THE LOCAL AND REGIONAL ECONOMIC IMPACTS OF THE PORTLAND HARBOR, 2015

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EXECUTIVE SUMMARY

The Portland Harbor consists of public marine terminals owned by the Port of Portland and private marine terminals. The Port of Portland's public marine terminals include Terminal 6, which is the primary ocean container terminal on the Columbia River; Terminal 2, which handles break bulk, bulk products and steel rail; Terminal 4, which handles bulk products, as well as break bulk cargoes and automobiles; and Terminal 5, which handles grain and mineral bulks. Automobiles and break bulk are also handled at Terminal 6. Private marine terminals within the Portland Harbor handle grain, petroleum products and dry bulk cargoes such as cement, urea and aggregates. In fiscal year 2015, these public and private marine terminals in the Portland Harbor handled nearly 21.3 million tons of cargo for exporters and importers located within the metropolitan region, the state of Oregon, as well as throughout the Pacific Northwest and the United States. The purpose of this study, conducted by Martin Associates, is to quantify the regional economic impacts generated by the cargo and vessel activity at these marine terminals.

In fiscal year 2015, 14,057 jobs in the Portland metropolitan region and the states of Oregon and Washington were generated by activity in the Portland Harbor. Of the 14,057 jobs:

- 5,199 are **direct** jobs, in that these jobs are generated by activities at the Port, and if such activities should cease, these jobs would be discontinued over the short term. It is these jobs that are most directly dependent upon the vessel and cargo activity in the Portland Harbor. These jobs are with the International Longshore and Warehouse Union, terminal operators, stevedores, trucking firms, railroads, steamship agents, freight forwarders and customhouse brokers, warehousemen, federal government agencies, towing companies, pilot organizations, and marine construction companies. Seventy-two percent of these jobs are held by residents of the Portland metropolitan region, as defined by the counties of Multnomah, Clark, Washington, Clackamas and Skamania. Fifty-four percent of the direct jobs are held by residents of Multnomah and Clark counties. Activity at the Port of Portland's public marine terminals created slightly more than 50 percent of the direct jobs.

- 5,551 are **induced** jobs, or those jobs supported by the local purchases made by the 5,199 individuals holding the direct jobs due to port activity. Should the direct jobs be lost from the economy, the induced jobs would also be lost. These jobs are with local grocery stores, retail outlets, restaurants, transportation services, local government services, schools, hospitals, etc.

- The firms dependent upon the marine activity in the Portland Harbor made $355.0 million of local purchases for office supplies, equipment, utilities, communications, maintenance and repair services, transportation services, professional services, and goods and services. These purchases supported 3,306 **indirect** jobs in the Portland metropolitan economy.

Businesses providing maritime services in the Portland Harbor received nearly $1.1 billion of direct business revenue. The $1.1 billion of revenue received by the businesses providing the services in the Portland Harbor does not include the value of the cargo moving over the marine terminals, since the value of the cargo is determined by the demand for the cargo, not the use of the marine terminals.

Marine activity also created nearly $1.2 billion of direct, induced and indirect personal wage and salary income and local consumption expenditures for Portland metropolitan area residents. The consumption expenditures are a part of the direct multiplier effect, and measure the local consumption expenditures by those directly employed. The consumption expenditures support the induced jobs. The 5,199 direct job holders received $294.9 million of direct wage and salary income, for an average salary of $56,710.

A total of $111.1 million of state and local tax revenue was generated by maritime activity in the Portland Harbor in fiscal year 2015.

For the most part, the same methodology has been used to estimate the 2015 economic impact study as was used to estimate the impacts for the Port of Portland in 2011. Therefore, the study results can be directly compared with those of the earlier study, which measured the impacts of activity in calendar year 2011. Since the 2011 study, the Port has experienced a loss of 3.5 million tons. While significant increases in cement, aggregates and soda ash were recorded since 2011, these gains were offset by major tonnage losses in grain, containerized cargo, steel slab, ferrous scrap and petroleum products.

The loss of 1.2 million tons of grain exports at the Portland Harbor is a the result of closing of the Louis Dreyfus Grain Elevator in 2014 for capital upgrades and the addition of new elevator capacity that was added at other ports on the Columbia River since 2011. This new capacity on the Columbia River captured grain that had previously moved via the older existing Columbia River elevators, as well as elevators in other Pacific Northwest Ports, as reflected by the fact that the Columbia River elevators' share of grain exports from all Pacific Northwest ports increased from 65% in 2011 to 77% in 2014.

The loss of more than 1 million tons of containerized cargo handled at the Port of Portland (a 50% reduction since 2011), not only reflects the discontinuation of containerized cargo service by Hanjin Shipping Company and Hapag-Lloyd at the Port of Portland, but also the overall stagnant container market in the U.S. Pacific Northwest. For example, containerized cargo at the Northwest Seaport Alliance (which is the newly formed alliance of the Ports of Seattle and Tacoma) has declined by 2% between 2011 and 2014. In contrast, containerized cargo throughput at the Canadian port of Metro Vancouver, BC increased by 16% over this same period and containerized cargo at the Port of Prince Rupert grew by more than 50%.[1] The overall decline in containerized activity at the U.S. Pacific

[1] American Association of Port Authorities, "Containerized Traffic Statistics", 2015

Northwest ports between 2011 and 2014 compared to the growth in container activity at the Canadian West Coast ports also reflects the congestion issues and works slowdowns that occurred at the U.S. West Coast ports during the contract negotiations between the International Longshore and Warehouse Union (ILWU) and the Pacific Maritime Association (PMA) in 2014. Due to the resulting congestion issues at the U.S. West Coast ports during 2014 and early 2015, containerized cargo was diverted to Canadian West Coast ports as well as to ports on the U.S. Atlantic and Gulf coasts.

The loss of 729,000 tons of slab imports reflects the use of other non-Portland Harbor marine terminals to serve a local manufacturer.

Ferrous scrap exports at the Port of Portland Harbor marine terminals fell by 982,000 tons. This can be traced to the fact the that the overall world market demand for export ferrous scrap has fallen significantly since 2011, and as of October, 2015, the export price for scrap was reported by Recycling International to be the lowest price in 11 years. [2] This declining world market demand for scrap is also reflected in the fact that overall international scrap exports from all Pacific Northwest ports fell from 2.3 million tons in 2011 to 1.3 million tons in 2014.[3]

The loss in petroleum traffic at the Port of Portland is a result of the overall decline in petroleum products moving by water at Pacific Northwest ports. As reported by USA Trade On-Line, in 2011, a total of 6.4 million tons of petroleum and petroleum products were imported into the Pacific Northwest marine terminals compared to 4.2 million tons in 2014.[4] In addition, the share of petroleum products received and shipped by pipeline (primarily the Olympic Pipeline), has increased with the resumption of full capacity utilization of the pipeline following the 1999 pipeline explosion in Bellingham.

As a result of the contracting tonnage base since 2011, direct jobs generated by the Portland Harbor marine terminals fell by 2,075 jobs and business revenue decreased by $451.7 million since 2011. Despite this loss of tonnage and dependent jobs, the Port remains a key economic generator in the region, supporting more than 14,000 jobs. To regain the Port's previous level of economic activity, it will be necessary to expand current markets, and identify new cargo markets in which the Port of Portland Harbor marine terminals can compete. This will require aggressive marketing by the Port, as well as possible market driven facilities investments.

[2] "Recycling International", October 19, 2015

[3] USA Trade On-Line, U.S. Bureau of the Census

[4] USA Trade On-Line provides data only for foreign imports and exports of crude petroleum and petroleum products and does not include domestic shipments and receipts. The U.S. Army Corps of Engineers (USACE) does provide tonnage data for domestic shipment and receipt of petroleum products, but 2014 data is not available at this time. Using the USACE data for the period 2010-2013 for the Columbia River only, the combined domestic and international shipment and receipt of petroleum products has declined from 5.4 million tons in 2010 to 4.9 million tons in 2013.

I. OVERVIEW OF THE ANALYSIS AND SUMMARY OF RESULTS

Martin Associates was retained by the Port of Portland to measure the local and regional economic impacts generated by maritime activity at the Port of Portland. This study focuses on impacts generated by marine cargo handled at private and public marine facilities in the harbor area of the Port of Portland. Impacts are estimated in terms of jobs, personal earnings, business revenue, and state and local taxes. The impacts are estimated for marine cargo activity in fiscal year 2015. In addition to the baseline impact estimates, a computer model specific to the Port of Portland has been prepared which can be used in evaluating the sensitivity of impacts to changes in tonnage, labor productivity, labor work rules, commodity mix, inland origins/destinations of commodities and vessel size. The model can also be used to evaluate the impacts of new terminal development and for annual updates.

This analysis is an update of the 2011 economic impact analysis of the Port of Portland, also conducted by Martin Associates. The methodology used in this analysis has been used by Martin Associates on over 500 economic impact studies to estimate the economic impacts of seaport activity at United States and Canadian ports, including:

- *Seattle*
- *Tacoma*
- *Longview*
- *Vancouver, BC*
- *Vancouver, WA*
- *Los Angeles*
- *San Diego*
- *Long Beach*
- *Oakland*
- *Sacramento*
- *Houston*
- *Texas City*
- *Freeport, TX*
- *Beaumont/Port Arthur, TX*
- *Victoria, TX*
- *Port Lavaca/Point Comfort, TX*
- *Corpus Christi*
- *Baton Rouge*
- *New Orleans*
- *Gulfport*
- *Miami*
- *Port Everglades*
- *Jacksonville*
- *Tampa*
- *Palm Beach*
- *Port Canaveral*
- *Wilmington, NC*
- *Morehead City, NC*
- *Baltimore*
- *Philadelphia*
- *Wilmington, DE*
- *Boston*
- *Montreal*
- *Halifax*
- *32 US and Canadian Great Lakes Ports*

This chapter presents an overview of the economic impact analysis by defining the following:

- The types of economic impacts estimated;
- The economic sectors for which impacts have been estimated; and
- The commodities/commodity types for which impacts have been estimated.

In addition, a summary of the data sources used in the analysis is presented.

1. ECONOMIC IMPACT STRUCTURE

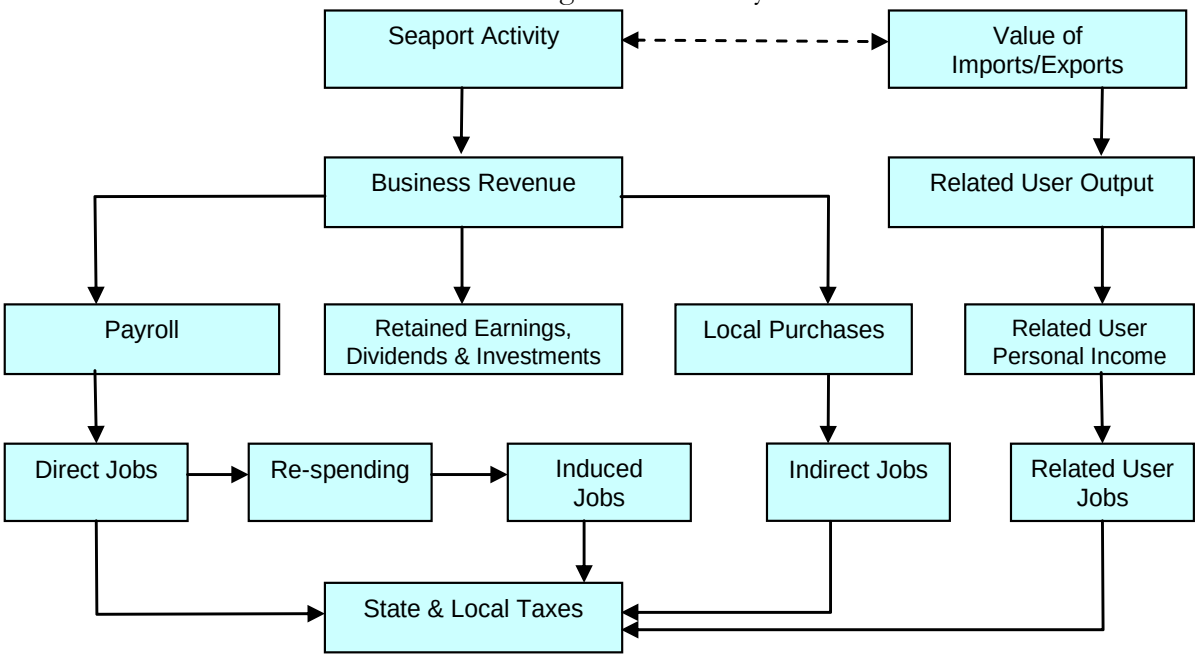
A deep water port such as Portland contributes to the local, regional, and national economies by providing employment and income to individuals, tax revenues to local and state governments, customs fees to the federal government, and revenue to businesses engaged in handling, shipping, and receiving cargo via the port. Exhibit 1 illustrates the flows of economic impacts throughout the economy. As this exhibit shows, activity at a seaport (i.e., the handling of cargo and the servicing of vessels) initially creates business revenue to firms providing those cargo handling and vessel services. This revenue is in turn used for several purposes:

- To hire employees to provide the services;
- To pay stockholders dividends, retire debt, and invest;
- To buy goods from other firms; and
- To pay federal, state, and local taxes.

The hiring of employees generates personal income. This personal income is spent throughout the local, state and national economy to purchase goods and services. This re-spending of income is known as the multiplier effect, which in turn creates induced jobs throughout the economy. Finally, state and local taxes are paid by those employed due to port activity.

As can be seen from Exhibit 1, and the previous discussion, the flow of economic impacts throughout an economy creates four separate and non-additive types of impacts.

Exhibit 1
Flows of Economic Activity
Through the Economy



These four types of impacts are:

- Employment Impact - the number of full-time equivalent jobs generated by activity at the public and private marine terminals in the Portland Harbor. This consists of jobs directly generated by port activity as well as induced jobs, or jobs created in-state due to the purchase of goods and services by those individuals directly dependent upon port activity. In addition, indirect jobs, or those jobs generated in the local economy due to the local purchases of goods and services by firms directly dependent upon maritime activity in the Portland Harbor are also measured as part of the employment impact;

- Personal Income Impact - the level of payroll/earnings associated with the jobs created by port activity, and adjusted to reflect re-spending throughout the economy;

- Revenue Impact - the sales generated by firms engaged in handling and transporting cargo through the Portland Harbor. This impact includes national as well as local and state revenue. The value of shipments through the Port is not included as a revenue impact for the purpose of this analysis; and

- Tax Impacts - the state and local tax revenues generated by port activity. These are taxes paid by individuals and firms directly dependent upon the maritime activity.

In addition, the direct, induced and indirect impacts also support activity with regional exporters and importers using the Port of Portland's marine terminals. These impacts are classified as ***related user impacts*** in that the exporters and importers using the marine terminals can and do use other ports for the shipment and receipt of cargo. The influenced impacts measure the impact, or influence, of the Port's marine terminals at a given point in time, and if the Port's terminals were no longer used, these influenced users would use other ports to export and import cargo. Unlike the direct, induced, and indirect impacts, the related impacts would not necessarily be dislocated from the economy – instead, the impacts would no longer be influenced by the Port of Portland, but by another port.

Portland Harbor generates economic activity in various business sectors of the state and local economy. The following economic sectors are involved in providing cargo and vessel handling services at the Port of Portland. These are the:

- Surface Transportation Sector;
- Maritime Service Sector;
- Shippers/Consignees using the Port;
- Marine and Navigation Divisions of the Port of Portland; and
- Banking/Insurance/Law Sector.

Within each sector, various participants are involved. Separate impacts are estimated for each of the participants. A discussion of each of the economic impact sectors is provided below, including a description of the major participants in each sector.

(1) The Surface Transportation Sector

The surface transportation sector consists of both the railroad and trucking industries. These sectors are responsible for moving the various cargoes between the Port and their inland origins and destinations. In general, the railroads are more heavily involved in moving grain, automobiles, soda ash and potash to and from the Port.

Many local and national trucking firms serve the marine terminals in the Portland Harbor, as do numerous individual owner-operators. The trucking industry's major involvement is in moving containers, steel, cement and aggregates, and petroleum for local distribution.

Barge transportation is also a key component in moving cargo to and from the Port of Portland, and is included in the maritime services sector, which follows.

(2) The Maritime Service Sector

This sector consists of numerous firms and participants performing functions related to the following maritime services:

- Cargo Marine Transportation;
- Vessel Operations;
- Cargo Handling;
- Linehaul Barge Operators on the Columbia and Snake River System; and
- Federal, State, and Local Government Agencies.

A brief description of the major participants in each of these five sub-categories is provided below:

- Cargo Marine Transportation - Participants in this category are involved in arranging for inland and water transportation for export or import freight through the Port of Portland. The freight forwarder/customhouse broker is the major participant in this category. The freight forwarder/customhouse broker arranges for the freight to be delivered between the marine terminals and inland destinations, as well as the ocean transportation. This function performed by freight forwarders and customhouse brokers is most prevalent for containerized cargo and general cargo commodities. Bulk cargo arrangements are often made by the shipper/receiver.

- Vessel Operations - This category consists of several participants. The steamship agents provide a number of services for the vessel as soon as it enters the Port; the agents arrange for pilot services and towing, for medical and dental care of the crew, and for ship supplies. The agents are also responsible for vessel documentation. In addition to the steamship agents arranging for vessel services, those providing the services include:

  - Chandlers - supply the vessels with ship supplies (food, clothing, nautical equipment, etc.);

  - Pilots - provide navigation services to ensure safe transit of vessels between the harbor entrance and docks and along the Columbia River transit;

  - Towing firms - provide the tug service to guide the vessel to and from port;

  - Bunkering firms - provide fuel to the vessels;

  - Marine surveyors - inspect the vessels and the cargo;

- Launch services - provide transportation for the crew between land and vessel;

- Shipyards/marine construction firms - provide emergency or scheduled repairs, as well as marine pier construction and dredging. Also included in this category are one-time impacts generated by the construction of marine facilities.

- Cargo Handling - this category involves the physical handling of the cargo at the marine terminals between the land and the vessel. Included in this category are the following participants:

  - Longshoremen - are members of the International Longshore and Warehouse Union, and are involved in the loading and unloading of cargo from the vessels, as well as handling the cargo prior to loading and after unloading;

  - Stevedoring firms - manage the longshoremen and cargo-handling activities;

  - Terminal operators - are often stevedoring firms who operate the marine terminals where cargo is loaded and off-loaded;

  - Warehouse operators - store cargo after discharge or prior to loading and consolidate cargo units into shipment lots;

  - Container leasing and repair firms - provide containers to steamship lines and shippers/consignees and repair damaged containers;

  - Container consolidators - consolidate containerized cargo as well as full containers in order to achieve favorable transportation rates for their customers; and

  - Automobile processing firms - service new automobiles after they are off-loaded from the vessels and are often terminal operators as well.

- Barge Operators - move grain, containers, and petroleum products along the Columbia, Willamette, and Snake River Systems between Portland and various locations in Oregon, Washington and Idaho. Barge is very important in the movement of grain from Oregon, Washington and Idaho to export elevators in Portland. Nearly 50 percent of grain exports arrive by barge at Portland for export. Petroleum arrives in Portland by ship or pipeline and is then distributed throughout the region by truck and barge. About 8 percent of the total containers are transloaded at the Port via barge. The major load points of the containers are at Lewiston, Pasco, Morrow and Umatilla. Barge operations are also very important for the sand, gravel and aggregate businesses.

- Government Agencies - this service sector involves federal, state and local government agencies that perform services related to cargo handling and vessel operations at the Port. U.S. Customs, Bureau of Immigration, U.S. Department of Labor, U.S. Department of Agriculture, and U.S. Department of Commerce employees are involved. In addition, both civilian and military personnel with the U.S. Coast Guard and the U.S. Army Corps of Engineers have been included. Finally, the city police and fire departments are part of this category.

(3) Shippers/Consignees

Two categories of shippers and consignees are considered in the analysis. The first category, dependent shippers/consignees are port users that are totally dependent on the Portland Harbor and located in close proximity to the Port. These dependent shippers and consignees would most likely shut down operations if the marine terminals were not available for their use, while those in the second category would ship or receive materials via another port. Dependent shippers often have private river terminals for the shipment and receipt of cargo, and include sand and gravel operators. Other dependent shippers/consignees have a manufacturing facility near the Port and rely on the receipt of waterborne raw materials for the production process. Such dependent shippers/consignees include local steel mills.

The second category of shippers and consignees are classified as related port users. These related users are located throughout the states of Oregon and Washington and other states whose business is only related to the cargo and vessel activity in the Portland Harbor. Shippers/consignees that use the port but do not have the same degree of dependency on the Port are considered port-related, and not port-generated. These related shippers/consignees use other ports as well as the marine terminals in the Portland Harbor.

(4) Port of Portland

The Port of Portland category includes those individuals employed by the Port Authority whose purpose is to oversee marine terminal activity. Also included in the Port of Portland category are employees of the Navigation Division and administration employees allocated to marine terminal work. The Port of Portland's Dredge Division maintains the shipping channel of the Columbia River. Hence, other Columbia River Ports such as Longview, Astoria, Vancouver and Kalama are dependent on the Port's dredging operation.

(5) Banking/Insurance/Law Sector

While this sector is not directly involved in cargo or ship operations, it nonetheless does provide services such as financing export/import transactions and insuring cargo and vessels. Also included in this sector are legal firms specializing in maritime law.

2. COMMODITIES INCLUDED IN THE ANALYSIS

A major use of an economic impact analysis is to provide a tool for port development planning. As a port grows, available land and other resources for port facilities become scarce, and decisions must be made as to how to develop the land and utilize the resources in the most efficient manner. Various types of facility configurations are associated with different commodities. For example, automobiles require a large area for storage, while certain types of dry bulk cargoes, e.g., soda ash, require direct rail car to terminal loading.

An understanding of the commodity's relative economic value in terms of employment and income to the local community, the cost of providing the facilities, and the relative demand for the different commodities is essential in making future port development plans. Because of this need for understanding relative commodity impacts, economic impacts are estimated for the following commodities handled via public and private facilities in the Portland Harbor:

- Containerized cargo;
- Steel, including slab and rail;
- Miscellaneous break bulk cargoes and scrap;
- Automobiles;
- Soda Ash;
- Grain;
- Potash;
- Other dry bulk such as urea and limestone;
- Liquid Bulk;
- Aggregates;
- Cement; and
- Petroleum.

It should be emphasized that commodity-specific impacts are not estimated for each of the five economic sectors described in the last section. Specific impacts could not be allocated to individual commodities with any degree of accuracy for the banking/insurance/law sector, marine construction and the government sector.

3. DATA COLLECTION

This Economic Impact Study of the Portland Harbor is based on a telephone survey of members of each of the five economic sectors. Participants were identified by the Merchants Exchange of Portland Directory, as well as internal Port of Portland tenant lists and data bases maintained by Martin Associates from previous Port of Portland Economic Impact Studies. All of the Port tenants and service providers were contacted by Martin Associates by telephone interviews and were used to achieve a 95 percent coverage. In total, 283 firms were interviewed for the study.

In addition to data collected from the 283 interviews, published data was collected from several sources. These publications include:

- Census of Wholesale Trade;
- Census of Retail Trade;
- Census of Construction;
- Census of Service Industries; and
- Annual Survey of Manufacturers.

Other published data was obtained from the U.S. Bureau of Census, County Business Patterns; U.S. Bureau of Economic Analysis, Regional Income Division; and U.S. Bureau of Labor Statistics, "Consumer Expenditure Survey, 2012". In addition, the data bases of marine service providers and tenants developed in the 2006 and 2011 studies were also used as a baseline for the data collection portion of the study.

The economic relationships and methodology have been used to develop an economic impact model for the cargo and vessel activity at the public and private marine terminals in the Portland Harbor. This model has been designed to update the port impact assessment on an annual basis, as well as to test sensitivities of impacts to changes in commodity tonnage, labor productivity, labor work rules, vessel calls (by type of vessel), pilotage and tug assist assumptions. Also, the model is designed to test the impacts of new facilities development.

4. IMPACT SUMMARY

The resulting economic impacts, as viewed for fiscal year 2015, are presented in Table 1. The impacts for activity at both public and private facilities are detailed, with totals showing the economic impact for the Portland Harbor.

Table 1
Summary of Economic Impacts Generated by
Port Activity in FY 2015

	PUBLIC TERMINALS	PRIVATE TERMINALS	TOTAL PORTLAND HARBOR
JOBS			
Direct	2,685	2,515	5,199
Induced	3,048	2,503	5,551
Indirect	1,400	1,906	3,306
TOTAL	7,133	6,924	14,057
PERSONAL INCOME ($1,000)			
Direct	$164,824	$130,039	$294,863
Induced	$402,285	$317,386	$719,671
Indirect	$61,712	$82,195	$143,907
TOTAL	$628,820	$529,621	$1,158,441
BUSINESS REVENUE ($1,000)	$628,511	$438,140	$1,066,652
STATE AND LOCAL TAXES ($1,000)			
Oregon	$42,423	$26,598	$69,021
Washington	$18,267	$23,783	$42,050
TOTAL	$60,690	$50,380	$111,071
LOCAL PURCHASES ($1,000)	$134,506	$220,516	$355,022

*Totals may not add due to rounding

II. EMPLOYMENT IMPACTS

In this chapter, the employment generated by maritime activity at the public and private marine terminals in the Portland Harbor is documented. The chapter is organized as follows:

- First, the total employment that is in some way related to the activities at the public and private marine terminals is estimated;

- Second, the subset of total employment that is judged to be totally dependent on maritime activity is analyzed in the following ways:

  - Direct jobs are estimated in terms of key economic categories, e.g., rail, truck, terminal operators, longshoremen, freight forwarders;
  - Direct jobs are estimated for each of the key commodities/commodity groups;

- Third, the direct jobs are estimated by place of residence;

- Fourth, induced jobs generated by local purchases made by those directly employed as a result of port activity are described;

- Fifth, indirect jobs created by local purchases by the firms directly dependent on maritime activity in the Portland Harbor are defined; and

- Finally, jobs related to the Portland Harbor cargo activity are discussed.

The impacts presented in this chapter are for the fiscal year 2015.

1. TOTAL EMPLOYMENT IMPACT

It is estimated that 14,057 resident jobs of Oregon and Washington are generated by cargo and vessel activity at the public and private marine terminals in the Portland Harbor. Of the 14,057 jobs, 7,133 jobs are generated by commodities moving over the public facilities owned and/or operated by the Port of Portland.

- **Direct**: 5,199 direct jobs are generated by cargo moving over public and private facilities in the Portland Harbor. It is these jobs that are most directly dependent upon the vessel and cargo activity in the Portland Harbor. These jobs are with the International Longshore and Warehouse Union, terminal operators, stevedores, trucking firms, railroads, steamship agents, freight forwarders and customhouse brokers, warehousemen, federal government agencies, towing companies, pilot organizations and marine construction companies. Of these 5,199 direct jobs,

2,685 jobs are directly dependent upon cargo moving over the Port's public facilities. These jobs are classified as direct jobs and if cargo activity at public facilities were to cease, these jobs would suffer near term dislocation.

- **Induced:** 5,551 are employed by providing goods and services to the 5,199 individuals directly involved with port activity. The Port's public facilities are responsible for 3,048 of the 5,551 induced jobs. Consequently, employment in this group is as directly dependent upon port activity as the first group.

- **Indirect:** Firms directly dependent on maritime activity in the Portland Harbor made $355.0 million of local purchases for office supplies, parts and equipment, maintenance and repair services, business services, utilities, communications services and fuel. These local purchases supported 3,306 indirect jobs in the local economy.

- **Related:** An additional 18,891 jobs are with firms, farms and mines that ship and receive cargo via the public and private marine terminals in the Portland Harbor. These jobs are considered to be related to activities at the Portland Harbor, but the degree of dependence on the marine terminals is difficult to estimate. The majority of these 18,891 related jobs are associated with cargo moving over the Port of Portland owned/operated public marine terminals. Of these related jobs, the majority are associated with containerized cargo, handled at the Port of Portland-operated Terminal 6, and grain exports, handled by both public and private terminals. Containerized cargo shippers can use other Pacific Northwest Ports, primarily Seattle and Tacoma, while grain shippers can use other Columbia River and Puget Sound Ports as well as the Gulf of Mexico Ports. Mineral exporters can use such ports as Longview or Vancouver, WA.

  If the marine terminals were not available to these organizations, they would suffer an economic penalty over the longer term. Such a penalty would vary from a loss of employment opportunities in some cases, to an increase in total transportation costs in other cases, which could in turn result in employment reductions.

  The next section of this chapter is dedicated to the direct impact category of 5,199 jobs for Portland area residents.

2. DIRECT JOB IMPACTS

As a result of port activity, 5,199 full-time jobs were directly created by activity at both public and private marine terminals in the Portland Harbor[5]. Of these 5,199 direct jobs, 2,685 jobs were

[5] Jobs are measured in terms of full-time equivalent workers. If a worker is employed only 50% of the year, the job is reported as 0.5 direct jobs.

created by maritime activity at the public port facilities owned/operated by the Port of Portland.

2.1 Job Impacts by Sector and Category

Table 2 shows the job impacts by sector and detailed job category. As this table shows, the largest job impacts are with terminal operations, maritime construction, trucking firms, ILWU and railroads.

Table 2
Employment Impacts by Job Category

	TOTAL PORTLAND HARBOR
SURFACE TRANSPORTATION	
Rail	365
Truck	1,088
SUBTOTAL	1,453
MARITIME SERVICES	
Terminals	1,162
ILWU	533
Towing	32
Pilots	25
Agents	22
Surveyors/Chandlers/Maritime Services	16
Forwarders	99
Warehouse and Container Repair	121
Government	222
Maritime Construction	1,133
Barge	161
SUBTOTAL	3,526
PORT OF PORTLAND	178
BANKING/INSURANCE/LAW	16
SHIPPERS/CONSIGNEES	26
TOTAL	**5,199**

*Totals may not add due to rounding

2.2 Job Impacts by Commodity

Most of the 5,199 direct jobs displayed in Table 2 can be considered to be related to the handling of specific commodities or commodity groups. Employment with certain types of firms and

organizations, such as most state, federal and local government agencies, the insurance and banking sector, and marine construction firms, is extremely difficult to assign to specific commodity groups, and if such an assignment is made, it is often done so arbitrarily. As a result, employment in these groups (which totaled 1,500 jobs) was not allocated to commodity groups.

Table 3 presents the employment impacts in terms of commodity/commodity group for total maritime activity in the Portland Harbor.

Table 3
Distribution of Direct Job Impact by Commodity – Portland Harbor

	HARBOR WIDE DIRECT JOBS
Containers	501
Steel Rail	41
Slab	36
Misc Break Bulk	376
Autos	559
Soda Ash	144
Grain	490
Potash	154
Other Dry Bulk	52
Liquid Bulk	19
Aggregates	582
Cement	84
Petroleum	660
Not Allocated	1,500
TOTAL	5,199

This table indicates that in fiscal year 2015, petroleum, aggregates, autos, containerized cargo and grain generated the largest number of direct jobs.

A description of the distribution of the direct job impacts associated with each commodity is provided in the remainder of this section.

(1) Containerized Cargo

In fiscal year 2015, 1.1 million short tons of containerized cargo, or about 60,557 containers (both full and empty) were moved on vessels calling the Port of Portland, creating 501 direct jobs (or about 8.3 jobs per 1,000 containers). One hundred percent of the containerized cargo was handled via Terminal 6, owned by the Port of Portland and operated by ICTSI. ICTSI operates this terminal under a long term lease with the Port of Portland. It is estimated that 160 jobs were created in the local trucking industry. In addition to the truck impact, other key employment categories include members of the ILWU (102 full-time equivalent workers) and 121 jobs with warehouse and distribution center operations. There are also 75 jobs with freight forwarders/customhouse brokers booking the freight and clearing imports through U.S. customs.

(2) Steel Products

The 44,000 tons of steel slab imports and 85,000 tons of steel rail via the public marine terminals generated 77 direct jobs. These jobs are primarily associated with the receipt of slab, and the employees of the local steel mill importing the slab. The majority of this cargo is trucked to the local mill or directly to importers. Steel rail is directly loaded to rail cars for inland distribution.

(3) Miscellaneous Break Bulk Cargo

About 212,000 tons of miscellaneous break bulk cargo moved via the Portland Harbor terminals in fiscal year 2015, creating 376 direct jobs.

(4) Automobiles

The Port of Portland is the leading automobile import port in the Pacific Northwest. In fiscal year 2015, the Portland auto facilities handled 246,107 import and export automobiles. In addition to imported and exported automobiles, the Port's facilities handled an additional 43,547 domestic automobiles for a total of 289,654 automobiles handled at Port of Portland facilities in fiscal year 2015. The handling of automobiles generated 559 direct jobs, of which 51 percent are with terminal operators and automobile processing facilities. About 30 percent of the direct jobs are in the surface transportation sector, and the majority of the surface transportation sector jobs generated by the transport of automobiles are with the trucking firms, and the balance by rail. The movement of automobiles generates 93 full time jobs for the ILWU.

(5) Soda Ash

The 2.8 million tons of soda ash exports are railed via unit train directly to the T-4 bulk loading facility. A total of 144 direct jobs were generated by this export move. The majority of these jobs are held by ILWU and rail employees.

(6) Grain

Grain elevators in the Portland Harbor exported roughly 6 million tons of grain by vessel in fiscal year 2015. This export tonnage consists of wheat originating in Oregon, Washington and the Dakotas. Two elevators moved this grain, one of which is a private terminal, while the other elevator is located on Port of Portland property. The third grain elevator located in Portland Harbor was shut down for capital improvements during the time of this study. Of the 6 million tons of grain exported via the Portland Harbor about 50% arrives by barge on the Columbia/Snake River System, and this tonnage also creates jobs at the seaport. The movement of grain generated 490 direct jobs. These jobs are concentrated with the barges and railroads moving the grain and the ILWU. About 54% of the grain is exported via the grain elevator leased from the Port of Portland.

(7) Potash

The 2.8 million tons of potash exported from the Port of Portland facilities created 154 direct jobs that are primarily with ILWU and the railroads moving the potash from Canada.

(8) Other Dry Bulk Cargoes (Cement, Aggregates, and Miscellaneous Dry Bulk)

Dry bulk commodities consist of cement, aggregates, and other dry bulks such as urea. About 3.6 million tons of dry bulk cargoes move via barge and vessel in the Portland Harbor and support 718 direct jobs with local truckers, terminal operations, plants and barge operations.

(9) Liquid Bulk

In fiscal year 2015, 56,000 tons of other liquid bulk cargoes such as fertilizers moved via the Portland Harbor. These cargoes supported 19 direct jobs.

(10) Petroleum

About 4.2 million tons of petroleum products moved by ship or barge to and from the private terminals along the Columbia River System. The terminals handling the petroleum products generated 660 direct jobs, of which the majority is with local truck distribution from the river terminals handling the products. These truck jobs also include the delivery of

petroleum products that are handled at river terminals that may arrive via pipeline. The total impact of the petroleum terminal operations is included as a harbor impact, since the activity would not occur if the product could not use the marine terminal for receipt and bunkering activity.

2.3 Job Impacts per Ton

The assessment of the job impacts on a per ton basis provides a tool for port planners to use in evaluating the relative importance of different commodities as economic generators. Table 4 shows the direct job impacts per 1,000 tons for each commodity moving via the public and private terminals at the Portland Harbor.

Table 4
Direct Jobs per 1,000 Tons – Portland Harbor

	JOBS/1,000 TONS
Containers	0.459
Steel Rail	0.478
Slab	0.821
Misc Break Bulk	1.773
Autos	1.514
Soda Ash	0.051
Grain	0.082
Potash	0.055
Other Dry Bulk	0.164
Liquid Bulk	0.345
Aggregates	0.223
Cement	0.124
Petroleum	0.156

Table 4 shows that miscellaneous break bulk, autos, and steel slab generates the largest impacts per 1,000 tons. The maritime service sector jobs generated by the general cargo commodities of automobiles, steel slab and miscellaneous break bulk cargoes are concentrated among longshoremen, terminal operators and stevedoring firms and steamship agents. In contrast, the majority of impacts generated by bulk commodities are concentrated with the private terminals and port-dependent shippers/consignees. The employment impacts for grain are concentrated with rail operations.

3. GEOGRAPHIC DISTRIBUTION OF DIRECT JOB IMPACTS

The distribution of the direct jobs by place of residence is a useful measure of the geographic importance of the seaport to the local economy. Except for rail crew and rail headquarters employment, the direct jobs were allocated by the place of residence of the direct job holders during the interview process. Rail crew jobs and rail headquarters jobs are not allocated to a specific place of residence, since they are, for the most part, held by non-residents of the Portland area. Also, the rail crew jobs were estimated from the average number of crew changes per rail linehaul required to move the rail cargo for each commodity group, and, as a result, it is not possible to trace the exact location of the residence of these crew jobs.

Table 5 shows the distribution of the direct jobs by county. Thirty-four percent of those employees directly employed due to port activity live in Multnomah County. Within Multnomah County, 69 percent live in the City of Portland. Overall, about 58 percent of those directly employed reside in Oregon.

Table 5
Distribution of Direct Jobs*
by Place of Residence

	PUBLIC TERMINALS		PRIVATE TERMINALS		PORTLAND HARBOR	
	PERCENT	JOBS	PERCENT	JOBS	PERCENT	JOBS
Portland	28.54%	673	19.01%	471	23.66%	1,144
Other Multnomah Co.	10.54%	248	10.63%	263	10.59%	512
Washington Co.	5.82%	137	7.40%	183	6.63%	320
Clackamas Co.	13.26%	313	6.58%	163	9.84%	476
Clark Co.	18.24%	430	21.99%	545	20.16%	975
Skamania Co.	0.95%	22	1.39%	34	1.17%	57
Other OR	8.63%	204	6.09%	151	7.33%	354
Other WA	11.71%	276	24.39%	604	18.21%	880
Other US	2.30%	54	2.51%	62	2.40%	116
Not Allocated Rail		327		38		365
TOTAL*	100%	2,685	100%	2,515	100%	5,199

* Percentages exclude railroad crew and headquarters jobs

4. INDUCED JOBS

The regional purchases by the 5,199 direct job holders with the direct income earned from port activity creates additional jobs throughout the Portland area. In fiscal year 2015, $294.9 million was received by those 5,199 directly employed by activity in the Portland Harbor. As the result of the re-spending of a portion of this income for purchases in the Portland metropolitan region, an additional 5,551 induced jobs were generated throughout the Portland area. Of these 5,551 induced jobs, activity at the Port's public maritime facilities generated 3,048 induced jobs.

These induced jobs are estimated based on the current expenditure profile of residents in the Portland area, as estimated by the U.S. Bureau of Labor Statistics, "Consumer Expenditure Survey". This survey indicates the distribution of consumer expenditures over key consumption categories for Portland area residents. The consumption categories are:

- Housing;
- Food at Restaurants;
- Food at Home;
- Entertainment;
- Health Care;
- Home Furnishings; and
- Transportation Equipment and Services.

The estimated consumption expenditures generated as a result of the re-spending impact is distributed across these consumption categories. Associated with each consumption category is the relevant retail and wholesale industry. Jobs to sales ratios in each industry are then computed for the Portland area, and induced jobs are estimated for the relevant consumption categories. It is to be emphasized that induced jobs are only estimated at the retail and wholesale level, since these jobs are most likely generated in the Portland area. Further levels of induced jobs are not estimated since it is not possible to defensibly identify geographically where the subsequent rounds of purchasing occur.

"The Consumer Expenditure Survey" does not include information to estimate the job impact with supporting business services, legal, social services and educational services. To estimate this induced impact, a ratio of state of Oregon and Washington employment in these key service industries to total state of Oregon and Washington employment is developed. This ratio is then used with the direct and induced consumption jobs to estimate induced jobs with business/financial services, legal, educational and other social services.

5. INDIRECT JOBS

The firms directly dependent upon the vessel and cargo activity at the private and public marine terminals in the Portland Harbor made $355.0 million of purchases from local suppliers of parts and equipment, business services, maintenance and repair services, communications and utilities, office equipment and fuel. These local purchases supported 3,306 local indirect jobs. If maritime activity within the Portland Harbor were to cease, these indirect jobs would also be lost. To estimate these indirect jobs, actual local expenditures by port-dependent firms were estimated from the telephone surveys. To estimate the indirect jobs, the local expenditures were used as inputs into a regional input-output model developed for the Portland Metropolitan area for Martin Associates by the U.S. Bureau of Economic Analysis, Regional Input-Output Modeling System.

6. RELATED JOBS

Related jobs are jobs with shippers/consignees using the public and private marine terminals in the Portland Harbor. These users include local Oregon/Washington manufacturers and retailers exporting and importing containerized cargo; Oregon/Washington grain farmers; users of petroleum and petroleum products in the Portland Harbor; and the related user jobs due to the steel operations importing slab and moving product via Portland Harbor marine terminals. It is to be emphasized that these users are related to the Portland Harbor marine terminals in that if these facilities were not available the users could ship and receive cargo via other ports. In fact, the majority of these users currently use multiple ports for export and import, especially those moving containerized cargo through the Port of Portland's Terminal 6. Furthermore, the level of employment with the related users is driven by the demand for the products produced by these firms, and not as the result of providing cargo handling vessel support services at the marine terminals. In contrast, the level of direct jobs generated by the Portland Harbor is driven by the vessel and cargo activity.

To estimate the related user impact, the types of containerized cargo moving via the marine terminals were identified from the United States Census Bureau, USA Trade Online database. The average value per ton of each commodity type was then estimated using U.S. Bureau of Census, Foreign Trade Statistics and the Port of Portland internal databases. A weighted average dollar value per ton of containerized cargo moving via the Port was next developed from this data. Average employment to value of output coefficients for the export producing and import consuming manufacturing and retail sectors related to the export and import of the containerized cargoes were then computed from Bureau of Economic Analysis, Regional Input-Output Model for the Washington-Oregon combined region. An estimate of the percent of containerized cargo handled at the Port of Portland marine terminals that is exported or imported by Oregon and Washington companies was next developed through the terminal operator and steamship line surveys. To estimate the related containerized cargo jobs, the average value per ton of containerized cargo was multiplied by the tons handled at the Port of Portland and the share of containerized cargo that was produced and/or consumed by an Oregon/Washington firm. The weighted average job coefficients corresponding to the export and import containerized

commodities consumed or produced in Oregon and Washington were next multiplied by the value of the containerized cargo moving via the Port to estimate the related jobs with exported and imported containerized cargo.

For steel slab and break bulk steel products, the job multipliers for the Oregon/Washington region for steel production (from the RIMS II model) were used to estimate the user job impacts supported by the imported steel slab and steel products. For dry bulk cargoes, the job multiplier for cement and sand and gravel operations was used to develop the user jobs. Finally, for grain, the value of the grain tonnage exported via the Portland Harbor grain elevators was estimated based on the average value per ton of grain. The tonnage originating in the Oregon/Washington region was multiplied by the value per ton and then combined with the job to revenue multiplier for grain farming (in Oregon/Washington) to estimate related user jobs.

It is important to note that the direct, induced and indirect jobs by commodity were subtracted from total user jobs to avoid double counting.

Using this methodology, it is estimated that 18,891 jobs with Oregon/Washington firms are related to the cargo moving via the Portland Harbor marine terminals. The majority of these jobs are related to the cargo moving via the Port of Portland marine terminals, and of these jobs, nearly 7,000 jobs with exporters and importers are related to the containerized cargo moving via the Port of Portland's Terminal 6.[6]

[6] The related jobs include the jobs throughout the state in the export producing or import consuming industry and also include the jobs within Oregon/Washington industries needed to produce the export cargo moved via the Port or utilize the import cargo moving via Portland. The direct jobs (and associated induced and indirect jobs) involved in transporting the cargo to and from the port as well as serving the cargo while in port are excluded from the user jobs as they are counted as direct jobs.

III. ECONOMIC VALUE, REVENUE, INCOME AND TAX IMPACTS

The movement of cargo via public and private marine terminals in the Portland Harbor generates revenue for each of the five economic sectors. For example, revenue is received by surface transportation firms (both railroads and trucks) as a result of moving export cargo to the Port and distributing the imported commodities inland after receipt at the Port. The firms in the maritime service sector receive revenue from arranging for transportation services, cargo handling, providing services to vessels in port and repairs to vessels calling the Port. The banking and insurance sector receives revenue from financial services provided to users of the Port. The Port of Portland receives revenue from leases at the terminals it owns, and also receives revenue from terminal operations. In addition, revenue is received by shippers/consignees from the sales of cargo shipped or received via Portland marine cargo facilities and from the sales of products made with raw materials received through the Port. Since this chapter is concerned with the revenue generated from providing maritime services, the shipper/consignee revenue (i.e., the value of the cargo shipped or received through the Port) will be excluded from the remaining discussion. Similarly, steamship lines' revenue from the ocean linehaul portion of the cargo movements is excluded from the revenue impact, since very few vessels calling the Port are American flag vessels, and it is not likely that a large portion of the revenue from ocean transportation remains in the local or even national economy.

The revenue generated by port activity consists of many components. For example, gross revenue is used to pay employee salaries and taxes, it is distributed to stockholders, and it is used for the purchases of equipment and maintenance services. Of these components, only three can be isolated geographically with any degree of accuracy. The personal income component of revenue can be traced to geographic locations based on the residence of those receiving the income. The local purchases by firms dependent upon maritime activity at marine terminals in the Portland Harbor are identified through the interviews and used to estimate the indirect job impacts. Finally, state and local taxes paid by individuals and businesses can be traced to a geographic location based on the residency of the individuals directly employed and the location of the firms dependent on maritime activity. The balance of the revenue is distributed in the form of non-local payments to firms providing goods and services to the five sectors, for the distribution of company profits to shareholders and to payment of federal taxes. Many of these firms and owners are located outside of the Oregon/Washington region, and, thus, it is difficult to trace the ultimate location of the distributed revenue (other than personal income, taxes and local purchases).

The value of output created by users of the Port is attributed to the region consisting of the states of Oregon and Washington, and the local purchases from other firms within the region are also included in this user output measure, as defined by the in-state output coefficients (for the user industries) developed from the U.S. Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II).

1. REVENUE IMPACT—TOTAL ECONOMIC ACTIVITY

The revenue impact is a measure of the ***total economic activity*** in the state that is generated by the cargo moving via the Port of Portland. In fiscal year 2015, marine cargo activity at the Port generated a total of $3.3 billion of total economic activity in the region. Of the $3.3 billion, nearly $1.1 billion is the direct business revenue received by the firms directly dependent upon the Port and providing maritime services and inland transportation services to the cargo handled at the marine terminals and the vessels calling the port. The balance, about $2.3 billion, represents the value of the output to the Oregon/Washington region that is created due to the cargo moving via the Portland Harbor. This includes the value added at each stage of producing an export cargo, as well as the value added at each stage of production for the firms using imported raw materials and intermediate products that flow via the marine terminals in the Portland Harbor and are consumed by industries within the region.

The balance of the discussion focuses on the $1.1 billion of direct business revenue generated from the provision of services to the cargo and vessels handled at the Portland Harbor marine terminals.

In fiscal year 2015, maritime activity at public and private facilities in the Portland Harbor generated $1.1 billion of total revenue. Activity at the Port of Portland's public facilities generated $628.5 million of revenue, while activity at the private terminals created $438.1 million of revenue. Table 6 presents the revenue impact generated by impact category for maritime activity at public and private terminals.

Table 6
Total Revenue Generated by
Port Activity ($1,000's)

	TOTAL PORTLAND HARBOR
SURFACE TRANSPORTATION	
Rail	$344,125
Truck	$115,094
Pipeline	$102,475
SUBTOTAL	$561,694
MARITIME SERVICES	
Terminals	$115,767
Towing	$7,139
Pilots	$12,092
Agents	$1,598
Surveyors/Chandlers/Maritime Services	$3,460
Forwarders	$20,420
Warehouse and Container Repair	$22,324
Maritime Construction	$209,236
Barge	$64,556
SUBTOTAL	$456,592
PORT OF PORTLAND	$46,164
BANKING/INSURANCE/LAW	$2,202
TOTAL	$1,066,652

Firms in the surface transportation sector received $561.7 million of revenue. Of this $561.7 million of revenue, 61 percent was received by the railroads, primarily as the result of the movement of grain, soda ash, potash and automobiles. The revenue generated by the surface transportation sector is based on the relevant modal (rail, pipeline, or truck) rate for a commodity multiplied by the tonnage of that commodity moved to and from the Port by the specified mode. The share of each commodity transported by rail, truck and pipeline was estimated from interviews with the terminal operators handling the respective commodities, as well as from steamship lines.

The relative modal shares were then applied to the port tonnage (or units) of the specific cargo. Average rail rates were obtained from the Burlington Northern/Santa Fe and the Union Pacific/Southern Pacific railroads, as well as from steamship lines, automobile importers and shippers/consignees. These rates were multiplied by the tonnage of each commodity carried by rail to estimate revenue accruing to railroads. The pipeline rate for liquid bulk and petroleum was obtained from the terminal operators.

Firms in the maritime services sector received $456.6 million of direct revenue. About 45 percent of the maritime service sector revenue was received by the firms supplying maritime equipment/marine construction services. Another 25 percent was received by terminal operations. The revenue accruing to the maritime service sector was estimated from interview results with terminal operators who provided stevedoring revenue per ton (or unit) estimates for each commodity. Revenue impacts for other maritime service sector categories are based on the interviews and include agency revenue per vessel call, freight forwarders' revenue per container or ton of break bulk and bulk cargo, revenue from the sale of bunkers, revenue from marine construction activity, revenue per pilotage assignment and tug assist, and revenue per vessel for line handling.

The Port of Portland received about $46.2 million in revenues from Port tariffs and revenue generated by marine terminal leases.

Roughly $2.2 million in revenue was generated by the local banks, law firms and insurance brokers as a result of international financial transactions and the provision of marine and cargo insurance and legal services, and is based on the surveys.

Table 7 shows the revenue impact by commodity for cargo moving over public and private facilities. In terms of total revenue, petroleum generates the largest total revenue impact, followed by grain, soda ash and potash.

Table 7
Revenue Impacts by Commodity, ($1,000)

	TOTAL PORTLAND HARBOR REVENUE
Containers	$66,906
Steel Rail	$3,572
Slab	$1,391
Misc Break Bulk	$22,919
Autos	$74,568
Soda Ash	$105,196
Grain	$175,902
Potash	$100,716
Other Dry Bulk	$9,929
Liquid Bulk	$1,519
Aggregates	$23,138
Cement	$15,805
Petroleum	$207,458
Not Allocated	$257,635
TOTAL	$1,066,652

Table 8 presents the revenue impact per ton. Automobiles generate the greatest revenue per ton, reflecting the processing charges and the fact that about 75 percent of the autos move by rail on tri-level car carriers.

Table 8
Revenue Impacts Per ton

	REVENUE/ 1,000 TONS
Containers	$61.28
Steel Rail	$42.09
Slab	$31.90
Misc Break Bulk	$108.04
Autos	$201.99
Soda Ash	$37.33
Grain	$29.28
Potash	$35.96
Other Dry Bulk	$31.03
Liquid Bulk	$27.00
Aggregates	$8.85
Cement	$23.41
Petroleum	$48.91

2. PERSONAL INCOME IMPACTS

In the previous section of this chapter, the total revenue generated by port activity was identified. As described earlier, the personal income received by those directly dependent upon port activity is one of the components of revenue that can be traced to the Portland metropolitan area. The income impact is estimated by multiplying the average annual earnings of each port participant, i.e., railroad employees, truckers, steamship agents, freight forwarders, bankers, etc., by the corresponding number of jobs in each category. The individual average annual earnings in each category multiplied by the corresponding job impact resulted in $294.9 million of direct personal income. Of the $294.9 million of income received, about $164.8 million was generated by cargo moving over the public facilities.

Re-spending of income within a state is measured by a local income multiplier. The size of the multiplier varies by state depending on the proportion of goods and services purchased locally by individuals. The higher this percentage, the lower is the income leakage out of the region. Based on data provided from the Bureau of Economic Analysis, for every one dollar earned by individuals in the Portland regional economy, about $.71 is spent locally, resulting in a total of $2.44 additional spending

for every dollar received in wages and salaries. This re-spending impact is known as the personal income multiplier. Hence, the personal income multiplier for the Portland-Vancouver area is 3.44, and was used to estimate the induced income and consumption impact of $719.7 million as a result of seaport activity. According to the Bureau of Economic Analysis, for every one dollar earned in the Portland-Vancouver regional economy, about 71 percent is spent on goods and services within the region, while the remaining 29 percent is used to purchase items produced out-of-area, to pay federal, state and local taxes or held as savings. The full income multiplier effect results from successive rounds of re-spending. For example, in the initial round, one dollar is earned. Of that $1.00, $.71 is used to purchase goods and services. Of that $.71, another 70 percent, or $.50, will be used for the next round of purchases of goods and services. Of this $.50, again 70 percent, or about $.36, will be used for further regional purchases. These successive re-spending rounds will continue until an additional $2.44 of spending in the Portland-Vancouver economy is generated for every dollar of income. At each stage of re-spending, additional jobs and income are created, as are consumption expenditures. These additional jobs are the 5,551 induced jobs described in the employment section of the preceding chapter, and the resulting $719.7 million includes wages and salaries of the induced job holders as well as revenue to the firms supplying the goods and services at each round of spending.[7]

This re-spending generated an additional $719.7 million of local personal income and consumption expenditures in local business and service providers. This additional re-spending of the direct income generates the induced job impact, 5,551 jobs, described in the previous chapter.

The indirect jobholders received $143.9 million of personal wages and salaries. Combining the direct, induced and indirect income and consumption impacts, maritime cargo activity in the Portland Harbor created nearly $1.2 billion of wages and salaries and local consumption expenditures. The Port of Portland marine terminals created $628.8 million of the total $1.2 billion personal wage and salary income impact and consumption expenditures.

The 18,891 related shippers/consignees using the Portland Harbor marine terminals received $739.0 million of direct, induced and indirect personal income.

3. LOCAL PURCHASES

The firms directly dependent upon the maritime activity at the public and private terminals in the Portland Harbor made $355.0 million of local purchases. These local purchases were for maintenance and repair services, utilities, communications services, office products, parts and

[7]It is to be emphasized that the re-spending impact of $719.7 million does not represent the earnings of the 5,551 induced job holders. The $719.7 million re-spending impact does include the direct earnings received by the employees holding the induced jobs, but the re-spending impact also includes the revenue received by the firms providing the goods and services to the 5,551 directly employed. Thus, dividing the re-spending impact by the number of induced job holders would NOT yield an average induced wage or salary.

equipment, fuel, etc. The $355.0 million of local purchases generated the 3,306 indirect jobs.

4. TAX IMPACTS

State and local tax impacts are based on state and local tax burdens for Oregon and Washington, which are developed from data provided by the Tax Foundation. The tax burdens are the total state and local taxes collected divided by total state income.

The state and local taxes for which estimates have been developed include:

- State and local personal and corporate income tax;
- Insurance tax;
- Gift tax;
- State fuel tax;
- Municipal school district taxes; and
- Tri-Met Tax.

Maritime activity at the public and private marine terminals in the Portland Harbor generated $111.1 million of state and local taxes. The state of Oregon and counties and municipalities within the state received $69.0 million of tax revenue while the state of Washington received about $42.1 million of state and local taxes from activity in the Portland Harbor. Activity at the public marine terminals generated $60.7 million in state and local taxes.

Activity generated by the related users of the Portland Harbor marine terminals supported an additional $70.8 million of state and local tax receipts in the Oregon/Washington region.

IV. COMPARISON OF ECONOMIC IMPACTS 2011–2015

This chapter compares the economic impacts generated by seaport activity in the Portland Harbor in calendar year 2011 and fiscal year 2015. The methodology used by Martin Associates to estimate the economic impacts generated by seaport activity in calendar year 2011 is, for the most part, the same as the methodology used to measure the fiscal year 2015 economic impacts.

1. COMPARISON OF TONNAGE

Tonnage handled in the Portland Harbor decreased from 24.8 million tons in 2011 to 21.3 million tons in fiscal year 2015. Table 9 compares the tonnage levels in the two study years.

Table 9
Comparison of Tonnage -- Portland Harbor

COMMODITY	2015 TONS (1,000)	2011 TONS (1,000)	CHANGE
Containers	1,092	2,095	(1,003)
Steel Rail	85	140	(55)
Slab	44	773	(729)
Scrap	120	1,102	(982)
Misc Break Bulk	92	28	64
Autos	369	351	18
Soda Ash	2,818	2,506	311
Grain	6,008	7,220	(1,211)
Potash	2,801	2,727	75
Other Dry Bulk	320	320	0
Liquid Bulk	56	20	36
Aggregates	2,615	2,452	164
Cement	675	145	530
Petroleum	4,242	4913	(671)
TOTAL	21,336	24,791	(3,455)

Since the 2011 study, the Port has experienced a loss of 3.5 million tons. While significant increases in cement, soda ash and aggregates were recorded since 2011, these gains were offset by major tonnage losses in grain, containerized cargo, ferrous scrap, steel slab and petroleum products.

The loss of 1.2 million tons of grain exports at the Portland Harbor is the result of a combination of the closing of the Louis Dreyfus Grain Elevator in 2014 for capital upgrades and additional new elevator capacity that was added at other ports on the Columbia River since 2011. This new capacity captured grain that had previously moved via older existing Columbia River elevators. The loss of grain exports at the Portland elevators between 2011 and 2014 occurred despite the growth in grain exports from all Columbia River elevators over the same period. Between 2011 and 2014, total grain exports from Columbia River elevators increased from 19.9 million tons in 2011 to 25.1 million tons in 2014. This growth in Columbia River grain exports was driven by the growth in soybean exports from 3.9 million tons in 2011 to 8 million tons in 2014. The new elevator capacity on the Columbia River also resulted in an increase in the share of export grain moving via Pacific Northwest grain elevators, as the share of Pacific Northwest grain exports from the Columbia River grew from 65% in 2011 to 77% in 2014.[8]

The loss of more than 1 million tons of containerized cargo handled at the Port of Portland (a 50% reduction since 2011), not only reflects the discontinuation of containerized cargo service by Hanjin Shipping Company and Hapag-Lloyd at the Port of Portland, but also the overall stagnant container market in the U.S. Pacific Northwest. For example, containerized cargo at the Northwest Seaport Alliance (which is the newly formed alliance of the Ports of Seattle and Tacoma) has declined by 2% between 2011 and 2014. In contrast, containerized cargo throughput at the Canadian port of Metro Vancouver, BC increased by 16% over this same period and containerized cargo at the Port of Prince Rupert grew by more than 50%.[9] The overall decline in containerized activity at the U.S. Pacific Northwest ports between 2011 and 2014 compared to the growth in container activity at the Canadian West Coast ports also reflects the congestion issues and work slowdowns that occurred at the U.S. West Coast ports during the contract negotiations between the International Longshore and Warehouse Union (ILWU) and the Pacific Maritime Association (PMA) in 2014. Due to the resulting congestion issues at the U.S. West Coast ports during 2014 and early 2015, containerized cargo was diverted to Canadian West Coast ports as well as to ports on the U.S. Atlantic and Gulf coasts.

The loss of 729,000 tons of slab imports reflects the use of other non-Portland Harbor marine terminals to serve a local manufacturer.

Ferrous scrap exports at the Port of Portland Harbor marine terminals fell by 982,000 tons. This can be traced to the fact the that the overall world market demand for export ferrous scrap has fallen significantly since 2011, and as of October, 2015, the export price for scrap was reported by Recycling International to be the lowest price in 11 years .[10] This declining world market demand for scrap is also reflected in the fact that overall international scrap exports from all Pacific Northwest ports fell from 2.3 million tons in 2011 to 1.3 million tons in 2014.[11]

[8] USA Trade On-Line, U.S. Bureau of the Census
[9] American Association of Port Authorities, "Containerized Traffic Statistics", 2015
[10] "Recycling International", October 19, 2015
[11] USA Trade On-Line, U.S. Bureau of the Census

The loss in petroleum traffic at the Port of Portland is a result of the overall decline in petroleum products moving by water at Pacific Northwest ports. As reported by the USA Trade On-Line, in 2011, a total of 6.4 million tons of petroleum and petroleum products were imported into the Pacific Northwest marine terminals compared to 4.2 million tons in 2014.[12] In addition, the share of petroleum products received and shipped by pipeline (primarily the Olympic Pipeline), has increased with the resumption of full capacity utilization of the pipeline following the 1999 pipeline explosion in Bellingham.

2. COMPARISON OF ECONOMIC IMPACTS

Table 10 compares the impacts generated by cargo and vessel activity at the public and private marine terminals in the Portland Harbor between calendar year 2011 and fiscal year 2015.

Table 10
Comparison of Economic Impacts -- Portland Harbor

	2015 IMPACTS	2011 IMPACTS	CHANGE
JOBS			
Direct	5,199	7,275	(2,075)
Induced	5,551	6,878	(1,326)
Indirect	3,306	3,928	(622)
TOTAL	14,057	18,081	(4,024)
PERSONAL INCOME ($1,000)			
Direct	$294,863	$366,597	($71,735)
Induced	$719,671	$897,540	($177,869)
Indirect	$143,907	$197,744	($53,837)
TOTAL	$1,158,441	$1,461,881	($303,441)
BUSINESS REVENUE ($1,000)	$1,066,652	$1,518,364	($451,713)
STATE AND LOCAL TAXES ($1,000)			
Oregon	$69,021	$83,329	($14,309)
Washington	$42,050	$56,877	($14,827)
TOTAL	$111,071	$140,206	($29,136)
LOCAL PURCHASES ($1,000)	$355,022	$429,959	($74,937)

[12]USA Trade On-Line provides data only for foreign imports and exports of crude petroleum and petroleum products and does not include domestic shipments and receipts. The U.S. Army Corps of Engineers (USACE) does provide tonnage data for domestic petroleum products, but 2014 data is not available at this time. Using the USACE data for the period 2009-2013 for the Columbia River only, the combined domestic and international shipment and receipt of petroleum products has fallen from a high of 5.4 million tons in 2010 to 4.9 million tons in 2013.

Direct jobs decreased by 2,075 jobs over the calendar year 2011-2015 fiscal year period, reflecting the decline in cargo activity at the port facilities, most notably grain, containerized cargo and miscellaneous break bulk. Induced jobs supported by Portland Harbor activity fell by 1,326 jobs, reflecting the reduction in the re-spending impact and hence the induced job impact, as the savings rate has increased between 2011 and fiscal year 2015, and the personal income multiplier has fallen from 3.45 in 2011 to 3.44 in fiscal year 2015. Indirect jobs decreased due to the $74.9 million decrease in local purchases.

Direct personal income decreased by $71.7 million. Business revenue generated by maritime activity also decreased by $451.7 million.

State and local tax revenues declined by $29.1 million, reflecting the loss in income and business revenue.

3. COMPARISON OF DIRECT JOB IMPACTS BY COMMODITY

Table 11 compares the direct jobs generated by commodity in 2011 and fiscal year 2015.

Table 11
Comparison of Direct Job Impacts by Commodity -- Portland Harbor*

COMMODITY	2015 DIRECT JOBS	2011 DIRECT JOBS	CHANGE
Containers	501	954	(452)
Steel Rail	41	49	(8)
Slab	36	647	(611)
Misc Break Bulk	376	455	(79)
Autos	559	509	50
Soda Ash	144	112	32
Grain	490	828	(338)
Potash	154	95	60
Other Dry Bulk	52	79	(27)
Liquid Bulk	19	8	11
Aggregates	582	796	(213)
Cement	84	33	50
Petroleum	660	1,399	(739)
TOTAL	3,699	5,963	(2,264)

*Excludes non-allocated jobs

The largest decline in direct jobs is with the movement of petroleum products. Not only did the

volume of petroleum products handled at the Portland Harbor marine terminals decline by nearly 700,000 tons, the share of product moved by pipeline increased, while the share of products moving by truck decreased, and the number of turns per day per truck driver increased, causing a significant decline in trucking jobs associated with the distribution of petroleum products.

The loss of the direct jobs with steel slab is driven by the fact that slab tonnage previously handled at the Portland Harbor marine terminals in 2011 has been diverted to other non-Portland Harbor marine terminals. The loss of the 611 direct jobs associated with the steel slab includes a combination of the loss of Portland dependent shippers/consignees as well as the trucking and other cargo handling activity that had been supported by the slab tonnage. The shipper/consignee is still located in the Portland area, but its employment is no longer considered to be dependent upon the Portland marine terminals.

The decrease in direct jobs associated with containerized cargo reflects the loss of container service by Hanjin Shipping Company and Hapag-Lloyd at Terminal 6 (T-6).

Grain tonnage was down in fiscal year 2015 due to a private grain elevator being closed for capital improvements during calendar year 2014. While this contributed to the decline in direct jobs associated with moving and handling grain, it should be noted that the associated capital expenditures were included. These capital costs are part of the maritime construction employment and revenue impact, which as previously discussed, are not allocated by commodity.

Despite the growth in aggregates tonnage from 2011 to fiscal year 2015, direct jobs generated by the movement of aggregates fell primarily due to the increased number of truck trips per day made by each driver, as reported by the terminal operators. Auto imports and exports increased from 234,000 units in 2011 to 246,616 units in fiscal year 2015, resulting in a small growth in jobs generated by auto activity. Jobs with soda ash, potash, and cement increased reflecting the growth in tonnage from 2011 to fiscal year 2015.

4. COMPARISON OF DIRECT JOBS BY CATEGORY

Table 12 shows the direct jobs generated by job category between calendar year 2011 and fiscal year 2015. The largest decline in jobs is with the trucking industry. The loss of containerized tonnage, slab and petroleum products are major factors leading to the decline in trucking jobs. The shifting of the 729,000 tons of slab to a non-Portland Harbor marine terminal resulted in the loss of the majority of the 424 jobs lost with dependent shippers/consignees. The loss in rail jobs was driven primarily by the loss of 1.2 million tons of grain exports, reflecting the closure of the Louis Dreyfus Grain Elevator for capital improvements and the addition of the new elevator capacity on the Columbia River since 2010..

The loss of more than 1 million tons of containerized cargo had significant impacts on several job categories. This loss directly impacted jobs with trucking, warehousing, container repair and freight

forwarding, as well as jobs held by members of the ILWU.

The loss in jobs with terminal operators is due to the reduction in terminal jobs with grain operations, scrap exports and auto imports. The decline in auto terminal jobs is due to a reduced level of auto processing of imports on terminal. Since 2011, overall automobile units increased, but the increase was due to auto exports, which require less processing than imports, while auto imports declined over the period.

The increased jobs with marine construction is driven by increased capital improvements at the public and private marine terminals. An increase of 90 Port of Portland jobs is associated with a share of administration and overhead personnel allocated to the maritime division that was not allocated in 2011.

Table 12
Employment Impacts by Job Category

	2015 DIRECT JOBS	2011 DIRECT JOBS	CHANGE
SURFACE TRANSPORTATION			
Rail	365	672	(307)
Truck	1,088	2,174	(1,086)
SUBTOTAL	1,453	2,846	(1,393)
MARITIME SERVICES			
Terminals	1,162	1,271	(109)
ILWU	533	556	(24)
Towing	32	51	(19)
Pilots	25	38	(12)
Agents	22	32	(9)
Surveyors/Chandlers/Maritime Services	16	33	(18)
Forwarders	99	200	(101)
Warehouse and Container Repair	121	297	(176)
Government	222	197	25
Maritime Construction	1,133	1,077	56
Barge	161	119	43
SUBTOTAL	3,526	3,871	(345)
PORT OF PORTLAND	178	88	90
BANKING/INSURANCE/LAW	16	20	(4)
SHIPPERS/CONSIGNEES	26	450	(424)
TOTAL	5,199	7,275	(2,075)

*Totals may not add due to rounding

5. CONCLUSION

As a result of the contracting tonnage base since 2011, direct jobs generated by the Portland Harbor marine terminals fell by 2,075 jobs and business revenue decreased by $451.7 million since 2011. Despite this loss of tonnage and dependent jobs, the Port remains a key economic generator in the region, supporting more than 14,000 jobs. To regain the Port's previous level of economic activity, it will be necessary to expand current markets, and identify new cargo markets in which the Port of Portland Harbor marine terminals can compete. This will require aggressive marketing by the Port, as well as possible market driven facilities investments.