

Seattle Department of Transportation

# THE ROLE OF FREIGHT IN SEATTLE'S ECONOMY APPENDIX G

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# 1.0 INTRODUCTION

The goals of this document are to connect information about economic sectors in Seattle, and beyond the city, to freight movement in Seattle and to address why freight related industries are important to Seattle. Specific objectives include:

- Show how economic sectors have grown over time
- Provide projections of growth by major sector and how this may impact freight volumes
- Assess why freight-generating industries are worth supporting including jobs and incomes
- Show spatial intensity of economic sectors within Seattle

In examining economic sectors related to freight, it is important to note that some major economic sectors are freight **generators** and a smaller subset of industries are freight transportation **service providers**. For example, freight trucking may be the most visible of freight-related industries but it carries freight generated other sectors and creates no freight volumes on its own.

The two major components of economic activity that generate freight in Seattle are 1) the Seattle economy, and 2) economic sectors outside Seattle that generate international trade volumes handled through Seattle-region ports

Sections which follow provide:

- An overview of Seattle's economy covering major industry sectors
- Details about freight-generating industries and their growth prospects
- An overview of international freight volumes
- A view of the geographic intensity of Seattle's industries
- A forecast of economic growth by industry sector and how this may affect freight volumes

# 2.0 SEATTLE'S ECONOMY

Seattle's economy includes sectors largely connected to the United States' and global economies as well as sectors that are more regional in nature. Both broad economic components are significant generators of freight. In the global economy, Seattle's deep water port provides an international gateway for imports as well as exports to and from US inland regions as well as from the state's agricultural and manufacturing businesses. The Port of Seattle which ranked as the 5th largest port in the US in terms of volume in 2012 has a profound effect on freight movement in Seattle and is discussed in Section 4.<sup>1</sup> Due to the Port and associated industries, Seattle's economy is particularly tied to freight and trade.

Seattle's more regional economic sectors are also an important driver of freight transportation, from stocking retail stores to meet consumer needs, to supplying local manufacturing and service industries with the goods they need to produce products and services for their customers. This section briefly summarizes the composition, size and growth of Seattle's major industry groups and also compares Seattle's economic sectors to those of the United States as a whole.

## 2.1 OVERVIEW OF SEATTLE'S MAJOR INDUSTRIES

The principal measure of regional economic activity by industry used in this report is employment, as measured by data derived from state employment surveys. Industry and employment growth is driven by both overall

population growth (which results in increased consumer spending, residential investment, and growth in other economic sectors) as well as industry-specific factors related to the Seattle region's "exports" of goods and services to the US and global economies. Employment data are available for industry groups defined under the North American Industry Classification System (NAICS) and published by state employment agencies including the [Washington State Employment Security Department](#) and the US Bureau of Labor Statistics (BLS). More limited data for Gross Domestic Product, measuring output by industry, are available from the US Bureau of Economic Analysis (BEA).

NAICS is a hierarchical system and the top level includes 11 "super sectors" grouped into those that are Service-Providing and Goods-Producing:

### Service-Providing

- Trade, Transportation and Utilities
- Information
- Financial Activities
- Professional and Business Services
- Education and Health Services
- Leisure and Hospitality
- Other Services
- Public Administration

### Goods-Producing

- Natural Resources and Mining (including agriculture and fishing)
- Construction
- Manufacturing

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<sup>1</sup>[www.logisticsmgmt.com/images/site/LM1205\\_TopPorts.pdf](http://www.logisticsmgmt.com/images/site/LM1205_TopPorts.pdf)

The following sections provide an overview of Seattle’s employment for these economic sectors including historic changes in employment levels and the extent to which the sector generates freight. Later sections provide additional details for economic sectors that are high freight generators.

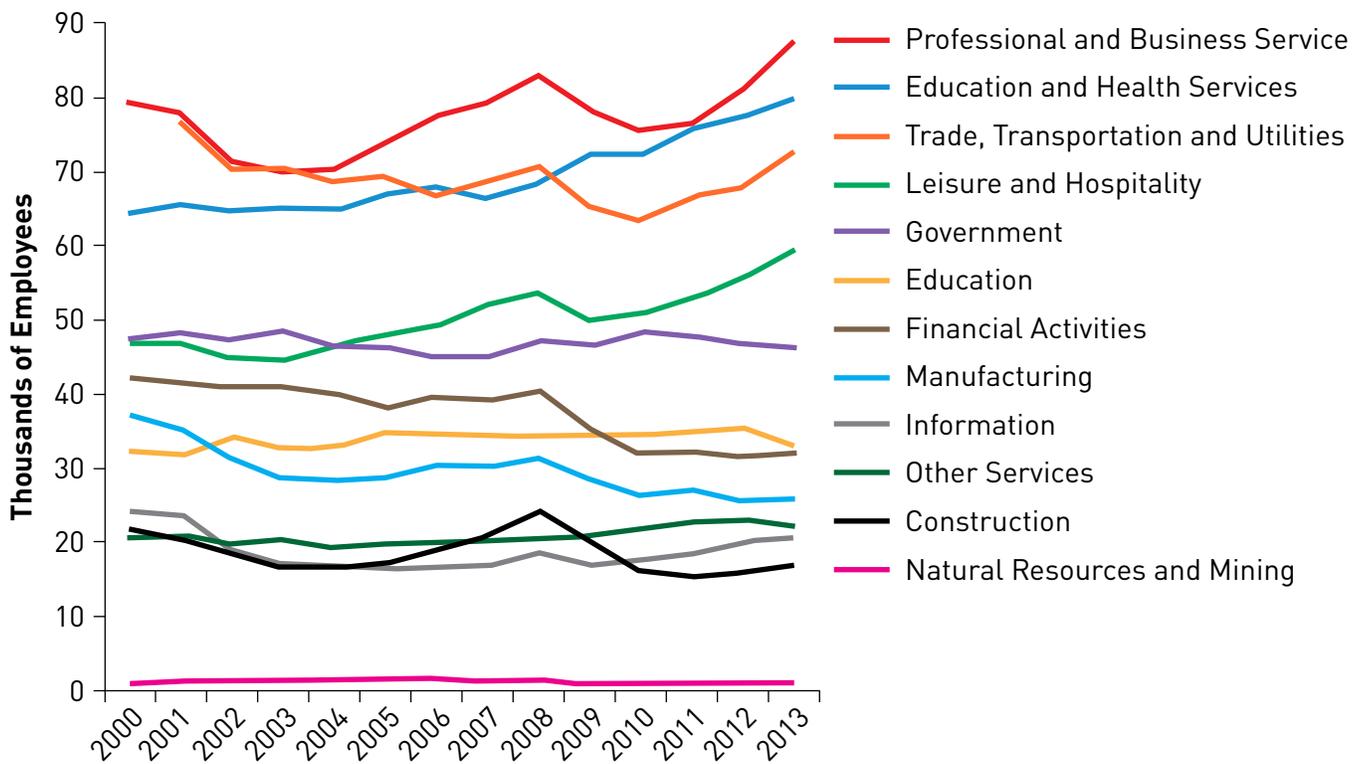
## 2.2 SEATTLE’S TRENDS IN EMPLOYMENT BY MAJOR SECTOR

Looking at employment over more than a decade, Seattle’s top six largest industries are service-providing: professional and business services; education and health services; trade transportation and utilities; leisure and hospitality; government; and financial activities. Again, due to the Port and related industries,

trade plays a big role in the economy. Seattle had the 15th highest trade value of US metropolitan areas in 2010.<sup>2</sup>

According to data from the Puget Sound Regional Council, as shown in Figure 1 below, four of the top six sectors experienced downturns during the Great Recession (Dec. 2007 to June 2009): professional and business services; trade, transportation and utilities; leisure and hospitality; and financial activities. While the first three have shown a recovery, employment in financial activities has been flat from 2010 to 2013. Government employment has remained relatively flat over the past decade but has declined slightly in 2011 to 2013.

FIGURE 1. SEATTLE’S EMPLOYMENT BY MAJOR ECONOMIC SECTOR



Source: Puget Sound Regional Council and Parsons Brinckerhoff analysis

<sup>2</sup>Adie Tomer, Robert Puentes, and Joseph Kane, Metro-to-Metro: Global and Domestic Goods Trade in Metropolitan America (Brookings, October 2013)

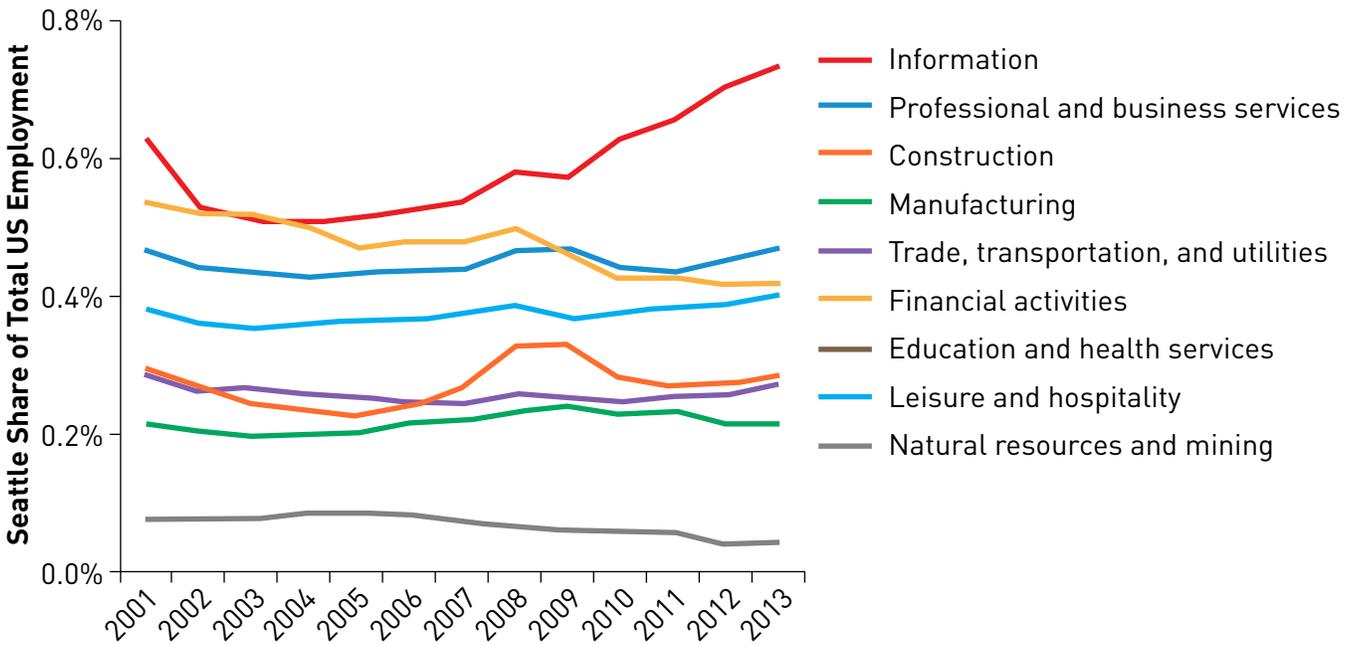
Trends in other industries include:

- Manufacturing employment grew in pre-recession years, but dropped during the recession and has declined slightly since then.
- Employment in other services and information sectors has shown relatively steady growth over the last decade.
- Construction employment is among the most cyclical of industries, peaking in 2008, dropping sharply in 2009-2010 and rebounding slightly in 2012 and 2013.
- In natural resources and mining, which includes agriculture, forestry and fishing, employment is very small and has been declining. Note that fish processing, which has substantial employment in Seattle, is included in manufacturing.

As summarized above, employment dropped sharply during the Great Recession in half of Seattle’s top-level industries. Of course this decline is not unique to Seattle, this economic decline occurred throughout the nation.

Another useful view of Seattle’s major economic sectors, as shown in Figure 2, is how the City’s industries fared relative to the rest of the country. This view also illuminates which industries are especially concentrated in Seattle (and which are not). Specifically, Figure 2 displays Seattle industry shares of US employment and how these shares have changed over time. In this view, it can be seen that the information sector has grown rapidly while the financial activities sector has been in decline relative to the rest of the US. This view also illustrates that Seattle fared better than the rest of the country in construction employment and manufacturing. Slight share growth has occurred in both trade, transportation and utilities and leisure and hospitality. Seattle’s economic growth relative to the nation has benefitted primarily in the newer information sector, where both numbers of employees and Seattle’s share of the US total have grown while in financial services there have been declines in number of employees and shares of the US total.

**FIGURE 2. SEATTLE’S SHARE OF TOTAL US EMPLOYMENT BY MAJOR ECONOMIC SECTOR**



Source: Puget Sound Regional Council and Parsons Brinckerhoff analysis

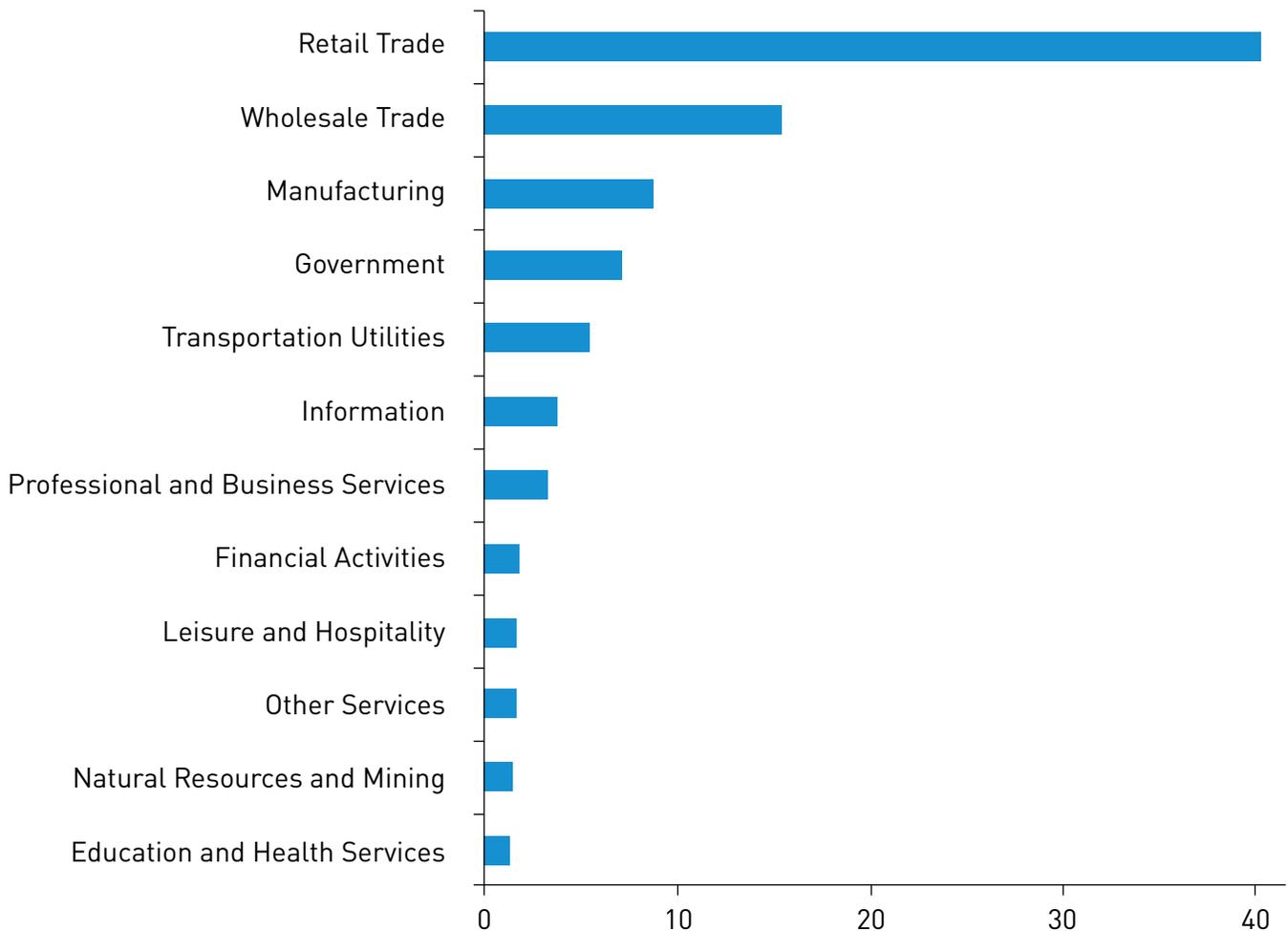
### 2.3 FREIGHT GENERATION

One of the primary goals of this document is to connect economic activity to freight. Since different industry sectors vary dramatically in how much freight they generate, the question is how to measure these differences. To address this, information from the United States Input-Output (I-O) Accounts produced by the US Bureau of Economic Analysis (has been used to develop a national freight generation measure. This information is relatively comprehensive and up to date, with 2007 data released in December 2013. The I-O accounts provide total value, for each industry, on how much input from other industries

is required to produce the output for the industry in question. This information covers all products and services from raw materials to services and all industries including government services.

The freight generation measure adopted here is the value of trucking plus warehousing and storage services used by each industry. Figure 3 displays this information for the top level industry sectors discussed above. Details for subsectors of Trade, Transportation and Utilities, which is a huge employer in Seattle, are broken out given their large size.

**FIGURE 3. UNITED STATES INDUSTRY USE OF TRUCKING AND WAREHOUSING SERVICES (\$BILLIONS)**



Source: US Bureau of Economic Analysis and Parsons Brinckerhoff Analysis

### **Top National Freight-Generating Industries**

Retail and wholesale trade are high freight-generating industries along with manufacturing, the principal goods-producing industry. These three sectors are the “Big Three” freight-generating industries. They are addressed in more detail in the following section (section 3.0) on freight-generating industries. The next three major industry sectors – government; transportation and utilities; and information—are all relatively low freight generators.

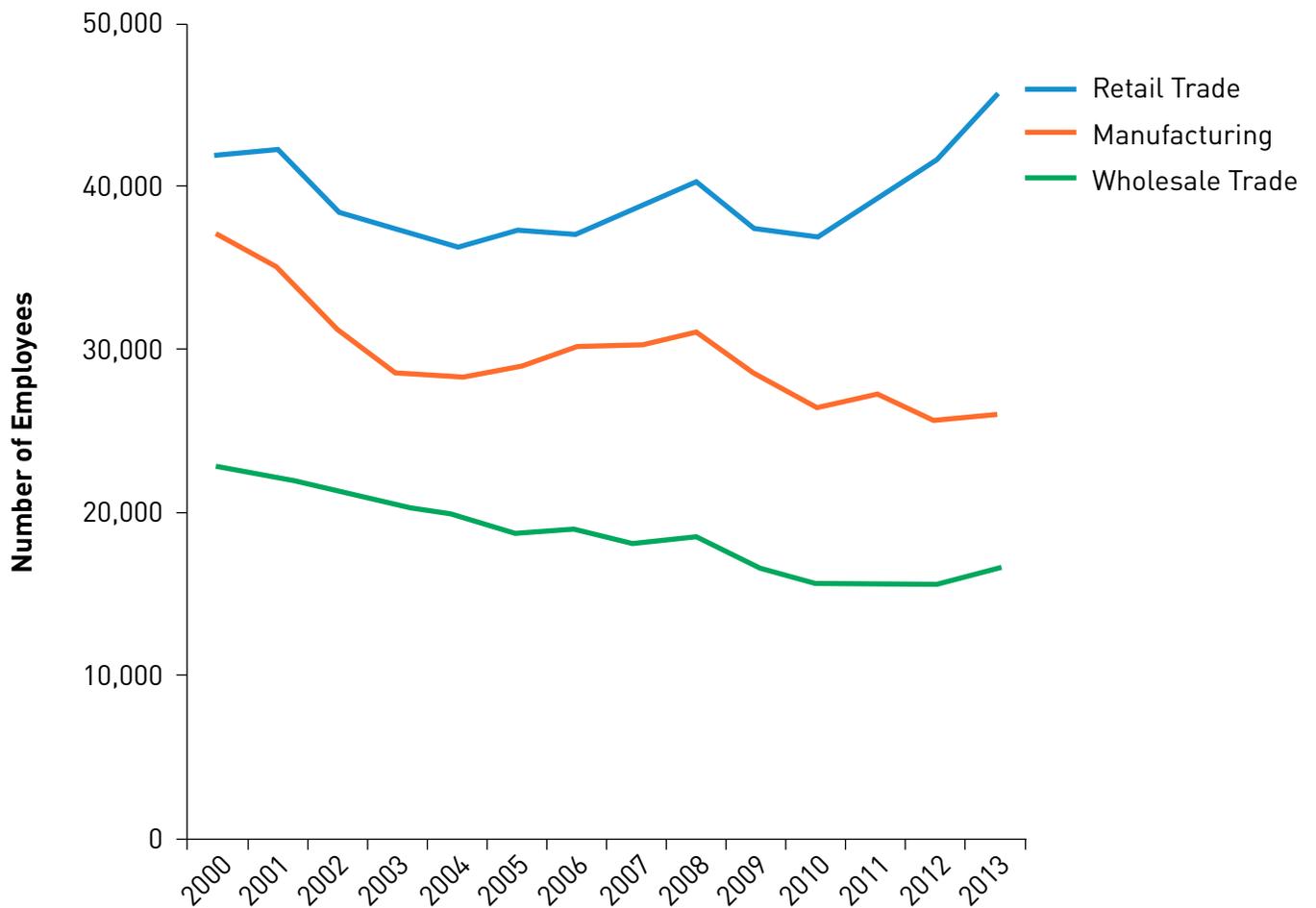
- Nearly half of government use of trucking and warehousing is in defense with most of the rest occurring in state and local general government. Thus the freight generation of government may vary widely by region. The Seattle metropolitan area, with major military facilities based in Pierce, Snohomish and Kitsap Counties, likely generates more government-related freight than most metropolitan areas and Seattle may therefore have more government related freight moving through it due to the proximity of these facilities.
- Transportation and utilities (excluding trucking and warehousing) are low freight generators since the principal industry subsector using trucking and warehousing is scenic and sightseeing transportation (e.g. tour buses or charter boat fishing) and transportation support where trucking and warehouse use may not be freight related.
- The information industry is a relatively low freight generator, generally producing information in various forms rather than volumes of goods. Trucking and warehousing services comprise 0.2% of information industry output according to the BEA I/O table data. Within the information industry, trucking and warehousing services account for a relatively high percentage of total output in the newspapers (0.7%) and periodicals (0.8%) subsectors where publishing does involve manufacturing processes using materials including inputs of paper.

The remaining major industry groups of professional and business services; financial activities; leisure and hospitality (encompassing arts, entertainment and recreation as well as accommodation and food services and drinking places); other services; natural resources and mining; and education and health services are all very low freight generators.

# 3.0 FREIGHT GENERATING INDUSTRIES

This section provides additional details for the top freight-generating industries—retail trade, manufacturing and wholesale trade—including the importance of freight within each sector and the types of products transported. Due to growth in the retail trade sector, total employment for these three freight generating sectors has grown from 2009 to 2013 by about 10% (from 80 to 88 thousand employees).

**FIGURE 4. SEATTLE'S EMPLOYMENT IN FREIGHT GENERATING INDUSTRIES (NUMBER OF EMPLOYEES)**



Source: Puget Sound Regional Council and Parsons Brinckerhoff analysis

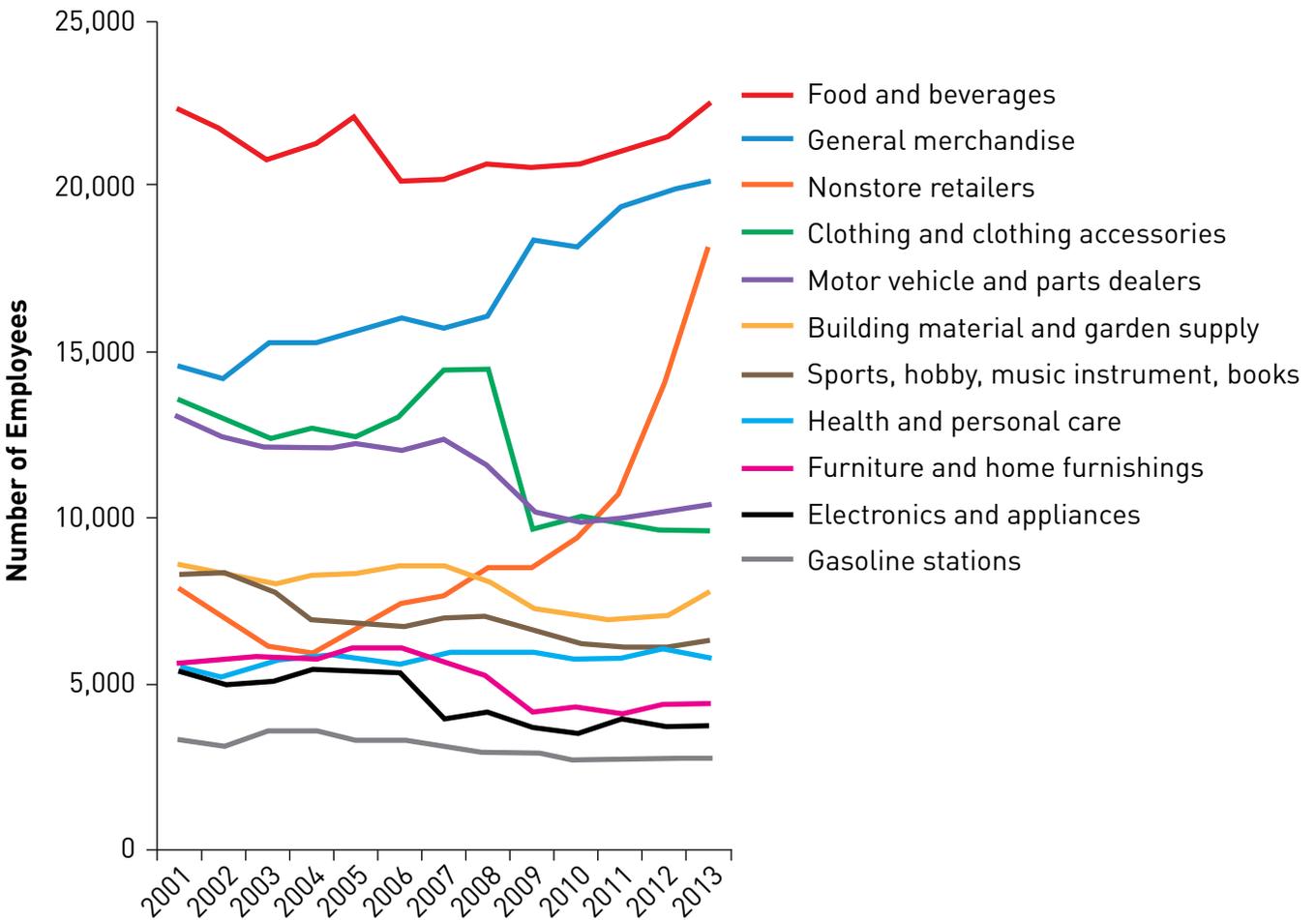
### 3.1 RETAIL TRADE

Retail trade is one of Seattle’s biggest economic sectors and is also the largest freight-generating industry sector. Retail trade’s use of trucking and warehousing represents a very high 3.4% share of total retail trade industry output according to the US Input-Output data described earlier (compared to 0.1% for manufacturing and 1.2% for retail trade). Within the overall retail trade sector, two subsectors’ use of trucking and warehousing as a share of total output is especially high. For general merchandise stores, this share is a very high 7.2% and for

food and beverage stores it is 4.6%, indicating the importance of freight transportation services and urban goods delivery in these industry subsectors.

Retail sector freight is generated by goods moving from distribution centers and warehouses to retail stores. This freight is almost universally carried to stores by truck. A view of the types of retailers and products transported is shown in Figure 5 that displays retail employment at the 3-digit NAICS code level for King County Washington (to allow a view of more detailed industry data).

**FIGURE 5. RETAIL TRADE EMPLOYMENT IN KING COUNTY WASHINGTON**



Source: US Bureau of Labor Statistics and Parsons Brinckerhoff analysis

A summary of historic trends and product categories (by category of retail store), as shown on Figure 5, is as follows:

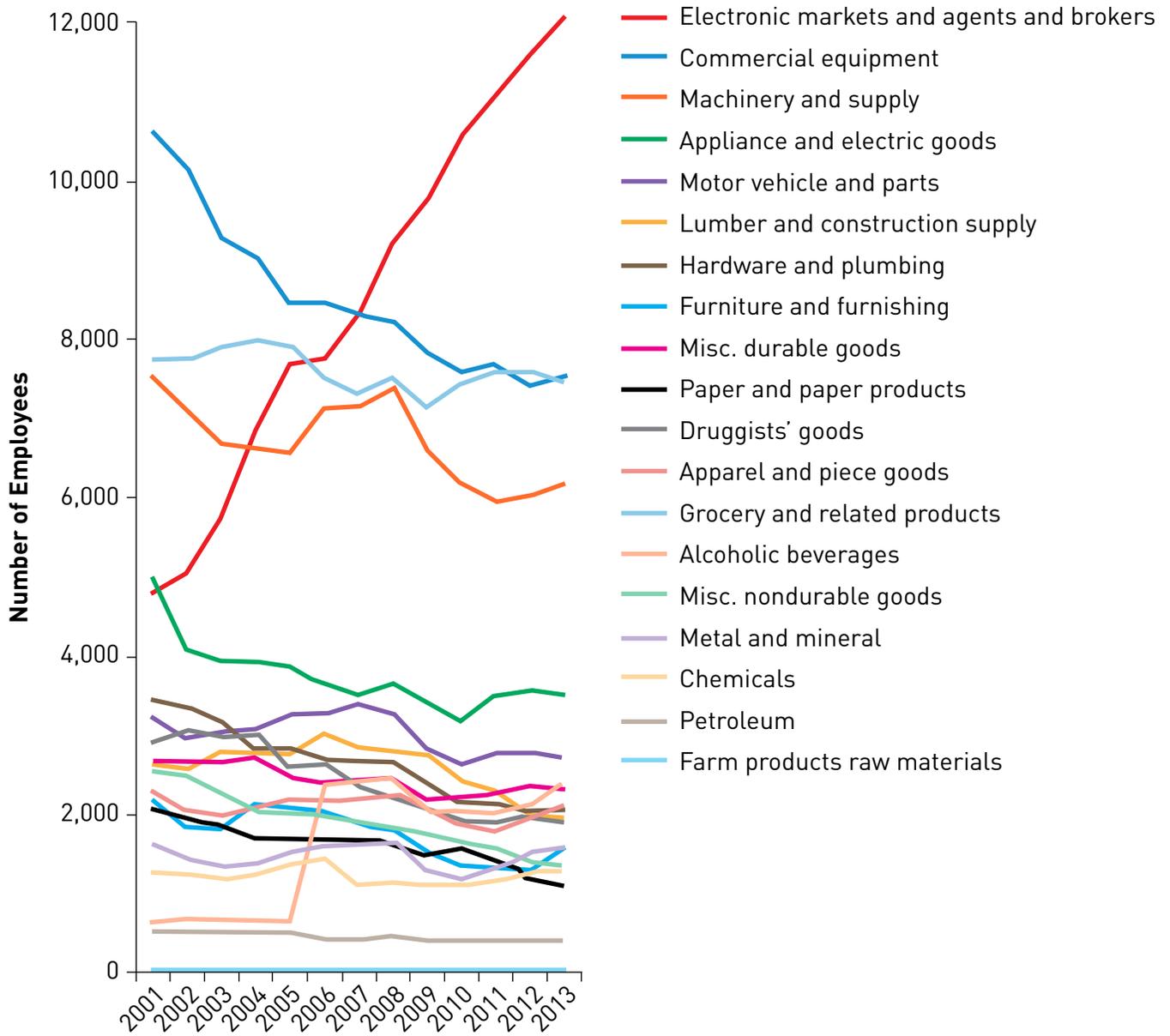
- Food and beverage is the largest of the 3-digit retail trade industries. Most employment is in grocery stores, but the category also includes specialty food stores and beer, wine and liquors.
- General merchandise stores include department stores which account for a majority of employment in the sector and other general merchandise stores.
- The fastest growing retail trade type is non-store retailers where employment has skyrocketed since 2009. This industry category principally includes electronic shopping and mail-order houses, but also vending machine operations and direct selling establishments. Employment at Seattle-based Amazon.com falls into this category.
- Employment in clothing and accessories stores dropped sharply during the Great Recession as personal consumption and inventory levels both declined.
- Employment in building materials and supplies stores and furniture and home furnishings stores both declined during the Great Recession.
- Health and personal care retailing, related to consumer spending on health care products, is one of the few retail sectors in which employment grew steadily during the Great Recession.

### 3.2 WHOLESALE TRADE

Wholesale trade includes merchant wholesalers that supply products across a broad spectrum of durable and nondurable consumer and industrial products. The industry's use of trucking and warehousing ranks it as the number two industry in terms of freight generation. The portion of total wholesale trade industry output represented by trucking and warehousing is a relatively high 1.2% (compared to manufacturing at 0.1%).

To provide a local view of the mix of products supplied by wholesalers, Figure 6 below displays employment in wholesale industries at the 4-digit NAICS code level. These products are delivered to both retail stores and businesses and the figure shows that products range from consumer durable goods, such as motor vehicles and parts, appliances, and industrial materials; to non-durables, such as food, apparel and gasoline. The rapidly growing employment line rising to the top of the figure is the relatively new wholesale electronic markets and agents and brokers category. This industry includes wholesale trade agents and brokers for all durable and nondurable goods.

**FIGURE 6. WHOLESALE TRADE EMPLOYMENT IN KING COUNTY WASHINGTON**



Source: US Bureau of Labor Statistics and Parsons Brinckerhoff analysis

## Emerging Trends in Retail and Wholesale Supply Chains

Two major shifts in employment patterns in retail and wholesale trade noted in sections above highlighted dramatic shifts that are occurring in supply chains and logistics. The first was the significant increase in non-store retailers seen in Figure 5, above, in section 3.1. The second was the massive rise of electronic markets noted in the section on wholesale trade (see Figure 6). These are both symptomatic of major changes in supply chains.

The retail sector is witnessing a shift from an old siloed perspective that separated e-commerce from brick-and-mortar store operations to a more comprehensive focus on omni-channel retail.<sup>3</sup> Within this new omni-channel orientation, considerable attention has been paid to the consumer end of things, as companies try to create a customer experience that involves the advantages of both the online and in-store platform. E-commerce providers are offering same-day or next-day deliveries to compete with the immediacy of in-store purchasing. At the same time, traditional retailers are developing a more digital relationship to their in-store customers, through use of cell phone apps and digital tracking.

Perhaps even more importantly, the omni-channel phenomenon is motivating a comparable shift in logistics approaches that combine logistics operations for both direct-to consumer and store needs. For example, Macy's has begun operating 500 of its stores as mini-distribution centers for e-commerce.<sup>4</sup> Home Depot is developing a nationwide network of direct fulfillment centers to process orders for both home delivery and pickup at their stores. Combined distribution approaches and merging

of the fulfillment cycle can be used to maximize customer flexibility and offer a competitive advantage. Already customers can order projects online and pick them up in stores. Alternately, a customer might view and purchase a product in stores, but then have the product delivered to their home on the same day.

Apart from the omni-channel nature of logistics requirements, there are other trends in retail distribution that are related to the rise of e-commerce. These include:

- increasing need to process and redirect returned goods;
- growing capacity requirements for peak demand periods; and
- a shift of distribution center networks to be closer to customer markets.

Beyond the trend towards rapid direct-fulfillment, retail, along with other major industries, is also experiencing an independent, and at times, conflicting trends towards "green logistics." Companies such as Dell and Recreational Equipment Inc. (REI) have implemented comprehensive programs that involve reduced packaging, materials recycling, load optimization, and modal shift strategies to reduce the environmental impacts of the supply chain. Finally, there are shifts in distribution centers toward increased automation and toward the incorporation of final-stage manufacturing/value-added functions into the fulfillment process. See sustainable memo for more information.

A telling analysis by Tompkins International compared the size of Amazon.com to Wal-Mart, usually viewed as the biggest company in retail. Wal-Mart buys goods for its own account and recognizes 100 percent of the revenue at sale, in keeping with normal accounting practice. Amazon

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<sup>3</sup>Omni-channel retail provides the consumer with the ability to shop through many possible methods, including mobile internet devices, computers, brick-and-mortar, television, radio, direct mail, and catalog.

<sup>4</sup>[www.technologyreview.com/news/520786/its-all-e-commerce-now/](http://www.technologyreview.com/news/520786/its-all-e-commerce-now/)

does the same with the goods it buys and sells, but Amazon also operates a marketplace, where products from vendors are purchased via Amazon and shipped from the vendor. Amazon recognizes fees for the service, but not the full value of the goods, again in keeping with normal accounting practice. However if this difference is corrected for and the companies are compared in terms of the dollars they transact in the marketplace, the firms are about the same size and Amazon is growing faster. This insight helps explain the attention Amazon attracts in the retail sector and why, for example, its push into same day delivery – an attempt to match the convenience of storefront purchases – is a source of competitive concern. Tompkins believes that Amazon’s expansion into groceries and newspapers can be best explained by its desire to control the delivery channel to consumer homes and the need for delivery density in same day delivery corresponds to that.<sup>5</sup>

A few further points from Tompkins’ Supply Chain Consortium for the retail sector are outlined below. They show the signs of emphasis on time to market, as proximity is valued and more distribution centers deployed, as well as the blurring of lines with e-commerce:

- The trend is toward moderate growth in master distribution centers as opposed to regional distribution centers. The database shows an average of two regional distribution centers two years ago per company and today this average is over three regional distribution centers. By contrast master distribution centers went from an average of seven facilities two years ago to 10 facilities today.
- There is also significant evolution of the regional distribution facilities to operate as fulfillment centers for e-commerce businesses or portions of traditional product retail companies.

- Key criteria for determining different distribution center locations include the following:
  - Conform to quota limitations or minimize import duties
  - Proximity to customers/stores for shorter order fulfillment times
  - Inventory segregated by sales channel
  - Access to foreign trade zones

A further trend affecting large companies, including large retailers and e-commerce entities, is efforts towards “green logistics”. Green logistics has three primary dimensions, some of them reflecting a related business interest in energy and fuel economy, and opportunities to reduce transportation costs generally through logistical efficiencies:<sup>6</sup>

- Product design and production planning: production process, near sourcing strategies, application of environmental standards
- Physical distribution: better consolidation of loads, modal shift, fuel consumption improvements to vehicle fleets
- Materials management: more efficient packaging, recycling (“reverse logistics”), turning waste into inputs

These factors are affecting how supply chain networks are constructed and managed, and the types of support they require. However, challenges to green logistics include:<sup>7</sup>

- Door-to-door and just-in-time delivery practices tend to require truck transportation as the mode best able to meet their requirements, despite its relatively higher air emissions

<sup>5</sup>“Reshoring, Rightshoring – Where is it Headed?” Tompkins International recorded by Stifel, Nicolaus & Company, Inc., 12/13/14.

<sup>6</sup>[http://people.hofstra.edu/geotrans/eng/ch8en/appl8en/logistic\\_green\\_dimensions.html](http://people.hofstra.edu/geotrans/eng/ch8en/appl8en/logistic_green_dimensions.html)

<sup>7</sup><http://people.hofstra.edu/geotrans/eng/ch8en/appl8en/ch8a4en.html>

- Reliability issues associated with “greener” modes, such as the “debilitating service issues” suffered by railroads in the past year, exemplified by prolonged delays in the national hub in Chicago<sup>8</sup>
- Inventory reductions mean inventories are now carried by the transportation system
- E-commerce demands for quick turn-around times

### **Impact of Supply Chain Trends on Freight in Seattle**

Retail and wholesale trade together represent the great majority of freight generated in the Seattle economy, outweighing all other sectors combined in terms of their use of trucking and warehousing services relative to total output. Retail trade, and the wholesale trade that supports it, is what allows Seattle consumers to purchase the goods they need, from cars, furniture, and electronics to food, apparel and gasoline. Simply put, if you buy something in a store, it likely got there by one or more trucks.

As described above, there are profound changes occurring in the supply chains and logistics systems used to get goods to consumers including electronic markets and direct delivery. The trends are still emerging and it will take time before the full impacts are clear. However, while the patterns of truck transportation services and the size of trucks employed in these services may change, the total volume of goods trucked is likely to rise in proportion to increasing consumer demands for goods, especially as the population of Seattle continues to grow. Overall, the trends in warehousing and distribution are likely to result in an increase in shorter truck trips, with potential for at least some of these to take place in smaller vehicles.

### **3.4 MANUFACTURING**

Manufacturing is the second largest of the major freight-generating industries in terms of Seattle employment (see Figure 4), but the third largest industry in terms trucking and warehousing services’ share of total industry output (as shown above in Figure 3). In aggregate, the sectors’ use of these services at the national level actually represents a very small 0.1% of output, an order of magnitude less than the much larger shares in retail trade (3.4%) or wholesale trade (1.2%).

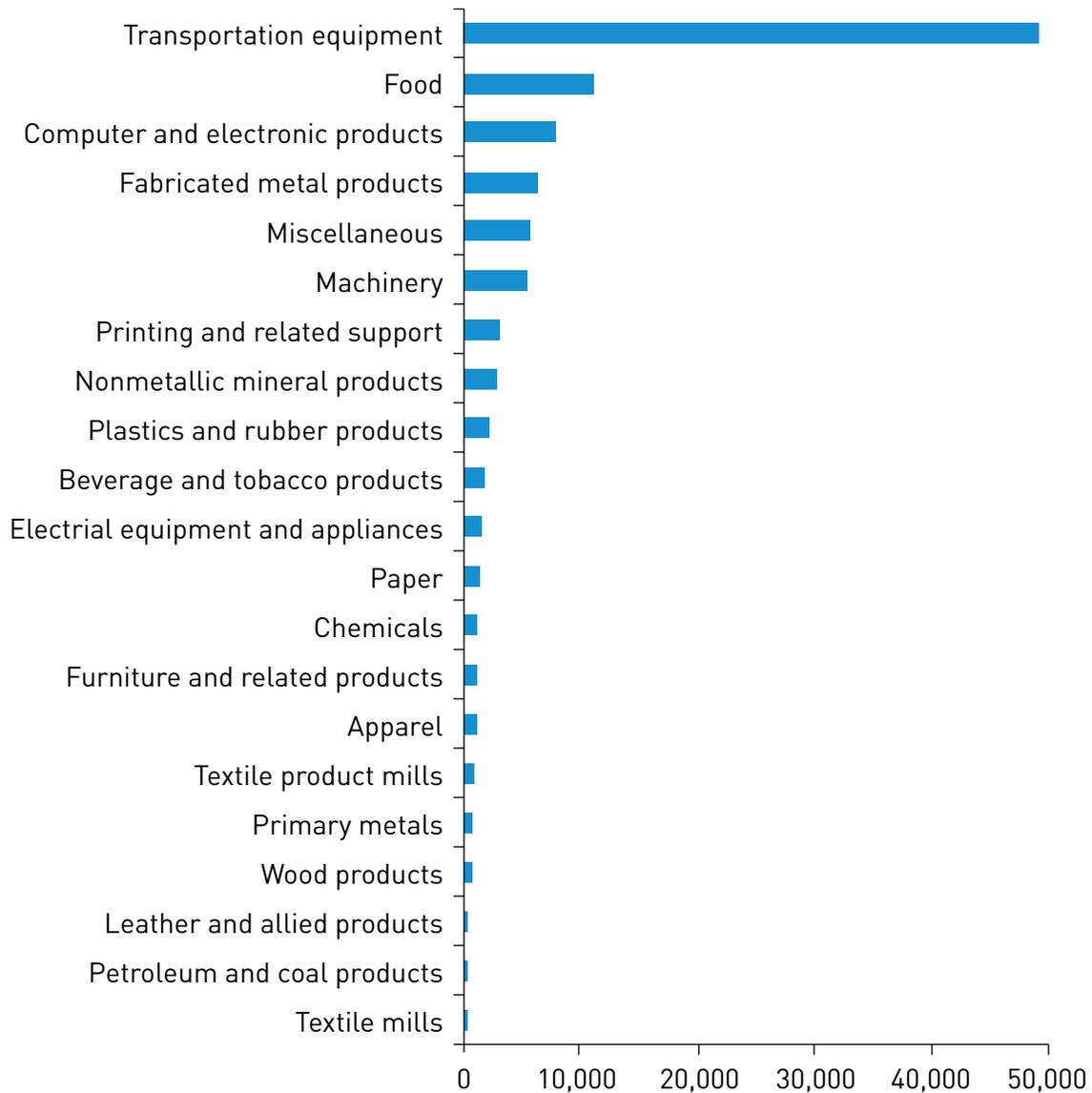
Outputs of manufacturing processes include products ranging from industrial materials such as primary metals; intermediate products, e.g. fabricated metals; and final goods including airplanes, food and apparel. Each of these products represents a freight output transported to local markets, US regional markets or exported. Figure 7 displays 2013 manufacturing employment in King County by 3-digit NAICS code. By far the largest category, transportation equipment (automotive, aerospace, railroad and ships) includes Boeing and its local suppliers as well as Paccar and local shipyards.

Manufacturing also involves inbound freight including raw materials and intermediate products used as inputs to the manufacturer’s products as well as machinery and other goods used in the manufacturing process.

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<sup>8</sup>“Key Takeaways from the Rail Trends Annual Conference”, Stifel, Nicolaus & Company, Inc, 11/24/14

**FIGURE 7: 2013 MANUFACTURING EMPLOYMENT IN KING COUNTY**



Source: US Bureau of Labor Statistics and Parsons Brinckerhoff analysis

**Conclusion**

Manufacturing represents the second largest of Seattle’s major freight generating economic sectors. However, the final goods that are manufactured, from airplanes to seafood, are more likely to be destined to markets in the US or overseas than headed to local consumption. Along with many service industries manufacturing represents the direct “exports” to the US and overseas that help drive Seattle’s economy and jobs.

**3.5 REGIONAL CONCENTRATIONS OF FREIGHT GENERATING INDUSTRIES**

**Economic Sectors’ Geographic Distribution within Seattle**

Figure 8, below, shows the total concentration of employment within Seattle by census tract.

As described in the previous sections, the top freight generating sectors in Seattle are retail trade, wholesale trade, manufacturing, and trade. The employment concentrations of these Top Three freight generating industries are shown by census tract in figures 9-11, below.

**FIGURE 8: TOTAL EMPLOYMENT IN SEATTLE BY CENSUS TRACT**

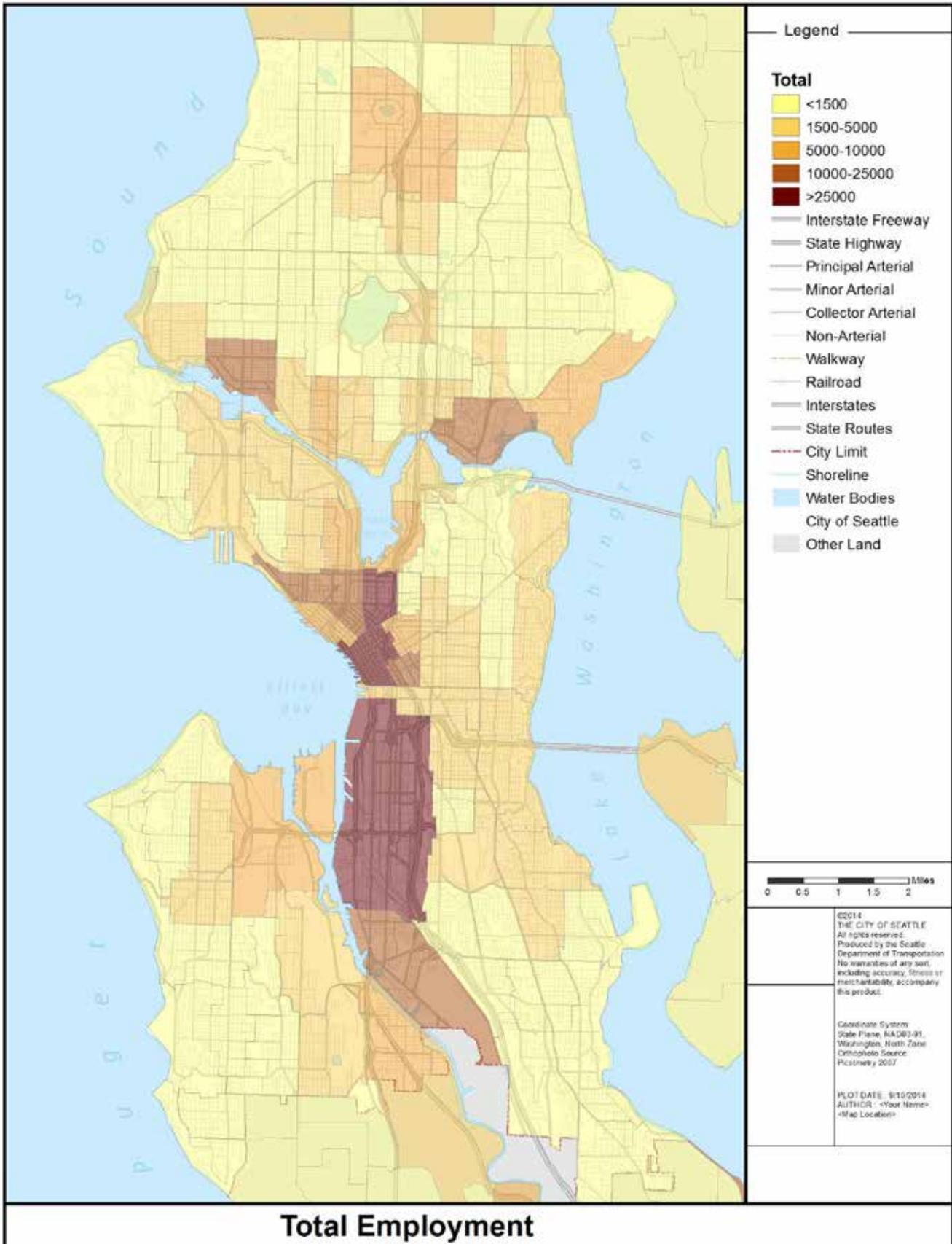


FIGURE 9: RETAIL EMPLOYMENT IN SEATTLE BY CENSUS TRACT

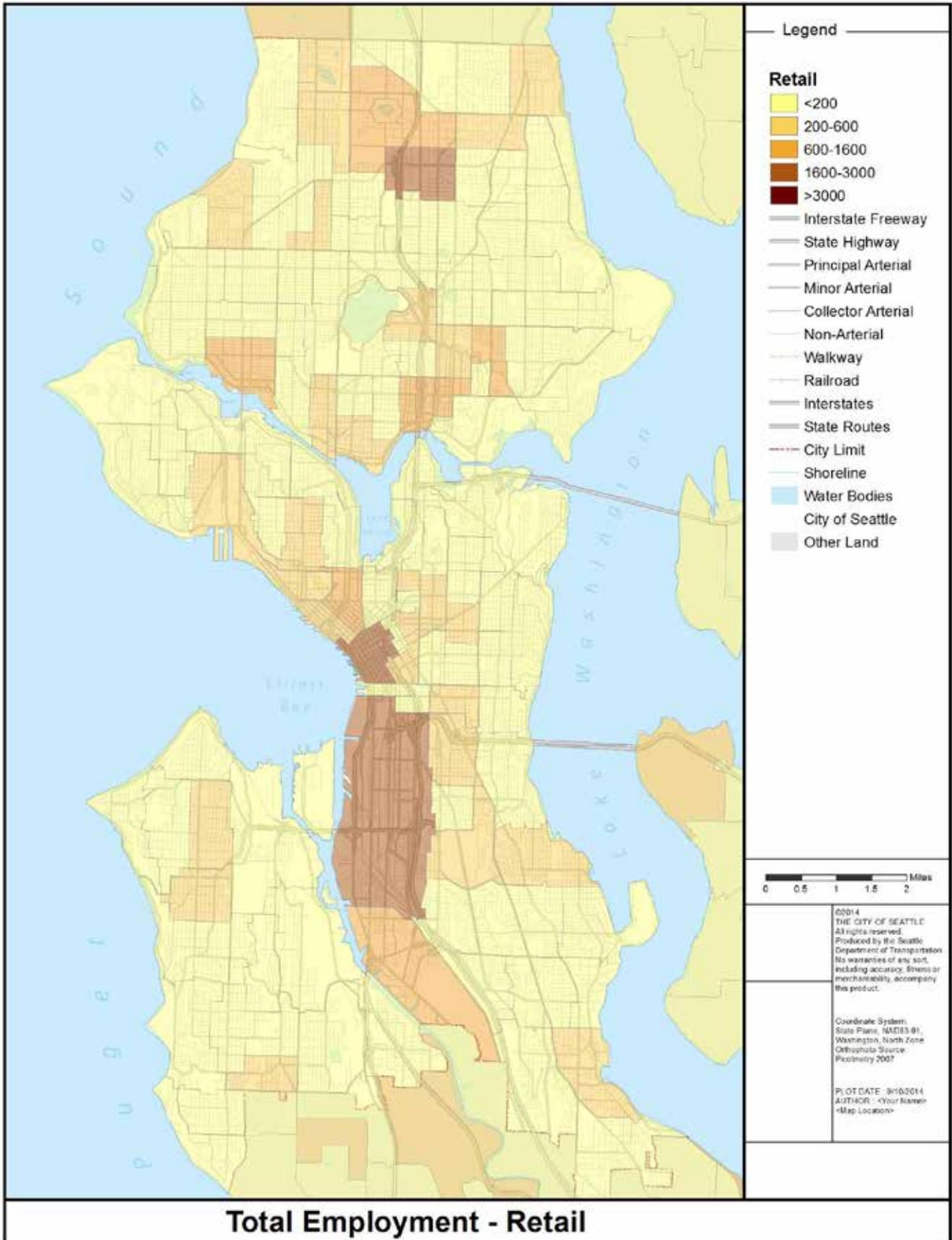
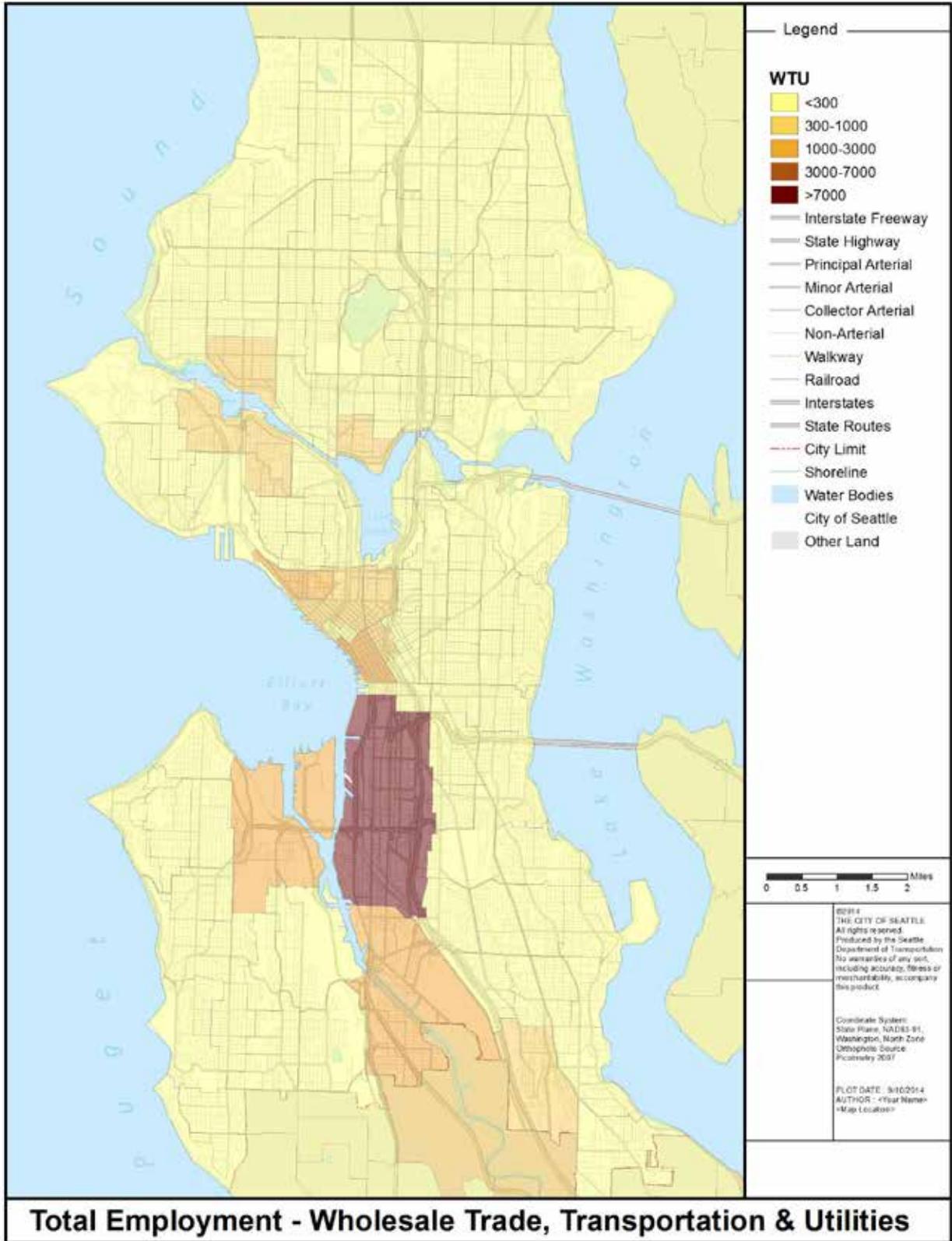
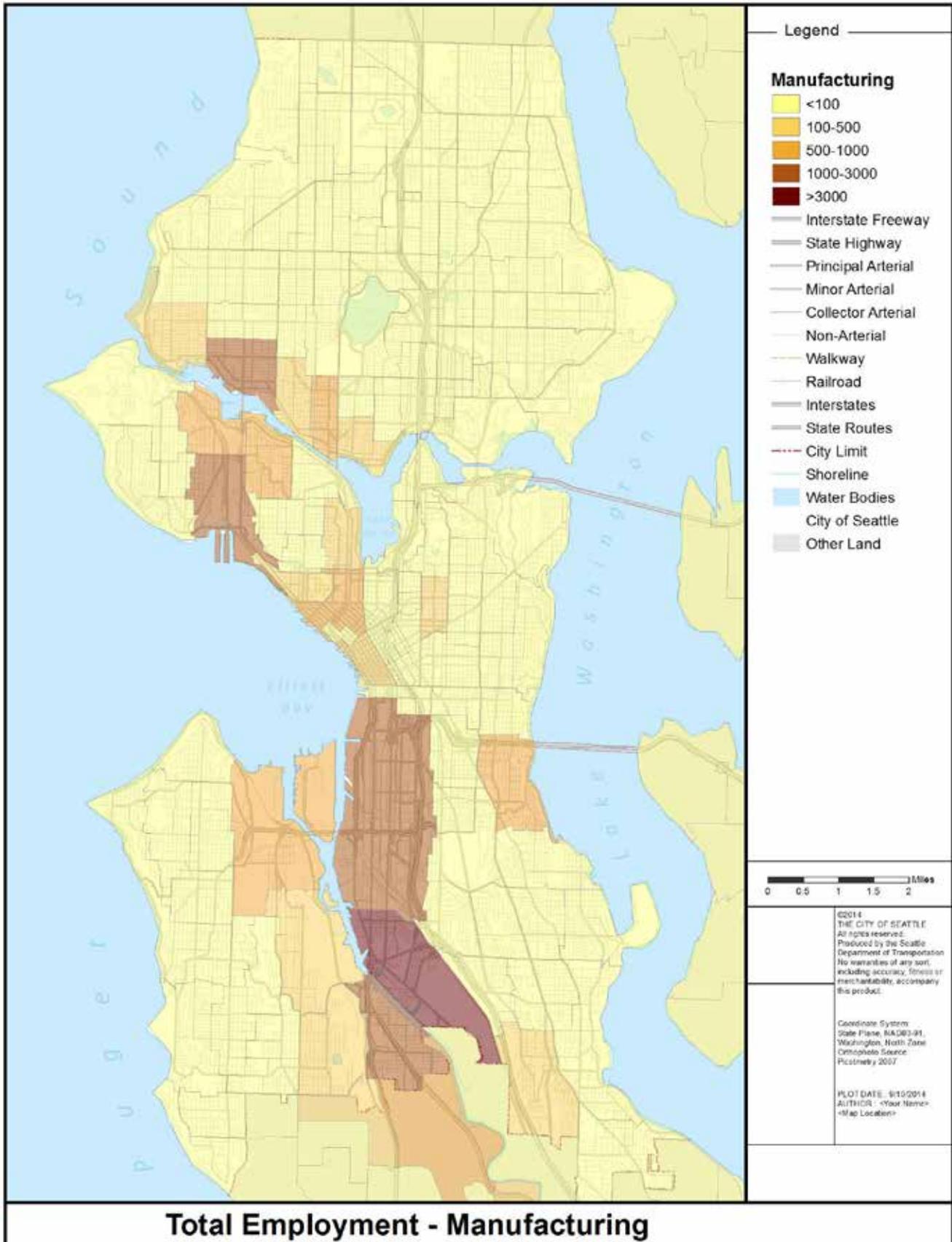


FIGURE 10: WHOLESAL TRADE, TRANSPORTATION AND UTILITIES EMPLOYMENT BY CENSUS TRACT.<sup>9</sup>



<sup>9</sup>Puget Sound Regional Council

FIGURE 11: MANUFACTURING EMPLOYMENT BY CENSUS TRACT.



As shown in figure 9, the retail sector is spread throughout the city with clusters in the urban and neighborhood centers. Retail movements within the city typically occur in small single-unit trucks that make multiple stops along their delivery route. The start and end of the delivery trip are most affected by local and regional congestion, but intermediate stops are often close together and delays due to congestion are limited. The size of delivery trucks are relatively maneuverable in the urban environment. One common challenge is a lack of on-street loading space, particularly in the older retail districts where shops do not have back-of-house loading areas.

As shown in figures 10 and 11, the wholesale, manufacturing and trade sectors are concentrated in the Duwamish and Ballard-Interbay Manufacturing and Industrial Centers (Duwamish MIC and BINMIC, respectively). Truck trips associated with wholesale, manufacturing and trade sectors are more likely to be made in larger trucks that move longer-distance using the regional interstate or highway network. These trips then use city arterials and local streets for the final segment of the trip. Businesses located in the BINMIC are a further distance from Interstate 5 (I-5) and SR 99, so a higher proportion of trip travel time can be affected by local congestion or physical constraints to these larger vehicles. In the Duwamish MIC, some of the area's major access points to I-5, I-90 and SR 99 also serve downtown commuters as well as event traffic destined to the area's two major league sports stadia. This leads to frequent conflicts with general traffic congestion during rush hour peaks and around daytime sporting events.

In sum, freight generating industries are spread throughout the City of Seattle, with particular concentrations in and around the downtown core. This makes for challenges as high volumes of trucks flow to and from the business establishments in these highly developed and congested areas. These issues will be further explored in future memos.

### **3.6 EMPLOYMENT IN TRANSPORTATION SERVICES**

While transportation services are typically a relatively small freight generator, the presence of the Port makes it more significant in Seattle. Transportation services includes industry subsectors that move the freight generated by other industries (and also provide passenger transportation services). As shown in Figure 12, King County transportation services employment accounted for 4.0% of total county employment in 2013, higher than the 3.8% share for the US as a whole.

While the county had a 0.9% share of total US private employment in 2013, the shares of employment directly related to the Port of Seattle were much higher. Reflecting the importance of the Port, the county has a very high relative concentration in water transportation services with 4.9% of total US private employment and a 2.4% share of support activities for water transportation. The 2.2% share of freight transportation arrangement services is also more than double the overall average county employment share of 0.9%.

**FIGURE 12: 2013 FREIGHT-RELATED TRANSPORTATION SERVICES EMPLOYMENT IN THE US AND THE SEATTLE REGION  
(NAICS INDUSTRIES WITHOUT NON-DISCLOSURE LIMITATIONS)**

	<b>US Total</b>	<b>King County</b>	<b>County Share of US</b>
<b>Total Private</b>	<b>112,958,334</b>	<b>1,041,080</b>	<b>0.9%</b>
48-49 Transportation and warehousing	4,246,329	41,296	1.0%
481 Air transportation	448,618	9,914	2.2%
483 Water transportation	65,988	3,230	4.9%
4841 General freight trucking	941,184	4,202	0.4%
4883 Support activities for water transportation	92,095	2,196	2.4%
4885 Freight transportation arrangement	187,720	4,063	2.2%
493 Warehousing and storage	708,067	2,905	0.4%

The Port, and its impact on freight movement in and through Seattle, is discussed in the next section.

# 4.0 THE ECONOMY BEYOND SEATTLE

## 4.1 SEATTLE REGION PORTS

Economic factors outside the borders of Seattle that affect freight in the City include US demand for goods that drives import volumes and US production that results in exports moving through the region's ports and airport. This section focuses on the freight movement through the Ports. Section 7 of this report discusses the economic implications of these movements.

### **International Imports Moving through the Ports of Seattle and Tacoma**

Freight moving through ports affects the City of Seattle in different ways. Port and airport employment, that supports the movement of international cargos, are included in the transportation and utilities industry sector and is discussed further in Section 5.2.

The Ports of Seattle and Tacoma represent a large gateway for international waterborne trade, especially for imported goods from Asia and the rest of the world. Together the two ports represent the third largest gateway for containerized goods in the US.<sup>10</sup> Much of the containerized cargo imported

through these ports is transferred to and from rail at or near the port terminals. The destinations noted in Figure 13 below provide an indication of the direction and route goods take out of Seattle. For example, only 8.5% of total rail traffic originating in Washington is destined south to the States of Oregon and California. In comparison much larger shares of rail traffic are destined to Midwest states including Illinois (27.8%) and Ohio (11.4%). Cargo destined to or originating in the Pacific Northwest, including agricultural products and supplies or products from manufacturing businesses, are mostly transported direct by truck.

The table below displays total estimated imports from all world regions moving through the Seattle metropolitan region (principally through the Ports of Seattle and Tacoma) in 2012 according to data from the Federal Highway Administration Freight Analysis Framework (FAF) database. It is noted that about 44% of the Seattle waterborne freight tonnage is transported by "Other and Unknown", which corresponds to pipeline or a non-domestic mode and mainly reflects crude petroleum activity.

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<sup>10</sup>Northwest Seaport Alliance Corporate brochure, [www.nwseaportalliance.com/sites/default/files/NWSA\\_Overview\\_2015.pdf](http://www.nwseaportalliance.com/sites/default/files/NWSA_Overview_2015.pdf)

**FIGURE 13: TOP 20 STATE DESTINATIONS FOR IMPORTS THROUGH THE SEATTLE REGION BY DOMESTIC MODE  
(2012 WATERBORNE IMPORTS IN THOUSANDS OF TONS)**

	Tons (thousands)				State Shares of Total Tons			
	Total	Truck	Rail	Other	Total	Truck	Rail	Other
<b>Grand Total</b>	<b>19,915</b>	<b>10,245</b>	<b>5,864</b>	<b>3,806</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
Washington	9,025	4,890	654	3,481	45.3%	47.7%	11.2%	91.5%
Seattle	7,835	3,776	611	3,448	39.3%	36.9%	10.4%	90.6%
Other	1,190	1,113	43	33	6.0%	10.9%	0.7%	0.9%
Illinois	2,736	983	1,685	69	13.7%	9.6%	28.7%	1.8%
California	1,401	1,010	274	117	7.0%	9.9%	4.7%	3.1%
Ohio	1,102	366	668	67	5.5%	3.6%	11.4%	1.8%
Minnesota	726	511	215	0	3.6%	5.0%	3.7%	0.0%
Oregon	554	321	222	11	2.8%	3.1%	3.8%	0.3%
New Jersey	485	130	354	2	2.4%	1.3%	6.0%	0.0%
Michigan	384	221	163	1	1.9%	2.2%	2.8%	0.0%
New York	373	323	46	4	1.9%	3.2%	0.8%	0.1%
Wisconsin	314	210	99	4	1.6%	2.1%	1.7%	0.1%
Indiana	290	158	129	3	1.5%	1.5%	2.2%	0.1%
Tennessee	243	81	162	0	1.2%	0.8%	2.8%	0.0%
Colorado	223	168	54	2	1.1%	1.6%	0.9%	0.1%
Kentucky	218	121	97	0	1.1%	1.2%	1.7%	0.0%
Arkansas	205	69	135	0	1.0%	0.7%	2.3%	0.0%
Pennsylvania	204	93	106	4	1.0%	0.9%	1.8%	0.1%
Missouri	202	31	170	0	1.0%	0.3%	2.9%	0.0%
Georgia	155	56	96	2	0.8%	0.5%	1.6%	0.1%
Texas	153	80	70	3	0.8%	0.8%	1.2%	0.1%
Iowa	132	18	114	0	0.7%	0.2%	2.0%	0.0%
Other	790	405	350	35	4.0%	4.0%	6.0%	0.9%

As shown in the table, Washington is the largest state destination for imported goods that flow through Seattle region Ports, representing 45% of total waterborne import tons. The Seattle metropolitan region accounts for most of this volume (7.8 out of 9.0 million tons). If the cargo moved by “Other” modes is removed from the total, then 86% of the imported cargo is transported by truck and 16% is transported by rail.

Goods moved by truck include those going:

1. Directly to businesses where the products are used or resold to customers
2. To local wholesalers or distributors serving Seattle or broader Pacific Northwest regions
3. To “transload” centers where containerized goods are unpacked and resorted into larger domestic containers and then moved either by rail or truck to US inland locations.

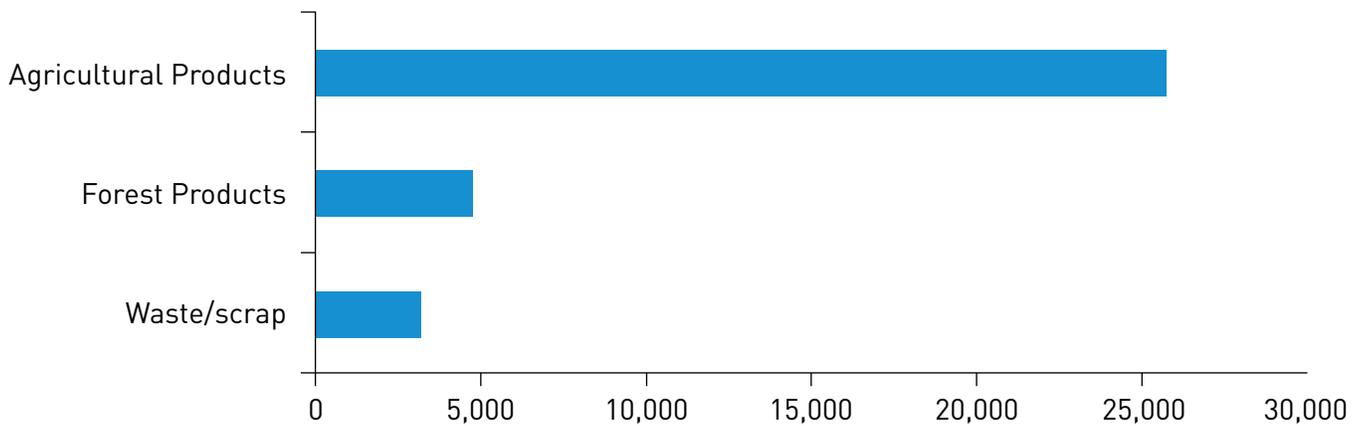
The West Coast states of California and Oregon are also principal destinations of goods imported through the Seattle/Tacoma region and, together, represent 10% of goods imported through the region. Of these goods, the great majority of tonnage is also transported by truck. Midwestern and Northeastern states comprise most of the remaining Top 20 destinations for imported waterborne tons. For the Top 20 states other than Washington, Oregon and California, over half of total tons are transported by rail.

### US Exports through Seattle Region Ports

US waterborne exports through Seattle region ports are dominated by three major commodity groups that represent 84% of total export tons:

- Agricultural products including cereal grains, animal feed and other agricultural products (64% of total tonnage)
- Forest products including wood, newsprint and paper, and wood products (12% of total) and
- Waste and scrap (8% of total)

**FIGURE 14: TOP 3 US WATERBORNE EXPORT COMMODITY GROUPS (THOUSANDS OF TONS IN 2012)**



Source: FHWA Freight Analysis Framework Database and Parsons Brinckerhoff analysis

Washington is the largest state in terms of waterborne export tons flowing through Seattle region Ports accounting for almost half of total exports in 2012 (48%). Trucking is the primary mode of transportation from Washington to ports at 7.9 million tons out of a total of 19 million tons. Of total export tons transported to Seattle by truck, about half originate in Washington.

The large agricultural exporting states of Minnesota and Illinois are the next largest origins with a total of 27% of export tons between the two. However, in contrast to Washington, given the longer distances involved, rail is the primary mode of transportation (both containerized and bulk) with 68% of total tons originating in these two states transported by rail.

**FIGURE 15: TOP 10 STATE ORIGINS OF EXPORTS THROUGH SEATTLE REGION PORTS BY DOMESTIC MODE(2012 WATERBORNE EXPORTS IN THOUSANDS OF TONS)**

					State Share of Total Tons			
	Total	Truck	Rail	Other	Total	Truck	Rail	Other
<b>Grand Total</b>	<b>40,582</b>	<b>17,955</b>	<b>16,886</b>	<b>5,741</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
Washington	19,275	8,854	4,857	5,564	47.5%	49.3%	28.8%	96.9%
Minnesota	6,240	2,246	3,991	3	15.4%	12.5%	23.6%	0.1%
Illinois	4,611	1,184	3,428	0	11.4%	6.6%	20.3%	0.0%
Connecticut	2,589	1,999	590	0	6.4%	11.1%	3.5%	0.0%
Oregon	2,577	1,479	1,023	74	6.3%	8.2%	6.1%	1.3%
California	835	555	277	3	2.1%	3.1%	1.6%	0.1%
Kansas	734	76	658	0	1.8%	0.4%	3.9%	0.0%
Florida	434	419	14	1	1.1%	2.3%	0.1%	0.0%
Ohio	428	155	273	0	1.1%	0.9%	1.6%	0.0%
Nebraska	308	58	250	0	0.8%	0.3%	1.5%	0.0%
Other	2,551	930	1,525	95	6.3%	5.2%	9.0%	1.7%

Source: FHWA Freight Analysis Framework Database and Parsons Brinckerhoff analysis

It should be noted that the exports described here refer to international goods but that domestic goods originating in the Seattle region and the rest of the US represent an important source of goods to the Alaska economy. Similarly, fish and fish products from Alaska that come through Seattle are considered domestic good rather than import. Regardless of its designation, the trade to and from Alaska, which is concentrated in the Ballard/Interbay area, represents an important marine activity in Seattle.

### Summary

The State of Washington is the most important market for both imports through the region’s ports (the destination for 45% of imported goods) and for exports (48% of originating volume). In both cases trucking is the predominant form of transportation.

Trucking is also the primary mode for moving imports to Oregon and California while rail is used to carry the majority of imports to other states.

Agricultural products are the principal products exported through regional ports, with the Midwestern States of Minnesota and Illinois representing the largest origins and rail is the principal mode of transportation.

Despite the use of rail for import and exports to the Midwest and east, the dominance of the western origins and destinations means that trucking plays an essential role in trade through the region. This means that enormous volumes of trucks move in and through the City in order to support the import/export economy.

### 4.2 AIR FREIGHT

Air freight is used to transport goods with very high value or that are otherwise time sensitive. In terms of transportation patterns and impacts on regional freight demand, international and domestic air freight are essentially the same. Inbound cargo from international origins, such as Asia, or domestic origins, such as Alaska, arrives at Seattle Tacoma Airport, is processed at airport air freight facilities and is transported by truck

to beneficial cargo owners or to local logistics facilities or distribution centers which may serve local, regional or even US markets. The reverse patterns occur for air shipments to Asia or Alaska.

The nature of air freight cargo origins and destinations is much different than waterborne cargo. The shipments are generally much smaller and lighter and aggregate volumes are tiny compared to waterborne cargo. According to FAF data, in 2012 total international air freight cargo through the Seattle region totaled 170 thousand tons compared to 60 million tons of waterborne trade. Domestic air freight cargo added another 100 thousand tons. Air freight cargo mostly moves through SeaTac International Airport and the King County International Airport at Boeing Field.

## **Conclusion**

Seattle region ports and airports represent one of the major US gateways for international trade especially with Asian countries. Imports flow into the region and feed both local wholesale and retail trade portions of the supply chain, helping meet consumer and business demand. A significant share of waterborne imports is destined to US inland regions. Whether to local regions or more distant locations, the cargo is moved by the local transportation service industry with employment and incomes contributing to the local economy.

The ports' role in exports supports US production of exports both from more distant US locations as well as from the local region. In addition to the economic benefits derived from exports, handling the export cargo also supports the local economy through jobs related to handling export trade.

# 5.0 TRANSPORTATION IMPACTS OF FREIGHT RELATED TO INTERNATIONAL TRADE

As noted above, transportation impacts of freight related to international trade are concentrated in goods moving by truck and rail. The impacts of waterborne trade are discussed first followed by impacts from air freight.

## WATERBORNE FREIGHT

According to Port of Seattle statistics the port handled a total of 1.6 million twenty-foot equivalent units (TEUs)<sup>11</sup> of containers in 2013, down from a peak of 2.2 million in 2010. In the past 10 years, the ratio of TEUs per container has remained relatively steady at 1.74; therefore, the 2013 volume translates to roughly 900,000 full and empty containers. An estimated 40% of the total port throughput is currently moved by rail, which includes containers that are drayed (trucks) to near-dock intermodal yards at SIG (for the BNSF Railway) and Argo (for the Union Pacific) or are loaded to and from trains directly at Terminal 5 and 18. This is down from a high of 57% in 2007. The majority of containers that are hauled by rail are destined to or originate in the midwest. Some export containers also arrive from closer states, many of which are likely to be empty containers being repositioned to Seattle or Tacoma for export back to Asia.

The remaining 60% of the containers are moved by truck to local and regional businesses. Including the containers that are drayed to the near-dock intermodal yards, an average day at the Port of Seattle in 2013 had about 3,300 trucks

entering the five container terminals, which generated a total of 6,600 one-way truck trips per day.<sup>12</sup> Note that this does not include bulk or break-bulk cargos or traffic to and from the Port of Tacoma that may affect Seattle truck traffic. Of these, about 30% are local dray trips to the near-dock intermodal terminals, and another 5% are to local businesses located in the Duwamish industrial area. Of the imports that move by truck beyond the local area, the majority are destined to logistics facilities and distribution center in the Pacific Northwest and California. Export moves usually come from a wider area given the broader reach of agricultural products in the region as well as the economics of having to bring truck equipment back to the Northwest to balance with higher imports. As previously shown on Figure 16, export cargo is trucked to Seattle from as far away as Connecticut. In addition to intermodal rail associated with the region's container ports, local rail movements are also associated with grain shipments through the Port of Seattle's Grain Terminal at Pier 86 along with general cargo that is loaded through rail hubs at the BNSF Stacy Yards (in SODO) and Seattle Yard in Tukwila as well as through the UP's Argo Yard. Garbage is also loaded to rail at several facilities including the Rabanco Yard in Sodo and UP Argo Yard. There are still many local rail spurs throughout Seattle's industrial areas that provide direct rail service for businesses. Some of the larger customers include Nucor Steel in West Seattle and Ash Grove Concrete in Sodo.

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<sup>11</sup>A forty-foot container is equivalent to 2.0 TEUs.

<sup>12</sup>Source: Heffron Transportation, Inc. and Port of Seattle for 1st Quarter 2013.

## AIR FREIGHT

The transportation impacts of air freight are fundamentally different. Individual shipments are much smaller and transported in smaller van or box trucks rather than by large trucks handling containers on chassis (or moved by railcars to and from US inland regions). The transportation impacts are also more local. For example, of the 60 thousand tons of air cargo tons imported through the Seattle region in 2012, 52 thousand tons was destined to Washington according to FAF data. In the Seattle area, most of the air cargo is handled through SeaTac International Airport and the King County International Airport at Boeing Field.

# 6.0 FUTURE FREIGHT GROWTH IN THE SEATTLE REGION

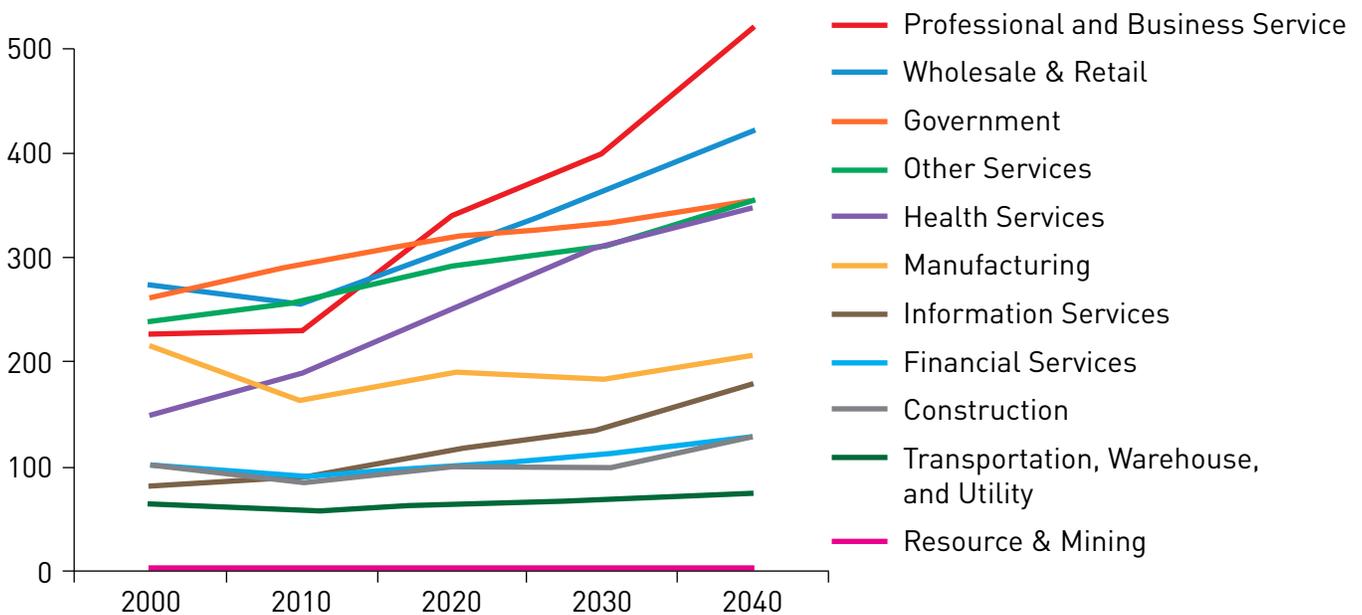
As discussed in the existing conditions, the future of freight volumes in Seattle depends on two principal factors 1) economic growth in Seattle and the surrounding region and 2) international trade moving through Seattle region ports. These fundamental drivers of freight overlap to the extent that international trade volumes are destined to or originate in the Seattle region. Sections which follow describe regional economic projections that drive local freight volumes and projections of international trade volumes and rail volumes moving through Seattle related to that growth.

## 6.1 SEATTLE ECONOMIC GROWTH AND ITS IMPACT ON FREIGHT

To help address the question of regional economic growth prospects, a regional economic forecast prepared by the Puget Sound Regional

Council is summarized in Figure 16, focusing on PSRC’s employment growth projections by major economic sector. It should be noted that this forecast is for the Puget Sound region as a whole but these projected growth rates may be considered indicative of Seattle’s growth prospects. The region’s total employment is projected to grow from 1.7 million in 2010 to 2.7 million in 2040, an increase of 58% over that period. Specifically, in Seattle total employment in may increase by as many as 115,000 jobs by 2035 (Seattle Comprehensive Plan Update). However, freight volumes are likely to grow at that average rate or higher based on: 1) above-average growth in freight generating sectors, and 2) increases in industry productivity, which leads to growth in industry output (and freight volumes) greater than increases in employment.

**FIGURE 16: PUGET SOUND 2012 ECONOMIC FORECAST - EMPLOYMENT BY MAJOR SECTOR**



Source: Puget Sound Regional Council and Parsons Brinckerhoff analysis

Employment in the largest freight-generating sectors, wholesale and retail trade, specifically, is projected to grow by 64% from 2010 to 2040 compared to the 58% average for all industries, which would lead to the conclusion that freight could be expected to grow faster than average employment growth. While projected 27% growth in manufacturing employment is lower than the average of all industries manufacturing output has historically increased more than employment due to productivity improvements. Those trends are expected to continue.

Based on the projected aggregate employment increases of 58% from 2010 to 2040, greater than average growth in major freight generating industries, and the expectation that productivity increases will continue in manufacturing, it may be expected that increases in freight volume related to local regional economic growth will be a minimum of 60% from 2010 to 2040. This represents a compounded annual growth rate of 1.6%. Actual growth is likely to be higher. Average annual growth of 2.0% would result in 2010 to 2040 an 80% total increase in freight. Annual average growth of 2.5% would more than double local freight volumes from 2010 to 2040. According to FHWA FAF data total freight tonnage from, to and within the Seattle region is projected to grow 2.2% per year from 2012 through 2040.

In summary, freight is expected to grow between 60% and 100% over the next 25 years.

## 6.2 GROWTH IN INTERNATIONAL TRADE AND ITS IMPACT ON FREIGHT

International freight volumes moving through Seattle region ports, and the major subset represented by containerized trade, are driven by four fundamental factors:

- US demand for goods including consumer spending and business investment
- The share of demand met by imported goods, i.e. the import propensity

- Sourcing of imported goods, i.e. Northeast Asia vs. Europe vs. Canada or Mexico
- The share of international goods handled by Seattle region ports

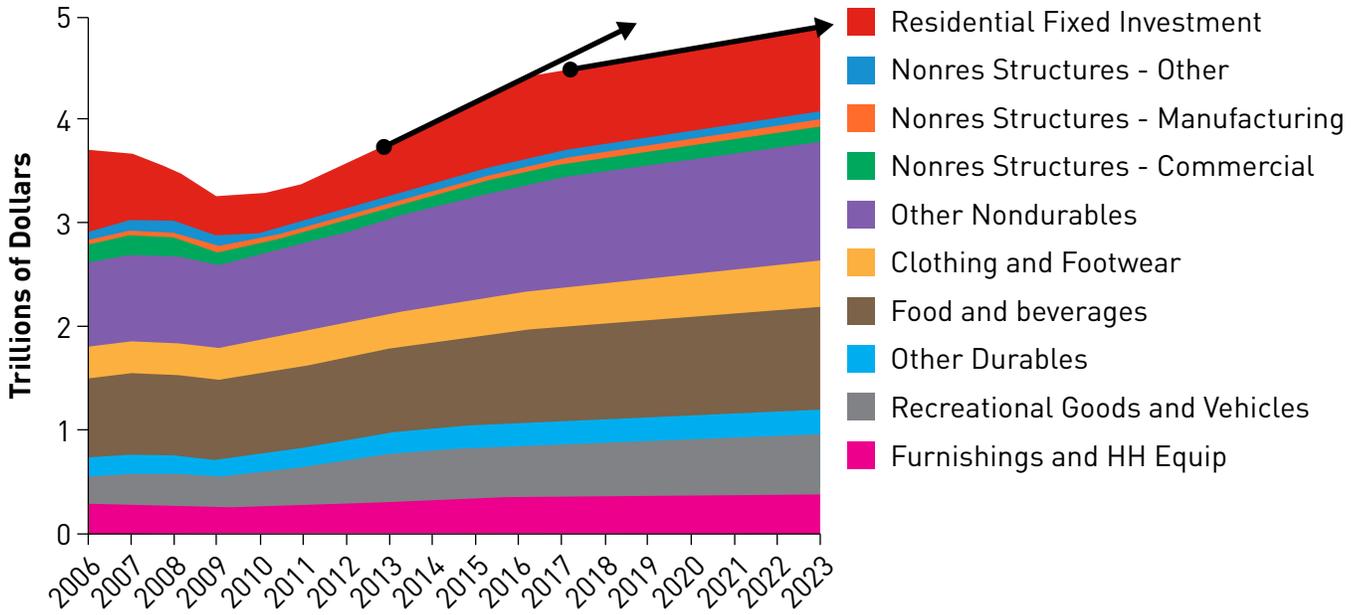
### US Demand

US demand for imported goods is the fundamental driver of total container trade volumes. Imports significantly outweigh exports and the difference is comprised of large numbers of empty exported containers.

US demand can be viewed in terms of major components of Gross Domestic Product (GDP) that are related to goods as opposed to services. As displayed in Figure 17, these major components of GDP include consumer spending for durable goods such as furniture and household equipment and recreational goods, and non-durable goods including food and beverages and apparel. Demand also includes residential investment and business investment in structures.

As shown in the figure, projected short term growth in total real GDP for the selected components is higher than longer term growth largely due to projected increases in residential investment. A recovery in the housing sector, which declined sharply during the Great Recession, is expected to spark the short term spike in growth. Average projected growth in 2014 to 2017 is 4.7% while the average for 2018 to 2023 is 1.6%.

**FIGURE 17: TOTAL OF REAL GDP COMPONENTS**



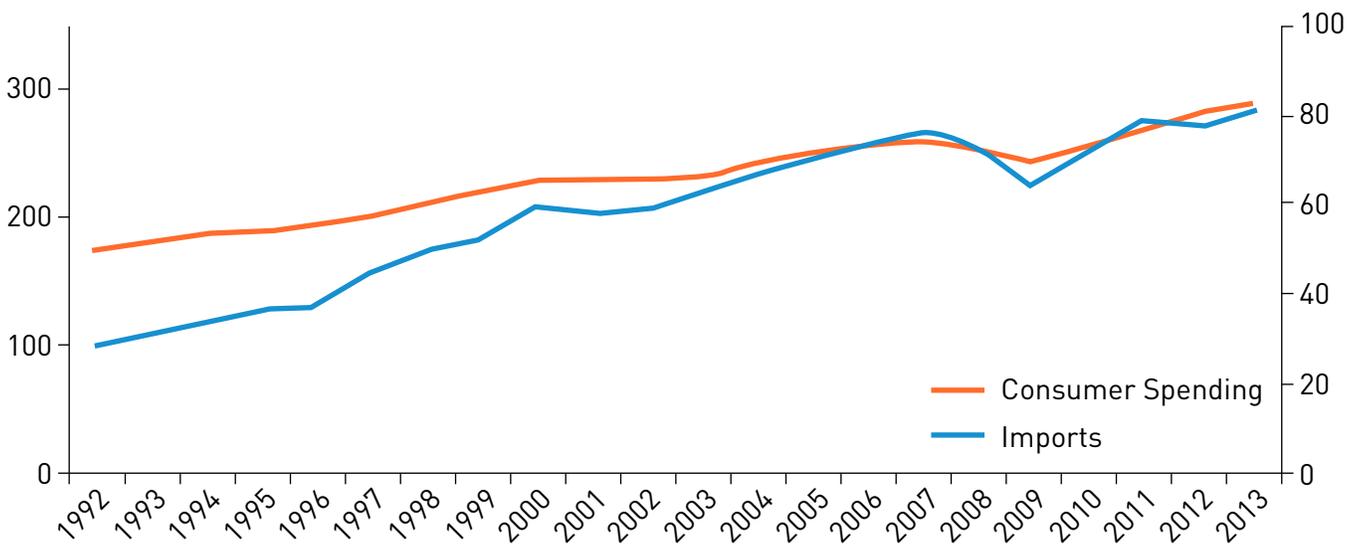
Source: Parsons Brinckerhoff, Los Angeles Economic Development Corporation International Trade Outlook Conference, June 5, 2014

**Import Propensity**

In past years growth in import volumes was driven in part by an increasing share of total demand being met by imports (i.e. the outsourcing of manufacturing to other countries). For many product categories, this trend has come

to an end and is no longer an independent source of container trade growth. For example, in the figure shown below it can be seen that imports of apparel increased faster than consumer spending on apparel though 2005, but has tracked relatively closely from 2006 through 2013.

**FIGURE 18: U.S. IMPORT PROPENSITY (OUTSOURCING) – CONSUMER SPENDING ON APPAREL VS. IMPORTS (\$BILLIONS)**



### Sourcing of Imported Goods

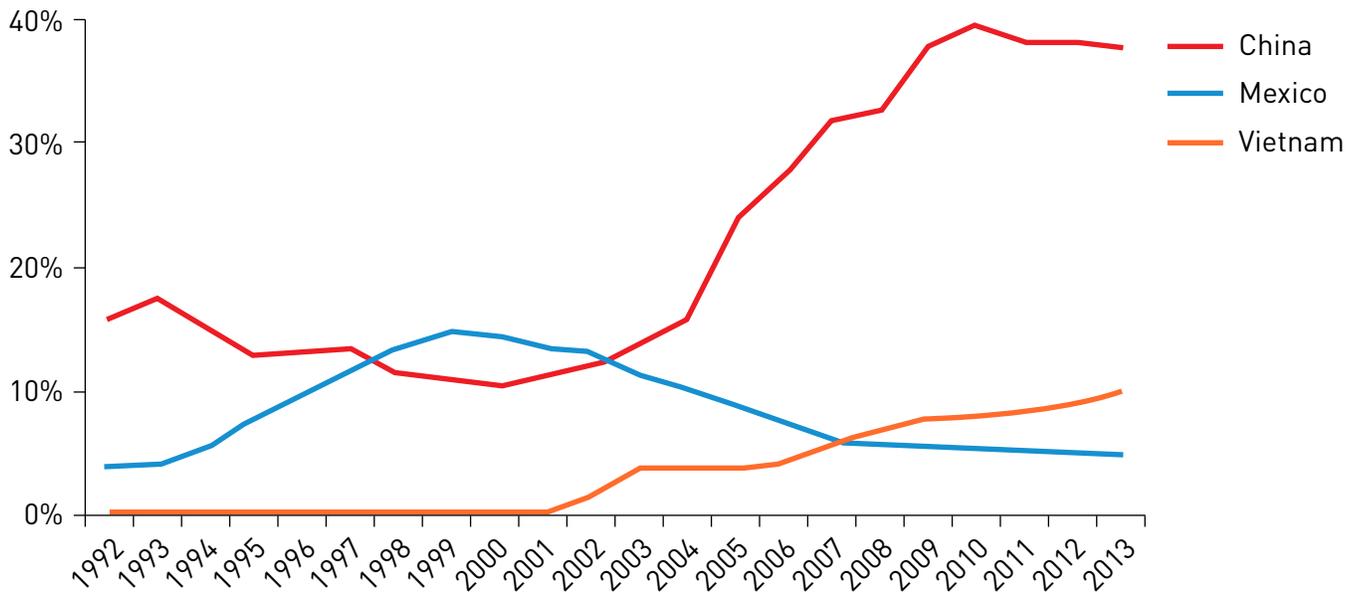
Another source of historic US container trade growth has been changes in import sourcing. As shown in the figure 19, below, beginning in 2000 Mexico's position as the principal exporter of apparel began to decline as China's share of imports grew rapidly. Since imports from Mexico were largely transported by rail or truck to US destinations while imports from China are transported primarily by water through US ports, this has resulted in an increase in container trade solely due to sourcing and the related shift in modal transportation rather than fundamental demand as noted above. Most recently sourcing of apparel has shifted from China to other countries

such as Vietnam but such shifts still involves ocean transportation, largely through West Coast ports. If there were a shift in sourcing back to Mexico (near-shoring) from overseas locations, this would mean a relative reduction in container trade given any level of demand.

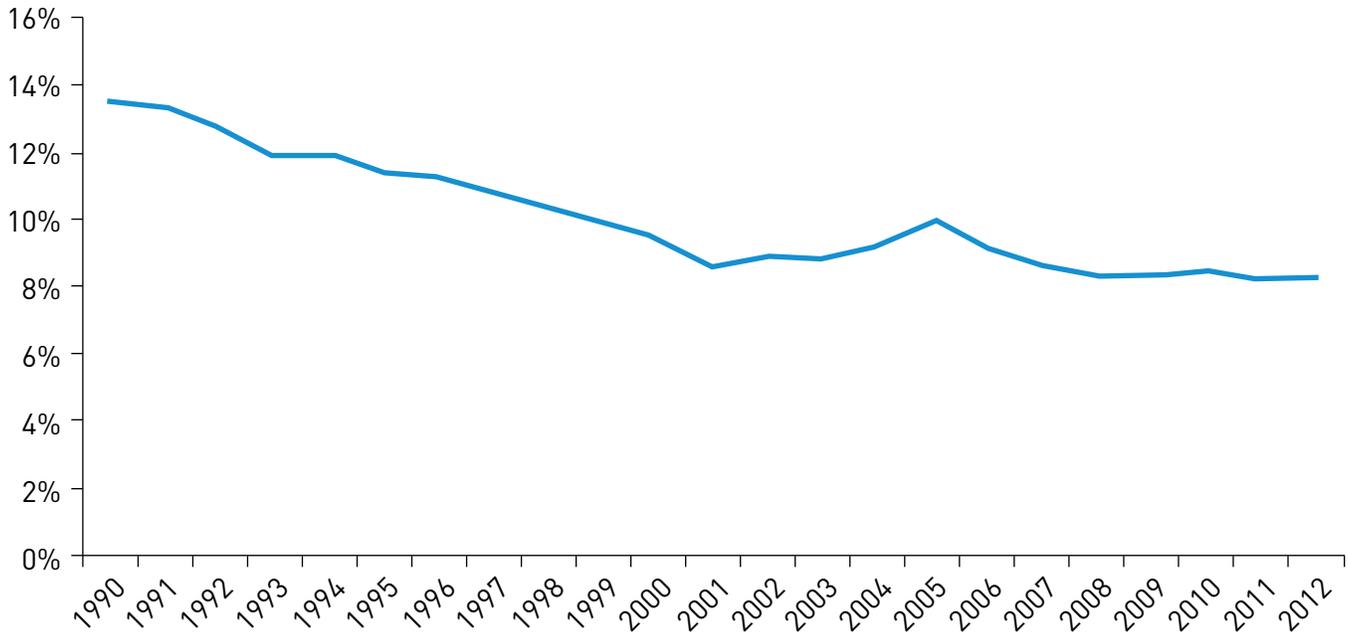
### Port Shares of Total US Container Trade

The final major factor affecting Seattle region ports' container volumes is their share of total US container trade. As shown in the figure below, this share declined during the 1990's but has been relatively stable, at about 9%, since 2000. The question of how Seattle's share of US container volumes may change is further discussed below.

FIGURE 19: COUNTRY SHARES OF U.S. IMPORT VALUE FOR APPAREL



**FIGURE 20: SEATTLE REGION PORTS' SHARES OF TOTAL US CONTAINER TRADE**



Source: American Association of Port Authorities and Parsons Brinckerhoff analysis

The Port of Seattle’s Century Agenda was developed in 2012 and targets long-term growth in its container operations in order to increase local and regional jobs. Its goal is to increase container throughput to 3.5 million TEUs within about 25 years. If growth were to continue at the same rate as the past decade—at 3.5% per year—then the Port could reach its 3.5 million TEU goal in about 22 years. If growth were to slow to a rate of 2% per year, the goal would be reached in about the year 2050. For planning purposes, the Port has assumed that the growth target can be achieved by the year 2035.

Due to competitive pressures which have resulted in erosion of market-share, the Ports of Seattle and Tacoma recently announced a decision to join their container terminal operations.<sup>13</sup> This is an attempt to help them achieve the more aggressive target. However, the alliance is brand new and the competitive pressures from Ports in Southern

California and Canada are quite real, so it is too early to predict the effect.

As container volumes through the Port of Seattle increase, more of them (both in terms of volume and as a percentage of the total) would be transported to larger inland markets in other parts of the country via rail. While local consumption will increase, it will continue to comprise a smaller portion of the overall growth compared to growth of inland markets throughout the U.S. As previously described, at its peak in 2006/2007, approximately 646,000 TEUs per year, or 57% of all containers through the Port of Seattle, were transferred to or from rail. For planning purposes, this is expected to increase to 2,100,000 TEUs per year, or 60% of the throughput, with total volumes at 3.5 million TEUs per year. This would reflect an annual growth rate in direct rail volume of between 8.2% and 2.4% per year depending on whether that throughput is achieved by 2035 or 2050.

<sup>13</sup>[www.bizjournals.com/seattle/news/2014/10/07/in-historic-decision-ports-of-seattle-and-tacoma.html?page=all](http://www.bizjournals.com/seattle/news/2014/10/07/in-historic-decision-ports-of-seattle-and-tacoma.html?page=all)

The Port has available capacity to spread the growth out among several terminals or concentrate it at one or two terminals. If concentrated at Terminal 5 and/or 18, a higher percentage of cargo is likely to be moved direct to rail at those terminal's on-dock rail yards. If concentrated at Terminal 46, then more would be drayed to the near-dock rail yards. Depending on the growth scenario, total trucks trips at the Port of Seattle are forecast to range from 11,000 to 12,600 one-way trips per day. About 5,500 of these would be trips beyond the local industrial area and near-dock rail yards.<sup>14</sup>

### 6.3 GROWTH IN RAIL AND TRUCK VOLUMES

According to FHWA FAF forecast data US waterborne imports through Seattle region ports will triple from 18 million metric tons in 2012 to 55 million metric tons in 2040 but there will be a slight long-term modal shift from trucking to rail. The rail share of total US import tonnage through Seattle region ports to all US regions is projected to increase from 29% in 2012 to 33% in 2040, and the truck share is projected to decrease from 60% to 58% over that same period.

US exports through Seattle region ports are projected to nearly triple from 2012 to 2040, increasing from 36 million metric tons in 2012 to over 100 million metric tons in 2040. While rail volumes are projected to grow, truck volumes are expected to grow more rapidly, with the rail share of total volumes expected to decrease from 47% in 2012 to 40% in 2040. The truck share is expected to grow from 49% to 57% over this same period.

With any long term freight forecast, there are many variables. Not only is this subject to international economic and logistics factors, but local project relating to movement of oil, grain and coal could also impact the projection.

If capacity is constrained by local projects, then modal shifts could occur, unless improvements are developed to meet those demands.

### 6.4 EFFECTS OF CLIMATE CHANGE ADAPTATION

Adaptation to the effects of climate change has taken two principal forms in the freight industry: improvement in fuel efficiency and management of risk from disruption.

#### Fuel Efficiency

Supply chain managements in many sectors have taken aggressive action in respect to fuel usage, and their carriers have followed suit, as is extensively documented in the recently released NCFRP Report 28 "Sustainability Strategies Addressing Supply Chain Air Emissions".<sup>15</sup> The primary motivation for improvement has been the rise in fuel prices over the past decade, but reduced fuel use also reduces greenhouse gas emissions, an effect that industry has embraced.

Goals for fuel economy and CO2 reduction are often cited together, and methods of achieving them are diverse. Examples include changed designs in distribution networks, length of haul and empty mile reduction, product densification, routing practices, driver training and tracking, and a variety of equipment improvements in trailers, tires, and motive power. Most notable is the serious if gradual adoption of natural gas powered vehicles, which produce lower GHG emissions than diesel as a transportation fuel, provided methane release in the supply system can be controlled. The surge in availability of low cost natural gas from U.S. domestic sources has been behind this development, and while the recent drop in oil prices to four year lows could slow it, that drop can be interpreted as an attempt by overseas competitors simply to diminish U.S. production.<sup>16</sup> Fuel remains a major component

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<sup>14</sup>Heffron Transportation, Inc., April 2014.

<sup>15</sup>Available at [www.trb.org/main/blurbs/170749.aspx](http://www.trb.org/main/blurbs/170749.aspx)

<sup>16</sup>See for example [www.nytimes.com/2014/11/29/business/energy-environment/free-fall-in-oil-price-underscores-shift-away-from-opeac.html?module=Search&mabReward=relbias%3Ar%2C%7B%221%22%3A%22RI%3A6%22%7D](http://www.nytimes.com/2014/11/29/business/energy-environment/free-fall-in-oil-price-underscores-shift-away-from-opeac.html?module=Search&mabReward=relbias%3Ar%2C%7B%221%22%3A%22RI%3A6%22%7D)

of transportation and distribution cost, and industry efforts to control it are unlikely to abate. From a GHG perspective, this means that private sector efforts that reduce carbon emissions will continue, quite apart from regulatory efforts that political forces may block.<sup>17</sup>

### **Management of Risks from Disruption**

The consequences of climate change include greater frequency of severe weather events. Costly incidents of recent years including tempests and bitter winter weather have captured the attention of supply chain managements, such that natural disasters loom nearly as large as potential labor stoppages as a risk factor for supply chain disruption.<sup>18</sup> Initiatives to manage such risks begin with resiliency – for example, by utilizing geographically dispersed suppliers or gateways. They ultimately extend to facility location decisions, such that locations at lower risk for disruptive weather could become preferable.

## **6.5 CONCLUSION**

Based on the fundamental drivers of US demand represented by consumer spending and investment, US container trade may be expected to grow in the short term (i.e. through 2017) at a rate of over 4% per year depending in large part on the recovery of the US housing sector. Long

term growth in container trade could be expected to grow on the order of 2% per year thereafter based on growth of total real GDP components most closely related to imports of goods.

Increasing imports relative to demand and changes in sourcing are not expected to provide additional boosts to container trade volumes such as those experienced in the past.

Given these relatively stable fundamental drivers of container volumes, Seattle region ports' volumes may be expected to grow on the order of 2% per year with additional volumes in the Port of Seattle dependent on the success of its *Century Agenda* program.

The mid-range growth of 2% for freight volumes related to regional economic growth described earlier is at the same level as the 2% growth rate for international trade just outlined, indicating that the balance between the two principal sources of freight volumes will remain roughly the same. Based on anticipated growth and trends in logistics, section 6.1 concluded that freight would grow between 1.6 and 2.5% annually for the next 30 years. Taking 2% as a conservative baseline, freight volumes can then be expected to increase by approximately 55% between 2013 and 2035.

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<sup>17</sup>Example of a recent regulatory proposal in the general area of greenhouse gas emissions is summarized at [www.nytimes.com/2014/06/03/us/politics/key-details-of-epa-carbon-emissions-proposal.html?module=Search&mabReward=relbias%3As%2C%7B%221%22%3A%22RI%3A6%22%7D](http://www.nytimes.com/2014/06/03/us/politics/key-details-of-epa-carbon-emissions-proposal.html?module=Search&mabReward=relbias%3As%2C%7B%221%22%3A%22RI%3A6%22%7D)

<sup>18</sup>Tompkins International Supply Chain Consortium, June 2012

# 7.0 FREIGHT'S IMPACT ON THE ECONOMY

The sections above demonstrate the important role that freight intensive industries play in the Seattle economy today, describes how these sectors are expected grow and forecasts the effect on freight volumes.

Other recent studies further illuminate the broader effect freight intensive sectors have on the Seattle economy. A National Cooperative Freight Research Program study found that, in 2011, freight dependent industries like manufacturing, retail and wholesale, construction and natural resources were responsible for over 30% of the Seattle/Tacoma region's GDP.<sup>19</sup> Two local studies, one which explores the importance of the maritime industry to Seattle and the other calculates the economic impact of congestion on the region, are discussed below.

## THE ECONOMIC IMPACT OF THE MARITIME INDUSTRY

The maritime industry has a long and central role in the Washington State economy. Core maritime industries include maritime logistics and shipping, ship and boat building, maintenance and repair, fishing and seafood processing and passenger water transportation. A recent report estimated that the state had 57,700 maritime industry jobs with gross business sales of \$15.2 billion in 2012.<sup>20</sup>

The maritime industry is supported by numerous support industries including technical services, supply and wholesale and professional services. In addition to jobs and spending in supporting industries, there are also benefits from personal spending. The report calculates a combined impact of 148,000 jobs and \$30 billion sales, from the maritime industry as shown in Figure 21.

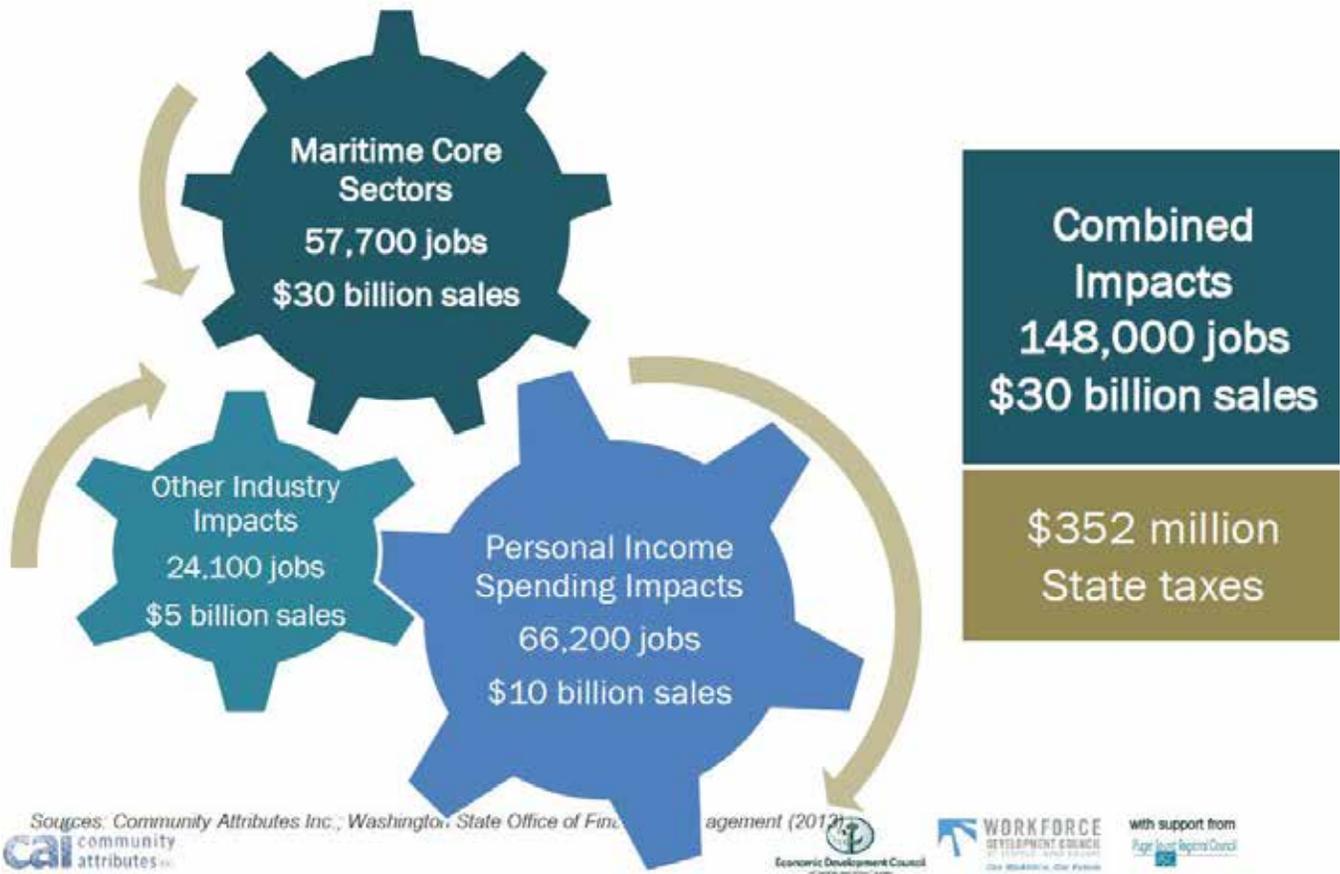
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<sup>19</sup>Jose Holquin Vargas, "Freight Action Strategy for the Seattle Tacoma Corridor Case Study" (NCFRP 38, 2014)

<sup>20</sup>Community Attributes Inc., Washington State Maritime Cluster (Economic Development Council of Seattle and King County and Workforce Development Council of Seattle and King County, November 2013)

**FIGURE 21: WASHINGTON STATE MARITIME IMPACTS<sup>21</sup>**

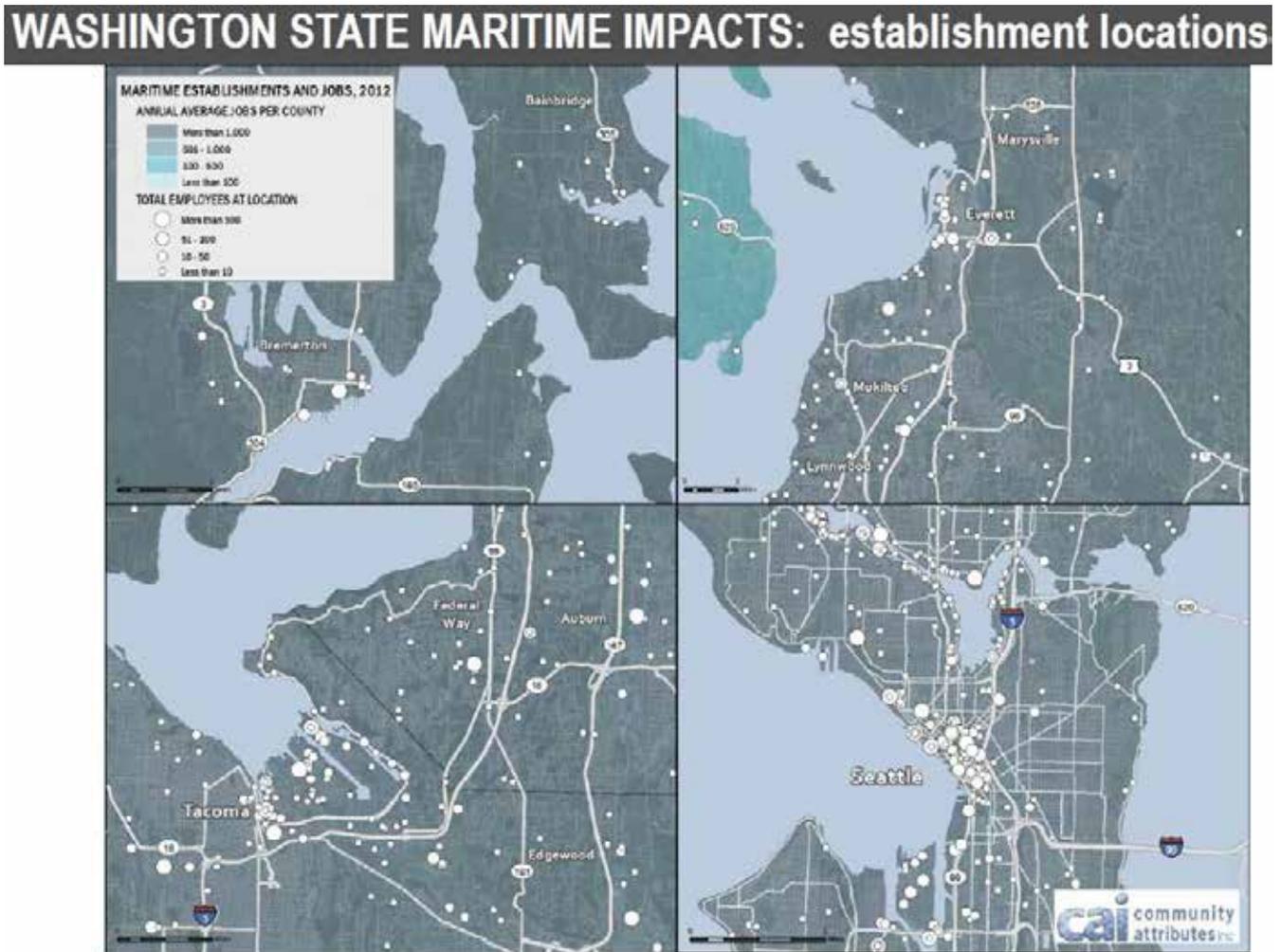
2007-2012, billions USD, adjusted to 2012 \$



<sup>21</sup>Community Attributes Inc., The Impacts of the Maritime Industry in Washington State, (presentation to the freight Mobility Roundtable, 2014)

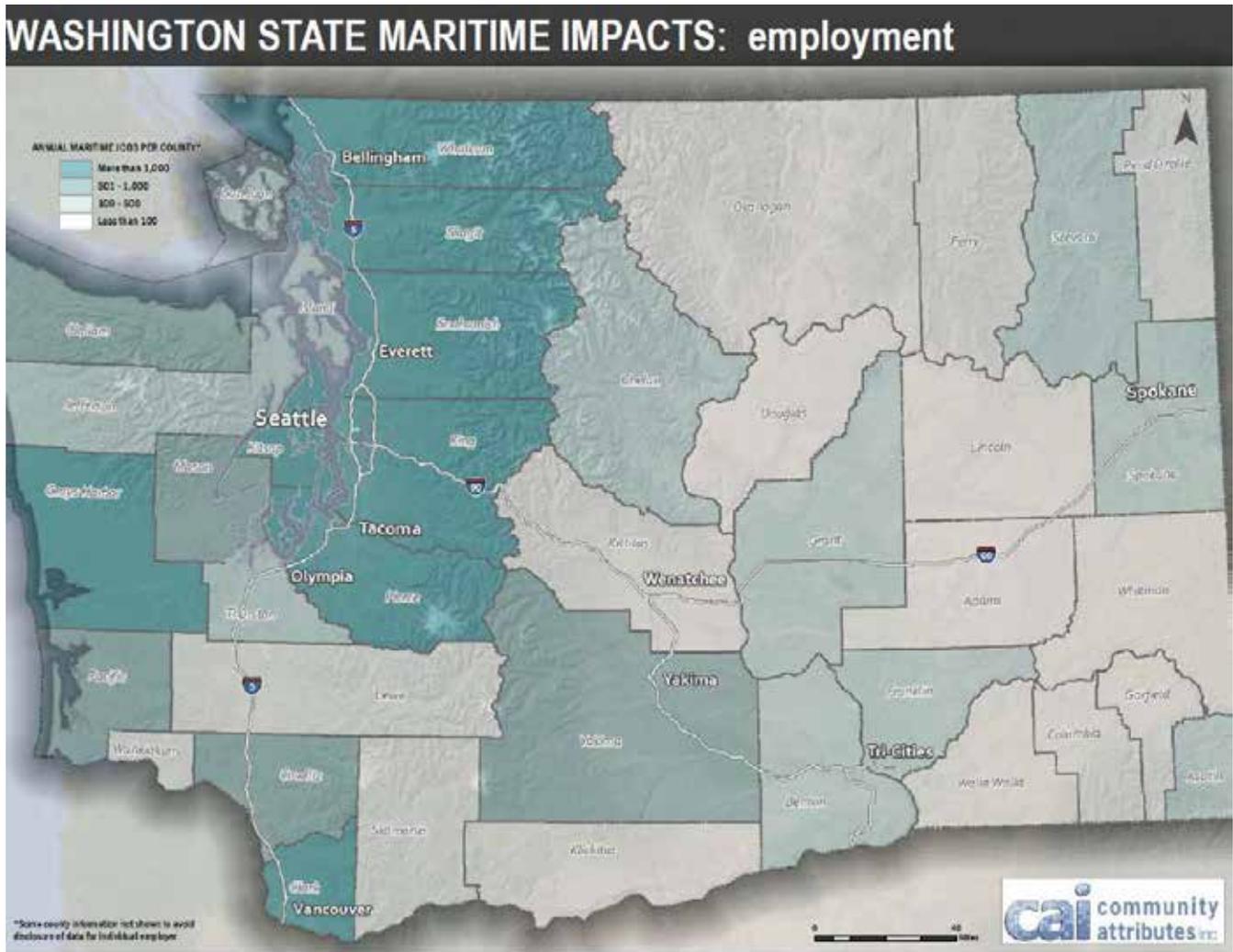
These facilities and jobs are concentrated in the Puget Sound region as shown in Figures 22 and 23.

FIGURE 22: MARITIME ESTABLISHMENT LOCATIONS<sup>22</sup>



<sup>22</sup>CAI, 2014 p 9-10

FIGURE 23: MARITIME EMPLOYMENT BY COUNTY



Most of these jobs offer wages higher than the state median wage of \$51,000 in 2012. Maritime jobs include marine and related industry engineers, operators of maritime equipment, captains mates and pilots, fish and game wardens and various kinds of technicians. Lower wages jobs include fish cutters and machine setters or cutting and slicing.<sup>23</sup>

The report points to the high concentration of key occupations as an indicator of the State's

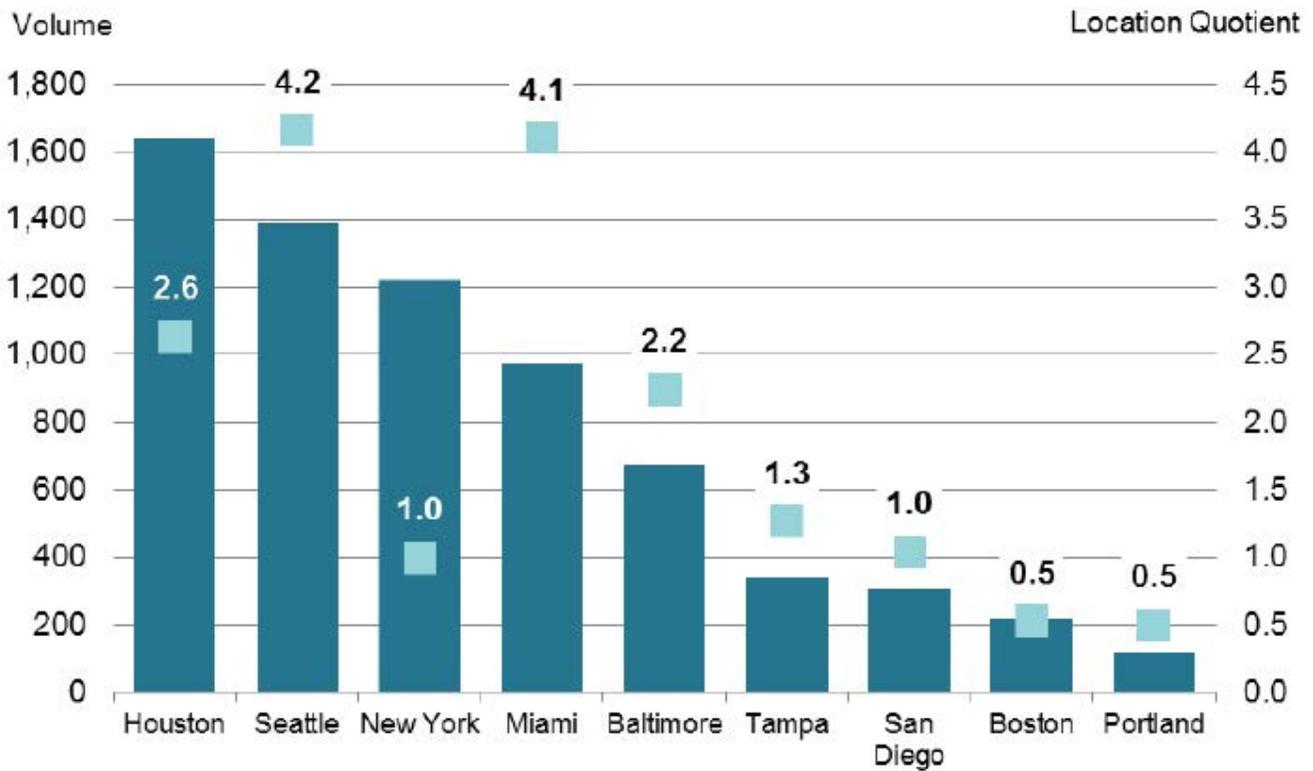
prominence in the maritime industry. Seattle has location quotients between four and seven times the national average for ship engineers, sailors and marine oilers and captains mates and pilots. This places it in the top one or two of major coastal regions in the country.<sup>24</sup>

Figure 24 compares Seattle to selected coastal metropolitan statistical areas in terms of the volume and location quotient of captains, mates and pilots.

<sup>23</sup>Community Attributes Inc, 2013, p 64.

<sup>24</sup>CAI, 2013, p58

**FIGURE 24: VOLUME AND RELATIVE CONCENTRATION OF CAPTAINS, MATES AND PILOTS (LOCATION QUOTIENT), SELECT MSASs<sup>25</sup>**



Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics (2012).

**THE IMPACT OF CONGESTION ON THE FREIGHT ECONOMY**

In 2012, WSDOT published *The Economic Impact of Increased Congestion for Freight-Dependent Businesses in Washington State*. The report, prepared by Justin Taylor of 2L Data Solutions with Ken Casavant and Danna Moore of the Freight Policy Transportation Institute at WSU, used IMPLAN to determine the economic output of freight dependent businesses in Washington State. It took into account a survey with over 1,000 businesses regarding the impact of increased congestion.

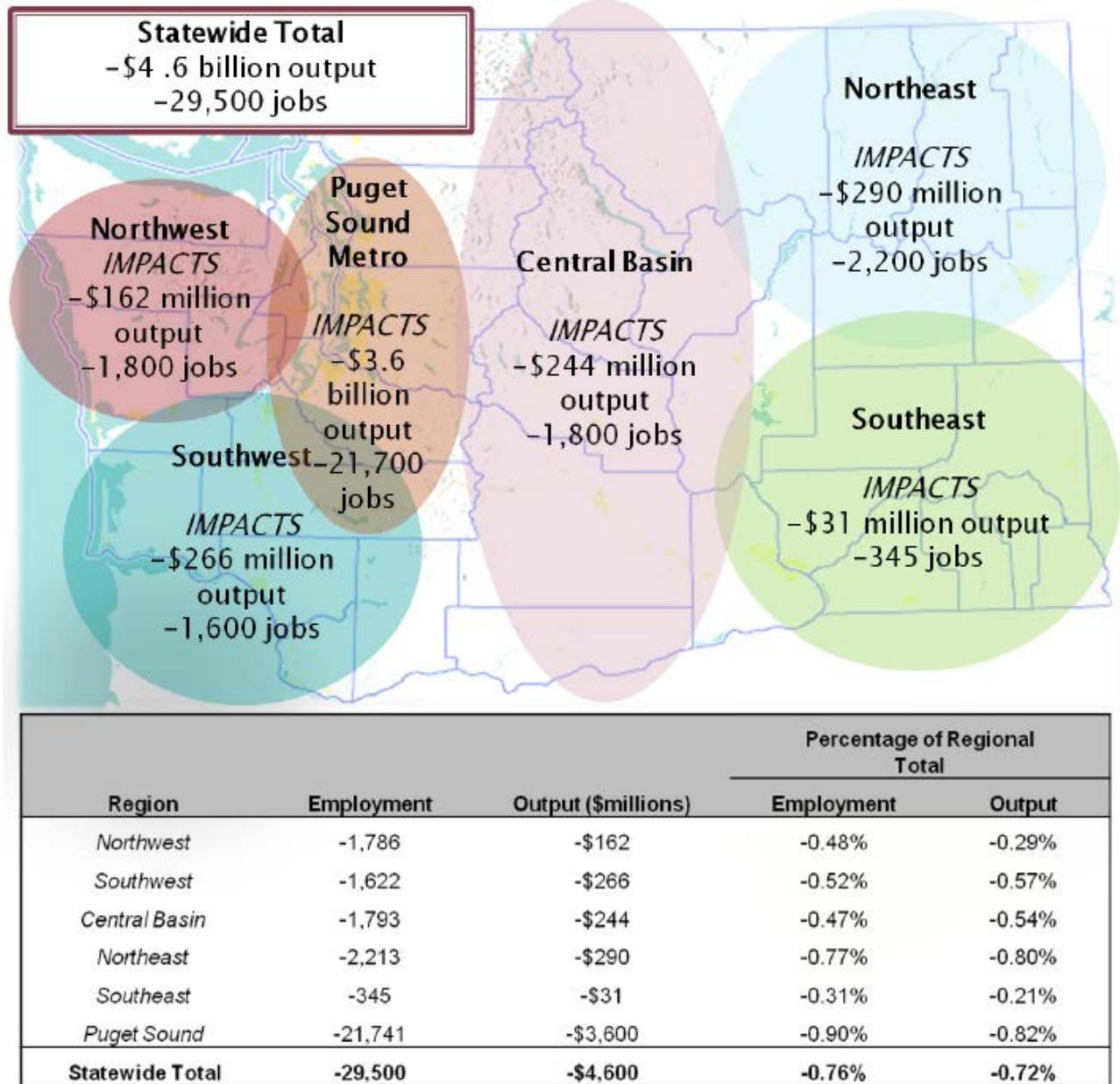
Using input output analysis, the study found that a 20 percent increase in congestion would cost the state 29,500 jobs and \$4.6 billion in economic

output. Overall, this represents more than a .7% loss in employment and output statewide. While increased congestion forces industries to add employees and assets, these are more than off-set as consumers have to pay more for these products and have less to spend in other areas.

In the Puget Sound region, where freight dependent industries are concentrated, these losses are even more staggering. The study estimated that the Puget Sound region would lose an estimated 21,700 jobs and \$3.6 billion in output. With a 20 percent increase in congestion, the region is estimated to lose .9% of its employment and .82 percent of its economic output. Figure 25 shows the economic impacts of a 20 percent increase in congestion by region.

<sup>25</sup>CAI, 2013, p59

FIGURE 25: STATEWIDE AND REGIONAL EFFECTS OF CONGESTION ON ECONOMIC OUTPUT AND JOBS.<sup>26</sup>



This paper has described the important role that freight generating industries play in the Seattle economy and developed a forecast of freight volumes moving within the region. It has broadly

outlined the potential effects that congestion could have on these industries. A subsequent memo will detail the conditions for truck mobility and accessibility within Seattle today and in the future.

<sup>26</sup>Justin Taylor, Ken Casavant, Danna Moore, Jeremy Sage and Barbara Ivanov, "The Economic Impact of Increased Congestion for Freight Dependent Businesses in Washington State" Transportation Research Board 92nd Annual Meeting, (Washington, D.C.), January 2013.