that specific corridor. In the case of rail and barge, this assumption may not be as appropriate, but differences between carriers are also not as pronounced.

Differences in delay times at export terminals are not specifically calculated into the rate model. Delays at export terminals add an additional cost to many container movements. Based on discussions with the Peer Review Panel, HDR assumed that terminal delays are figured into the rates quoted for delivery to each port. HDR employed the estimates of delivery time and distance described above to calculate rates where quoted rates were not available.

#### **4.3.2 Assumptions Related to Origin-Destination Data**

The Port of Portland collected origin, destination, and volume data to represent all of the containerized cargo generated within the capture area of the Port of Portland in terms of both

demand for imports, and production of exports. The Peer Review Panel reviewed the Port's assumptions in the same manner as all other assumptions incorporated into this analysis. The assumptions are as follows:

***Cargo generated by or destined for areas within Portland's capture area, but shipped through an alternative port was included in the analysis as if it was shipped via Portland except as noted below.*** A significant portion of the cargo generated within Portland's capture area is exported via the ports of Tacoma and Seattle. Even though this cargo does not use Portland's facilities directly, shippers benefit from the competition present in Portland. Where a competitive service exists in Portland, ocean carriers that do not call Portland often choose to compete for this cargo by offering the shipper a Portland bill of lading. As a result, the shipper benefits from Portland exactly as if the cargo was exported through Portland. Conversely, factors other than cost can result in cargo traveling from the Seattle or Tacoma capture areas for export via Portland. In all cases, the model calculates benefits based on the least cost destination with Portland as an option, and the least cost destination without Portland as an option. As a result, the model identifies no benefit for cargo generated outside of the Portland capture area, while cargo generated within the Portland capture area is included in the benefit analysis regardless of whether or not it actually travels through Portland.

***The cargo base was restricted to trade lanes in which Portland has substantial or direct service, i.e., Transpacific, Australia/New Zealand, Southern Europe, and South America. Container cargo in other trade lanes was excluded.*** The intent of this analysis is to calculate the benefit that Portland's container services provide shippers. Because Portland shippers exporting to other destinations cannot use Portland's services, they do not receive any direct benefits in reduced transportation costs, or indirect benefits from competition. Therefore this cargo cannot be included in the analysis.

***Where origin and destination data were found to be inconsistent or conflicting, the most logical data was used.*** For example, volume information obtained from third-party industry databases often differs from information obtained directly from shippers through interviews. In such cases, it is logical that the interview information derived from a specific client contact is more reliable than third-party database and, therefore, the interview data is used.

***Where calendar year 1999 data was unavailable, the most recent twelve-month period was used.*** The origin and destination data collected by the Port was derived from a number of different sources and no standardized time period information was available. The port used this assumption to most nearly approximate consistent 1999 calendar year data.

***Where origin, and destination information was unavailable, cargo was allocated to destinations based upon the known "market."*** In cases where the commodity type could be identified, but the origin or destination was unknown, the port allocated cargo to different locations based on the distribution of other shipments of the same commodity. For example, many commodities that are shipped through the Port of Portland are agricultural and their origins are closely tied to known production regions and processing facilities.

***Where cargo volumes were identified without commodity type or origin/destination information, benefits were calculated based on the average benefit per container.*** The Port of

Portland has very reliable data regarding the number of containers processed through its facility. Where discrepancies were identified between the number of containers indicated in the Port's data and the number of containers listed in PIERS and other data sources, the Port's numbers were used. Because no information was available as to the origins or destinations of this cargo, the average benefit per container was considered to be the benefit for all of this cargo. Because these benefits are identified with a lower degree of certainty than the model's other calculations, these benefits were calculated separately from the other results.

*Super chassis and standard chassis designation and 20' or 40' container size designation for each commodity are based upon how the commodity is drayed in normal conditions.* Whether a specific cargo travels on a super chassis or regular chassis can affect its routing and the overall calculation of benefit. The same can be said for container size. Because many commodities travel on both regular and super chassis and in different container lengths depending on shipment specific factors, there are no clear rules to dictate which type of chassis or container should be used in the model. The Port allocated the percentage of each shipment traveling in each container size and by each chassis type based on interviews with industry representatives from each commodity group.

*For imports destined for locations outside of the scope of the model, there is assumed to be no benefit as a result of Portland's container service.* The Port receives a small number of import containers that are destined for areas far removed from the Port's capture area. While there is clearly some reason why a shipper would unload an import in Portland bound for markets in other regions, this benefit is not quantified in the model.

*The origin used in the model was assumed to be the cargo's point of origin, not the location where it was loaded into a container.* For example, all of the softwood lumber exported through Portland was found to travel by flatbed or other mode to a transloading point before being loaded into containers for ocean shipment. In these cases, the point of origin for the cargo was used rather than the point where it was moved into a container. Because the model attempts to simulate the costs faced by shippers, this assumption seems a logical choice. This assumption affects approximately 9,000 containers accounting for \$4.36 million in benefits attributed to the Port. It is not known to what degree this benefit would change if the container loading point was used instead.

## **4.4 Data Collection**

The data collection process for this analysis was completed in two segments. Port of Portland staff completed an analysis of the origins and destinations of cargo generated within Portland's capture area. This collection effort included discussions with shippers, as well as discussions with ocean carriers and research using existing data sources. The information generated by this origin and destination study included the commodity type, volume, container size, typical chassis type, import/export classification, typical mode, and other information. HDR completed the second component of the data collection effort which included an analysis of rates for containers shipped by truck, barge, and rail from all of the origin and destination zones identified in Figure 6 above. This effort was conducted using published tariffs for barge, and interviews with transportation providers, shippers, freight forwarders, and ocean carriers for truck and barge.

#### **4.4.1 Origin and Destination Data**

The study identified origins and destinations for container cargo in the Portland market area. This cargo was distributed into two categories: direct and indirect. Direct cargo is the cargo shipped directly via the Terminal 6 container facility in Portland. Indirect cargo, also known as “leakage” cargo, is cargo originating from or destined for the Portland capture area that is shipped via ports other than Portland. The Portland capture area is generally defined as the area in which inland transportation rates favor Portland relative to other container ports.

Container cargo origin and destination data were gathered from four sources: the Journal of Commerce Port Import and Export Reporting Service (PIERS), industry interviews, company research, and Port of Portland sales and marketing staff. These four methods were used in conjunction with one another because none of these methods alone provides complete and accurate information.

To quantify the overall size of the market and provide commodity and shipper/consignee breakdowns, the study relied upon reports from PIERS. PIERS is a database of waterborne cargo shipments through United States ports. Some examples of the types of data that PIERS provide are shipper or consignee name, commodity type, container size, type and TEU count, port of discharge, and port of loading.

The PIERS reports were based on sets of criteria developed, tested, and refined by Port staff. The criteria for direct cargo searched for cargo loaded/discharged to and from vessels calling Portland. The import indirect cargo criteria searched for container cargo discharged from vessels calling alternative ports with consignees having a Portland, Southwest Washington, or Idaho address. Also included was cargo with Oregon-address notify parties, and cargo with Portland listed as customs clearance port. The export indirect cargo criteria looked for container cargo loaded on vessels calling alternative ports with shippers having a Portland, Southwest Washington, or Idaho address. Also included was cargo shipped via alternative ports where Oregon was listed as the state of origination on the export declaration. The resulting indirect cargo database was further refined by deleting shippers/consignees that meet the above criteria, but are known to have cargo origins/destinations outside the Portland market area.

PIERS’s limitation is that it does not accurately detail the origin or destination of the commodities that it tracks. PIERS does have a field that identifies the origin of commodities (“org\_des\_city”, “org\_des\_st”), but it is often inaccurate and frequently left blank. Another PIERS limitation is that companies can request to be placed on a “Restricted Name List”, thus masking the shipper/consignee name on the PIERS record. Another difficulty is that commodities are often shipped by freight forwarders, non-vessel owner operators, or trading companies and the identification of the true shipper or consignee is not possible. PIERS is useful, however, in providing accurate totals of box movements. PIERS reports were primarily used to identify the market size of each commodity category and to identify shippers and consignees and, where available, the origin and destination of the cargo.

Interviewing shippers, consignees, freight forwarders, and ocean carriers proved to be very useful for confirming information obtained through PIERS and in finding origin and destination information. These interviews were conducted with the promise that volume information would be kept confidential. The drawback found in interviewing shippers and consignees is that some were unaware of the amount of cargo actually being shipped through the Port of Portland because while often times their bill of lading or booking reads Portland, the cargo is actually shipped via alternative ports. Because many shippers contract directly with steamship lines or freight forwarders they are not aware from which port their cargo is shipped. Additionally, some shippers and consignees have a mix of domestic and international cargoes, making it difficult for them to accurately trace their volumes and in some cases origin and destination data. Lastly, many freight forwarders and trading companies were unwilling to provide the data needed as it was considered proprietary.

Researching companies or markets was useful in determining origins and destinations when companies or freight forwarders could not be reached and PIERS data was unavailable. Common sources included company web sites, press releases, and SEC filings.

Port sales and marketing staff have developed extensive origin and destination data on shippers throughout the region. This data has been stored in company files and is updated by staff as they call on shippers and consignees. This data served as another way to find origin and destination information not available in the PIERS system and provided a way to verify volume information.

Each of these four methods complemented one another by providing volume and or origin and destination information. These methods used alone provided fragments of the data; however, when used in conjunction with one another, they enabled staff to obtain both the volume and the origin and destination data and to confirm the validity of each data source.

The calendar year period of 1999 (or most recent twelve-month period) was used as a benchmark. Through interviews and PIERS data, volumes were determined based upon a 1999 calendar year period.

#### **4.4.2 Rate Information**

As noted previously, HDR generated the rate information used in the least-cost model through a series of phone interviews and through the use of published tariff sheets. Appendix D contains a list of the individuals contacted during the course of this effort. Rates selected were the most current rates available including all fuel surcharges and other “temporary” additional charges. Where rates could not be documented, HDR employed a GIS based network analysis to determine the driving time and mileage based on the shortest distance route. HDR completed this analysis using highway data from the 1998 North American Transportation Atlas published by the U.S. Department of Transportation’s Bureau of Transportation Statistics.

### **4.5 Technical and Expert Review**

Port of Portland technical staff reviewed HDR’s work throughout the development stages of this analysis. In addition, HDR submitted the data, assumptions, methodology, and

preliminary findings of this analysis for consideration by a four-member Peer Review Panel. The panel consisted of Gene Leverton of Leverton and Associates, Darwin Rutland of BTS Containers, and John Burgess and Frank Ainley formerly of American Presidential Lines. The Peer Review Panel accepted the analysis completed by HDR with few changes. A letter summarizing the Peer Review Panel's findings is included with this document as Appendix E.

## List of Appendices

Appendix A: Benefits Distributed by 2-digit Harmonized Code.

Appendix B: Benefits Distributed by County

Appendix C: Benefits Distributed by Origin/Destination Zone

Appendix D: List of Interviewees for Rate Analysis

Appendix E: Summary of Peer Review Panel Findings

## Appendix A: Benefits Distributed by 2-digit Harmonized Code.

Commodity	Shipping Cost with Portland	Shipping Cost w/o Portland	Benefit of Portland		
			Import	Export	Total
<b>Total</b>	<b>\$ 59,667,906</b>	<b>\$ 127,591,913</b>	<b>\$ 13,935,870</b>	<b>\$ 53,988,136</b>	<b>\$ 67,924,006</b>
Misc Grain,Seed,Fruit	\$ 12,141,306	\$ 30,074,559	\$ 131,776	\$ 17,801,476	\$ 17,933,252
Wood	\$ 9,400,964	\$ 20,563,015	\$ 3,899,124	\$ 7,262,927	\$ 11,162,051
Paper & Paperboard	\$ 8,436,377	\$ 16,847,882	\$ 127,280	\$ 8,284,226	\$ 8,411,505
Preserved Food	\$ 8,069,976	\$ 14,205,418	\$ 398,559	\$ 5,736,883	\$ 6,135,442
Wood Pulp, Waste Paper	\$ 3,123,375	\$ 8,135,965	\$ 19,442	\$ 4,993,148	\$ 5,012,589
Vegetables	\$ 3,615,658	\$ 6,875,092	\$ 37,449	\$ 3,221,984	\$ 3,259,433
Iron/Steel Products	\$ 676,506	\$ 1,853,871	\$ 712,116	\$ 465,248	\$ 1,177,364
Other Base Metals, Etc.	\$ 584,152	\$ 1,703,786	\$ 26,002	\$ 1,093,632	\$ 1,119,634
Machinery	\$ 1,145,847	\$ 2,241,859	\$ 933,063	\$ 162,949	\$ 1,096,012
Rubber	\$ 804,331	\$ 1,645,297	\$ 829,884	\$ 11,082	\$ 840,966
Electrical Machinery	\$ 486,239	\$ 1,286,389	\$ 747,323	\$ 52,827	\$ 800,150
Container Cargo, Misc.	\$ 528,394	\$ 1,301,121	\$ 772,727	\$ -	\$ 772,727
Hides And Skins	\$ 843,189	\$ 1,532,705	\$ 382	\$ 689,134	\$ 689,516
Plastic	\$ 434,789	\$ 1,067,011	\$ 250,952	\$ 381,269	\$ 632,222
Stone,Plastr,Cement,Etc	\$ 289,640	\$ 911,076	\$ 40,755	\$ 580,681	\$ 621,436
Vehicles, Not Railway	\$ 374,905	\$ 973,993	\$ 459,652	\$ 139,435	\$ 599,087
Furniture And Bedding	\$ 350,494	\$ 940,913	\$ 555,338	\$ 35,082	\$ 590,420
Footwear	\$ 403,895	\$ 963,022	\$ 559,127	\$ -	\$ 559,127
Toys And Sports Equipmt	\$ 321,322	\$ 852,755	\$ 468,000	\$ 63,434	\$ 531,434
General Merchandise	\$ 650,725	\$ 1,175,347	\$ 524,622	\$ -	\$ 524,622
Salt;Sulfur;Earth,Stone	\$ 541,445	\$ 1,024,965	\$ 59,711	\$ 423,809	\$ 483,520
Edible Fruit And Nuts	\$ 345,701	\$ 789,613	\$ 25,633	\$ 418,279	\$ 443,912
Meat	\$ 620,665	\$ 1,003,649	\$ 8,789	\$ 374,195	\$ 382,984
Knit Apparel	\$ 155,088	\$ 530,068	\$ 362,751	\$ 12,228	\$ 374,979
Milling;Malt;Starch	\$ 1,111,595	\$ 1,455,928	\$ 8,302	\$ 336,031	\$ 344,334
Miscellaneous Food	\$ 404,678	\$ 685,453	\$ 64,919	\$ 215,857	\$ 280,776
Inorg Chem;Rare Erth Mt	\$ 209,624	\$ 466,055	\$ 228,213	\$ 28,217	\$ 256,430
Ceramic Products	\$ 219,330	\$ 472,089	\$ 251,995	\$ 764	\$ 252,759
Special Other	\$ 170,068	\$ 366,348	\$ 37,369	\$ 158,911	\$ 196,280
Fish And Seafood	\$ 142,032	\$ 311,281	\$ 44,458	\$ 124,791	\$ 169,249
Beverages	\$ 287,394	\$ 454,388	\$ 87,939	\$ 79,056	\$ 166,995
Organic Chemicals	\$ 145,656	\$ 302,291	\$ 102,830	\$ 53,805	\$ 156,635
Dairy,Eggs,Honey,Etc	\$ 654,000	\$ 808,481	\$ 8,789	\$ 145,692	\$ 154,482
Glass And Glassware	\$ 109,197	\$ 248,099	\$ 99,160	\$ 39,742	\$ 138,902
Baking Related	\$ 85,197	\$ 223,032	\$ 9,171	\$ 128,664	\$ 137,835
Iron And Steel	\$ 69,681	\$ 192,135	\$ 85,567	\$ 36,887	\$ 122,454
Tool,Cutlry, Of Base Mtls	\$ 73,571	\$ 186,800	\$ 98,708	\$ 14,521	\$ 113,229
Cereals	\$ 67,521	\$ 176,441	\$ 38,949	\$ 69,971	\$ 108,920
Miscellaneous Manufact	\$ 71,639	\$ 171,945	\$ 42,152	\$ 58,154	\$ 100,306
Aluminum	\$ 60,045	\$ 141,188	\$ 46,368	\$ 34,774	\$ 81,142

Commodity	Shipping Cost with Portland	Shipping Cost w/o Portland	Benefit of Portland		
			Import	Export	Total
Soap,Wax,Et;Dental Prep	\$ 44,608	\$ 122,976	\$ 72,253	\$ 6,114	\$ 78,368
Misc Textile Articles	\$ 55,116	\$ 130,772	\$ 43,945	\$ 31,710	\$ 75,655
Leathr Art;Saddlry;Bags	\$ 47,047	\$ 111,546	\$ 64,498	\$ -	\$ 64,498
Copper+Articles Thereof	\$ 46,362	\$ 110,028	\$ 57,933	\$ 5,732	\$ 63,665
Misc. Chemical Products	\$ 72,807	\$ 136,029	\$ 28,683	\$ 34,538	\$ 63,222
Optic,Nt 8544;Med Instr	\$ 49,010	\$ 104,801	\$ 20,253	\$ 35,538	\$ 55,791
Tanning,Dye,Paint,Putty	\$ 24,784	\$ 59,442	\$ 1,529	\$ 33,130	\$ 34,659
Other Veg Textile Fiber	\$ 29,205	\$ 62,450	\$ 33,246	\$ -	\$ 33,246
Misc Art Of Base Metal	\$ 28,533	\$ 61,014	\$ 29,042	\$ 3,439	\$ 32,481
Headgear	\$ 24,196	\$ 56,456	\$ 32,260	\$ -	\$ 32,260
Straw,Esparto	\$ 19,553	\$ 50,574	\$ 31,021	\$ -	\$ 31,021
Prepared Meat,Fish,Etc	\$ 26,519	\$ 56,708	\$ 30,188	\$ -	\$ 30,188
Book+Newspapr;Manuscrpt	\$ 21,552	\$ 51,395	\$ 22,582	\$ 7,261	\$ 29,843
Mineral Fuel, Oil Etc	\$ 30,635	\$ 60,315	\$ 382	\$ 29,298	\$ 29,680
Food Waste; Animal Feed	\$ 14,846	\$ 42,861	\$ 28,015	\$ -	\$ 28,015
Photographic/Cinematogr	\$ 21,312	\$ 47,366	\$ 5,418	\$ 20,635	\$ 26,054
Wadding,Felt,Twine,Rope	\$ 15,441	\$ 41,017	\$ 23,666	\$ 1,911	\$ 25,577
Aircraft,Spacecraft	\$ 16,755	\$ 41,239	\$ 17,223	\$ 7,261	\$ 24,483
Sugars	\$ 693,927	\$ 718,152	\$ 1,146	\$ 23,078	\$ 24,225
Fats And Oils	\$ 21,148	\$ 45,223	\$ 22,164	\$ 1,911	\$ 24,074
Railway;Trf Sign Eq	\$ 11,612	\$ 34,742	\$ 23,130	\$ -	\$ 23,130
Cocoa	\$ 19,134	\$ 40,916	\$ 21,782	\$ -	\$ 21,782
Spices,Coffee And Tea	\$ 10,826	\$ 30,679	\$ 19,853	\$ -	\$ 19,853
Manmade Staple Fibers	\$ 12,420	\$ 26,559	\$ 14,139	\$ -	\$ 14,139
Artif Flowers,Feathers	\$ 11,749	\$ 25,124	\$ 13,375	\$ -	\$ 13,375
Umbrella,Wlk-Sticks,Etc	\$ 6,724	\$ 19,638	\$ 12,913	\$ -	\$ 12,913
Explosives	\$ 9,403	\$ 20,639	\$ 11,236	\$ -	\$ 11,236
Fertilizers	\$ 9,735	\$ 20,817	\$ 1,911	\$ 9,171	\$ 11,082
Musical Instruments	\$ 9,399	\$ 20,099	\$ 10,700	\$ -	\$ 10,700
Ships And Boats	\$ 6,714	\$ 14,356	\$ 3,821	\$ 3,821	\$ 7,643
Other	\$ 6,378	\$ 13,639	\$ 7,261	\$ -	\$ 7,261
Perfumery,Cosmetic,Etc	\$ 4,364	\$ 9,332	\$ 4,968	\$ -	\$ 4,968
Clocks And Watches	\$ 4,028	\$ 8,614	\$ 4,586	\$ -	\$ 4,586
Albumins;Mod Strch;Glue	\$ 3,357	\$ 7,178	\$ -	\$ 3,821	\$ 3,821
Animal Hair+Yarn,Fabrc	\$ 2,368	\$ 5,644	\$ 3,277	\$ -	\$ 3,277
Impregnatd Text Fabrics	\$ 2,685	\$ 5,743	\$ 3,057	\$ -	\$ 3,057
Pharmaceutical Products	\$ 2,069	\$ 5,021	\$ 2,953	\$ -	\$ 2,953
Textile Floor Coverings	\$ 1,343	\$ 2,871	\$ 1,529	\$ -	\$ 1,529
Live Trees And Plants	\$ 1,007	\$ 2,153	\$ 1,146	\$ -	\$ 1,146
Arms And Ammunition	\$ 671	\$ 1,436	\$ 764	\$ -	\$ 764
Cotton+Yarn,Fabric	\$ 671	\$ 1,436	\$ 764	\$ -	\$ 764
Precious Stones,Metals	\$ 671	\$ 1,436	\$ 764	\$ -	\$ 764
Spcl Woven Fabric,Etc	\$ 336	\$ 718	\$ 382	\$ -	\$ 382
Tin + Articles Thereof	\$ 336	\$ 718	\$ 382	\$ -	\$ 382
Zinc+Articles Thereof	\$ 336	\$ 718	\$ 382	\$ -	\$ 382

## Appendix B: Benefits Distributed by County

Inland Origin/Destination County	Shipping Cost with Portland	Shipping Cost w/o Portland	Benefits		
			Imports	Exports	Total
<b>Total</b>	<b>\$59,667,906</b>	<b>\$ 127,591,913</b>	<b>\$ 13,935,870</b>	<b>\$53,988,136</b>	<b>\$67,924,006</b>
<b>Oregon Total</b>	<b>\$34,250,319</b>	<b>\$ 87,173,650</b>	<b>\$ 11,173,386</b>	<b>\$41,749,946</b>	<b>\$ 52,923,331</b>
Baker, OR	\$ 184,190	\$ 320,938	\$ 8,844	\$ 127,904	\$ 136,748
Benton, OR	\$ 31,772	\$ 96,774	\$ 13,560	\$ 51,441	\$ 65,001
Clackamas, OR	\$ 2,187,803	\$ 6,015,635	\$ 2,466,390	\$ 1,361,442	\$ 3,827,832
Clatsop, OR	\$ 47,677	\$ 69,617	\$ 70	\$ 21,870	\$ 21,940
Columbia, OR	\$ 152,484	\$ 243,930	\$ 4,896	\$ 86,549	\$ 91,445
Coos, OR	\$ 222,887	\$ 325,131	\$ 454	\$ 101,790	\$ 102,244
Crook, OR	\$ 726,421	\$ 1,233,286	\$ 332,948	\$ 173,917	\$ 506,865
Deschutes, OR	\$ 348,626	\$ 719,435	\$ 209,385	\$ 161,425	\$ 370,809
Douglas, OR	\$ 695,095	\$ 1,252,324	\$ 4,850	\$ 552,380	\$ 557,230
Hood River, OR	\$ 2,995	\$ 9,954	\$ -	\$ 6,959	\$ 6,959
Jackson, OR	\$ 1,779,873	\$ 3,609,459	\$ 1,682,565	\$ 147,021	\$ 1,829,586
Jefferson, OR	\$ 179,322	\$ 375,616	\$ 80,884	\$ 115,410	\$ 196,294
Josephine, OR	\$ 2,442	\$ 4,807	\$ 247	\$ 2,118	\$ 2,365
Klamath, OR	\$ 546,446	\$ 773,613	\$ 202,373	\$ 24,794	\$ 227,167
Lane, OR	\$ 5,237,854	\$ 13,717,240	\$ 161,544	\$ 8,317,842	\$ 8,479,386
Lincoln, OR	\$ 30,672	\$ 72,128	\$ 1,763	\$ 39,693	\$ 41,456
Linn, OR	\$ 2,479,568	\$ 7,263,646	\$ 171,417	\$ 4,612,662	\$ 4,784,078
Malheur, OR	\$ 320,250	\$ 561,400	\$ -	\$ 241,150	\$ 241,150
Marion, OR	\$ 5,827,050	\$ 15,547,358	\$ 81,598	\$ 9,638,710	\$ 9,720,307
Morrow, OR	\$ 2,287,758	\$ 5,089,146	\$ 11,314	\$ 2,790,075	\$ 2,801,388
Multnomah, OR	\$ 4,689,955	\$ 14,619,268	\$ 4,894,650	\$ 5,034,663	\$ 9,929,313
Polk, OR	\$ 339,618	\$ 780,743	\$ -	\$ 441,125	\$ 441,125
Tillamook, OR	\$ 8,278	\$ 11,661	\$ -	\$ 3,383	\$ 3,383
Umatilla, OR	\$ 3,914,863	\$ 9,038,875	\$ 330	\$ 5,123,682	\$ 5,124,012
Union, OR	\$ 3,840	\$ 9,360	\$ 5,520	\$ -	\$ 5,520
Wasco, OR	\$ 41,669	\$ 117,582	\$ -	\$ 75,913	\$ 75,913
Washington, OR	\$ 1,200,579	\$ 3,267,340	\$ 832,207	\$ 1,234,555	\$ 2,066,762
Yamhill, OR	\$ 760,330	\$ 2,027,383	\$ 5,578	\$ 1,261,474	\$ 1,267,052
<b>Washington Total</b>	<b>\$11,824,270</b>	<b>\$ 17,229,566</b>	<b>\$ 546,448</b>	<b>\$ 4,858,848</b>	<b>\$ 5,405,296</b>
Adams, WA	\$ 7,619	\$ 9,328	\$ -	\$ 1,710	\$ 1,710
Benton, WA	\$ 529,023	\$ 910,053	\$ -	\$ 381,029	\$ 381,029
Chelan, WA	\$ 975	\$ 975	\$ -	\$ -	\$ -
Clark, WA	\$ 407,013	\$ 1,169,142	\$ 484,804	\$ 277,324	\$ 762,128
Cowlitz, WA	\$ 4,353,624	\$ 5,375,890	\$ 50,627	\$ 971,638	\$ 1,022,266
Franklin, WA	\$ 2,038,582	\$ 3,439,345	\$ 8,192	\$ 1,392,571	\$ 1,400,763
Grant, WA	\$ 368,552	\$ 369,076	\$ -	\$ 524	\$ 524
Grays Harbor, WA	\$ 2,156	\$ 2,156	\$ -	\$ -	\$ -
King, WA	\$ 532,262	\$ 532,262	\$ -	\$ -	\$ -
Kitsap, WA	\$ 539	\$ 539	\$ -	\$ -	\$ -
Kittitas, WA	\$ 6,678	\$ 6,678	\$ -	\$ -	\$ -
Klickitat, WA	\$ 685	\$ 2,118	\$ 1,433	\$ -	\$ 1,433

Inland Origin/Destination County	Shipping Cost with Portland	Shipping Cost w/o Portland	Benefits		
			Imports	Exports	Total
Lewis, WA	\$ 860,205	\$ 860,205	\$ -	\$ -	\$ -
Pacific, WA	\$ -	\$ -	\$ -	\$ -	\$ -
Pierce, WA	\$ 12,952	\$ 12,952	\$ -	\$ -	\$ -
Skagit, WA	\$ 3,896	\$ 3,896	\$ -	\$ -	\$ -
Snohomish, WA	\$ 12,356	\$ 12,356	\$ -	\$ -	\$ -
Spokane, WA	\$ 9,870	\$ 14,479	\$ 1,391	\$ 3,218	\$ 4,609
Thurston, WA	\$ 7,825	\$ 7,825	\$ -	\$ -	\$ -
Walla Walla, WA	\$ 1,168,380	\$ 1,743,630	\$ -	\$ 575,250	\$ 575,250
Whatcom, WA	\$ 5,119	\$ 5,119	\$ -	\$ -	\$ -
Whitman, WA	\$ 1,024,004	\$ 2,188,448	\$ -	\$ 1,164,444	\$ 1,164,444
Yakima, WA	\$ 471,956	\$ 563,096	\$ -	\$ 91,140	\$ 91,140
<b>Idaho Total</b>	<b>\$ 9,633,454</b>	<b>\$ 14,726,590</b>	<b>\$ 534,270</b>	<b>\$ 4,558,865</b>	<b>\$ 5,093,136</b>
Ada, ID	\$ 661,226	\$ 760,477	\$ 14,525	\$ 84,727	\$ 99,252
Bannock, ID	\$ 10,481	\$ 10,481	\$ -	\$ -	\$ -
Bingham, ID	\$ 362,340	\$ 362,340	\$ -	\$ -	\$ -
Blaine, ID	\$ 1,245	\$ 1,446	\$ 201	\$ -	\$ 201
Bonner, ID	\$ 9,063	\$ 11,804	\$ -	\$ 2,741	\$ 2,741
Bonneville, ID	\$ 11,978	\$ 11,978	\$ -	\$ -	\$ -
Canyon, ID	\$ 1,824,114	\$ 2,085,814	\$ 50,543	\$ 211,157	\$ 261,700
Cassia, ID	\$ 3,483	\$ 3,535	\$ 17	\$ 34	\$ 52
Gooding, ID	\$ 709,371	\$ 719,869	\$ -	\$ 10,498	\$ 10,498
Jefferson, ID	\$ 311,637	\$ 311,637	\$ -	\$ -	\$ -
Jerome, ID	\$ 26,511	\$ 27,806	\$ -	\$ 1,295	\$ 1,295
Kootenai, ID	\$ 40,250	\$ 52,458	\$ 372	\$ 11,836	\$ 12,208
Latah, ID	\$ 83,616	\$ 272,094	\$ 4,890	\$ 183,588	\$ 188,478
Madison, ID	\$ 72,024	\$ 72,024	\$ -	\$ -	\$ -
Nez Perce, ID	\$ 2,406,055	\$ 6,066,249	\$ -	\$ 3,660,194	\$ 3,660,194
Payette, ID	\$ 427,450	\$ 891,005	\$ 463,555	\$ -	\$ 463,555
Power, ID	\$ 101,080	\$ 101,080	\$ -	\$ -	\$ -
Shoshone, ID	\$ 4,451	\$ 5,860	\$ -	\$ 1,409	\$ 1,409
Twin Falls, ID	\$ 2,567,080	\$ 2,958,634	\$ 169	\$ 391,385	\$ 391,554
<b>Montana Total</b>	<b>\$ 8,516</b>	<b>\$ 12,675</b>	<b>\$ -</b>	<b>\$ 4,159</b>	<b>\$ 4,159</b>
Missoula, MT	\$ 8,516	\$ 12,675	\$ -	\$ 4,159	\$ 4,159
Silver Bow, MT	\$ -	\$ -	\$ -	\$ -	\$ -
<b>Unknown</b>	<b>\$ 3,951,347</b>	<b>\$ 8,449,432</b>	<b>\$ 1,681,766</b>	<b>\$ 2,816,318</b>	<b>\$ 4,498,085</b>

## Appendix C: Benefits Distributed by Origin/Destination Zone

Summary by Inland Origin/Destination Region	Shipping Cost with Portland	Shipping Cost w/o Portland	Benefit		
			Imports	Exports	Total
<b>Total</b>	<b>\$ 59,667,906</b>	<b>\$ 127,591,913</b>	<b>\$13,935,870</b>	<b>\$53,988,136</b>	<b>\$ 67,924,006</b>
Portland Middle	\$ 5,728,307	\$ 17,657,253	\$ 5,949,268	\$ 5,979,678	\$ 11,928,946
Eugene/Springfield/Cottage Grove	\$ 6,925,890	\$ 18,478,154	\$ 172,026	\$11,380,238	\$ 11,552,264
Boardman/Umatilla	\$ 6,032,138	\$ 13,775,949	\$ 11,314	\$ 7,732,498	\$ 7,743,811
Aurora/McMinnville	\$ 3,982,012	\$ 10,839,741	\$ 14,091	\$ 6,843,638	\$ 6,857,729
Salem/Silverton	\$ 2,551,502	\$ 6,494,765	\$ 70,515	\$ 3,872,747	\$ 3,943,263
Lewiston	\$ 2,489,671	\$ 6,338,343	\$ 4,890	\$ 3,843,783	\$ 3,848,672
Portland Outer	\$ 1,971,187	\$ 4,834,892	\$ 1,463,999	\$ 1,399,707	\$ 2,863,705
Albany/Corvallis/Tangent/Jefferson	\$ 1,231,693	\$ 3,773,147	\$ 177,064	\$ 2,364,389	\$ 2,541,453
Medford/Ashland/White City	\$ 1,779,873	\$ 3,609,459	\$ 1,682,565	\$ 147,021	\$ 1,829,586
Pasco/Richland/Kennewick	\$ 2,180,722	\$ 3,922,619	\$ 17,036	\$ 1,724,861	\$ 1,741,898
Portland Inner	\$ 464,924	\$ 1,734,851	\$ 1,269,447	\$ 479	\$ 1,269,927
Colfax	\$ 1,024,004	\$ 2,188,448	\$ -	\$ 1,164,444	\$ 1,164,444
Longview	\$ 4,301,902	\$ 5,301,342	\$ 49,984	\$ 949,456	\$ 999,440
Walla Walla	\$ 1,310,465	\$ 2,035,477	\$ -	\$ 725,012	\$ 725,012
Roseburg	\$ 695,095	\$ 1,252,324	\$ 4,850	\$ 552,380	\$ 557,230
Prineville	\$ 726,421	\$ 1,233,286	\$ 332,948	\$ 173,917	\$ 506,865
Fruitland	\$ 427,450	\$ 891,005	\$ 463,555	\$ -	\$ 463,555
Willamina	\$ 345,733	\$ 786,126	\$ -	\$ 440,393	\$ 440,393
Twin Falls	\$ 3,307,690	\$ 3,711,289	\$ 387	\$ 403,212	\$ 403,599
Boise/Nampa	\$ 2,485,340	\$ 2,846,291	\$ 65,067	\$ 295,884	\$ 360,951
Vale/Ontario	\$ 320,250	\$ 561,400	\$ -	\$ 241,150	\$ 241,150
Bend	\$ 232,331	\$ 468,875	\$ 89,742	\$ 146,802	\$ 236,544
Klamath Falls	\$ 546,446	\$ 773,613	\$ 202,373	\$ 24,794	\$ 227,167
Madras	\$ 179,322	\$ 375,616	\$ 80,884	\$ 115,410	\$ 196,294
Connell	\$ 569,100	\$ 763,136	\$ -	\$ 194,036	\$ 194,036
Redmond	\$ 116,295	\$ 250,560	\$ 119,643	\$ 14,622	\$ 134,265
Coos Bay/ S. Oregon Coast	\$ 222,887	\$ 325,131	\$ 454	\$ 101,790	\$ 102,244
Sunnyside	\$ 425,753	\$ 519,170	\$ -	\$ 93,416	\$ 93,416
The Dalles	\$ 41,669	\$ 117,582	\$ -	\$ 75,913	\$ 75,913
Newport	\$ 30,672	\$ 72,128	\$ 1,763	\$ 39,693	\$ 41,456
Clatskanie	\$ 112,778	\$ 149,529	\$ 233	\$ 36,518	\$ 36,751
Astoria/ N. Oregon Coast	\$ 55,956	\$ 81,279	\$ 70	\$ 25,253	\$ 25,323
Kalama	\$ 51,332	\$ 73,925	\$ 411	\$ 22,182	\$ 22,593
Spokane	\$ 63,633	\$ 84,600	\$ 1,763	\$ 19,204	\$ 20,967
Pendleton/Pilot Rock	\$ 11,319	\$ 23,476	\$ 330	\$ 11,827	\$ 12,157
Hood River/Cascade Locks	\$ 3,680	\$ 12,072	\$ 1,433	\$ 6,959	\$ 8,393
La Grande	\$ 3,840	\$ 9,360	\$ 5,520	\$ -	\$ 5,520
Missoula	\$ 8,516	\$ 12,675	\$ -	\$ 4,159	\$ 4,159
Grants Pass	\$ 2,442	\$ 4,807	\$ 247	\$ 2,118	\$ 2,365
Othello	\$ 7,619	\$ 9,328	\$ -	\$ 1,710	\$ 1,710
Moses Lake	\$ 1,050	\$ 1,574	\$ -	\$ 524	\$ 524
Vader/Castle Rock/Winlock	\$ 391	\$ 623	\$ 233	\$ -	\$ 233

Summary by Inland Origin/Destination Region	Shipping Cost with Portland	Shipping Cost w/o Portland	Benefit		
			Imports	Exports	Total
Idaho Falls/Pocatello	\$ 869,540	\$ 869,540	\$ -	\$ -	\$ -
Quincy	\$ 368,476	\$ 368,476	\$ -	\$ -	\$ -
Ellensburg	\$ 71,934	\$ 71,934	\$ -	\$ -	\$ -
Salt Lake City	\$ -	\$ -	\$ -	\$ -	\$ -
Oakland	\$ -	\$ -	\$ -	\$ -	\$ -
Long Beach	\$ -	\$ -	\$ -	\$ -	\$ -
Puget Sound	\$ 577,104	\$ 577,104	\$ -	\$ -	\$ -
Centralia/Chehalis	\$ 860,205	\$ 860,205	\$ -	\$ -	\$ -
Unknown	\$ 3,951,347	\$ 8,449,432	\$ 1,681,766	\$ 2,816,318	\$ 4,498,085

## Appendix D: List of Interviewees for Rate Analysis

HDR conducted a lengthy interview process to develop the rate information included in the least-cost model. While several of the individuals contacted did not provide actual rate information, all contributed to the success of the rate matrix as a whole by sharing their knowledge of the transportation industry. Figure C-1 provides the names and company names of the individuals contacted in association with this study.

<b>Figure C-1: Names and Companies of Individuals Interviewed for Rate Information</b>	
John Faulk, Oregon Trucking Association	Ed, T.R. Compton
Jerry Grossnickle, Bernert Barge Lines	Randy Ford, Apex Containers
Greg Solar, Foss Maritime	Del Allen, Allports
Linda Carr, Tidewater Barge Lines	Jim Toomey, Port of Pasco
Doug Walters, T&G Trucking	Gary Neal, Port of Morrow
Bill Stewart, Willamette Traffic Bureau	Kim Puzey, Port of Umatilla
Annette, T&G Trucking	Dave Doeringsfeld, Port of Lewiston
Todd Farm, Port of Portland	Burt Ewers, Inland Empire Distribution
John Akre, Port of Portland	Tom Stephenson Inland Empire Distribution
Bob Lipscomb, Port of Portland	Bob Race, Inland Empire Distribution
Craig Levie, Port of Portland	Kurt Reichelt, HDR Engineering
Darwin Rutland, BTS Containers	Micky McMaster, Zen-noh
Tom Jackson, Western Ports Transportation	Link Transportation
Steve Wilson, Western Ports Transportation	Mike, Truck Express
Sonny Burris, Coastal Container Services	Jason Speck, Speck Transportation
Kathy, Coastal Container Services	Marty Gibbs, Swift Transportation
Walt Record, Record Transportation	Greg, IDEAL
Bobby Joe, Swift Transportation	Gerke & Sons
Kevin, Garcia Transport	Gary Cardwell, NW Container Service
Service Transport	Diane, Tidewater Terminal at Pasco
Gator Intermodal	Phase II Transportation
Frank Trabato, Eagle Systems	Robert Jimerson, Jeld-Wen
Schrock Trucking	Dennis Oden, Jeld-Wen
John Sullivan, Mitchell Brothers	Gloria Grayson, Jeld-Wen
Marianne, R&R Transport	Michael, Topflight
Panabulk America	Theresa, Yangming Line
Dana Parr, CSX Transportation	Dan Wyatt, Atlantic Pacific
Kevin Niles, US Shippers	Nancy, TRG
Dan Wadley, US Shippers	Josh Gruen, PRTI
Greg Papnorth, US Shippers	Richard, Keep on Trucking

# **Appendix E: Summary of Peer Review Panel Findings**

November 16, 2000

To: Chris Fowler, HDR Engineering  
From: Peer Review Panel

### **Peer Review Panel Discussion of Port of Portland Transportation Cost Analysis**

The Peer Review Panel consists of the following members:

Gene Leverton, Leverton and Associates

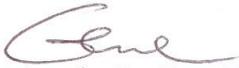
Darwin Rutland, BTS Container Service

John Burgess and Frank Hainley, Transolve LLP

The panel met on November 9 at the Port of Portland office for a presentation and discussion of technical memorandums describing assumptions on cargo origin/destinations, methodology for transportation rate analysis, and assumptions incorporated into the rate analysis.

The Peer Review Panel made several recommendations, including encouragement to clarify terms used, such as one-way versus two-way rates. The more accurate terminology and methodology combines the one-way loaded rate with the cost of positioning the empty container at the shipper's plant. For clarity, we encourage using this methodology for all traffic lanes and to avoid trying to calibrate each trade lane based on potential back-haul cargo. The Peer Panel recommends including time plus mileage in calculating the truck rates used in the least-cost analysis. Mileage can greatly underestimate the cost of transporting freight because it does not include traffic congestion or port clearance delays that increase the costs of certain trade lanes.

The peer panel concluded that the least-cost transportation methodology and assumptions are reasonably accurate and descriptive of the market. Additionally, it was agreed that this approach is very conservative, representing the minimum contribution of the Port of Portland to shippers.

Sincerely,   
Gene Leverton, for the Peer Panel

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