

REGIONAL  
FREIGHT  
AND GOODS  
MOVEMENT  
ACTION PLAN

# Profile of the Regional Freight Transportation System

in the Portland-Vancouver Metropolitan Region



METRO

 **New Look**  
The Regional Transportation Plan

## **Metro**

People places • open spaces

Clean air and clean water do not stop at city limits or county lines. Neither does the need for jobs, a thriving economy and good transportation choices for people and businesses in our region. Voters have asked Metro to help with the challenges that cross those lines and affect the 25 cities and three counties in the Portland metropolitan area.

A regional approach simply makes sense when it comes to protecting open space, caring for parks, planning for the best use of land, managing garbage disposal and increasing recycling. Metro oversees world-class facilities such as the Oregon Zoo, which contributes to conservation and education, and the Oregon Convention Center, which benefits the region's economy.

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*Metro Councilors* – Rod Park, District 1; Brian Newman, District 2; Carl Hosticka, District 3; Kathryn Harrington, District 4; Rex Burkholder, District 5; Robert Liberty, District 6.

*Auditor* – Suzanne Flynn

### **Metro's web site**

[www.metro-region.org](http://www.metro-region.org)

**REGIONAL FREIGHT AND GOODS MOVEMENT ACTION PLAN**

**Profile of the Regional Freight  
Transportation System**  
in the Portland-Vancouver Metropolitan Region

January 2007

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**The contents of this document do not necessarily reflect the views or policies of the State of Oregon.**

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## Executive Summary

This report provides background information on the Portland-Vancouver region's freight transportation system in order to provide context for the Regional Freight and Goods Movement Action Plan (RFGM Action Plan). The RFGM Action Plan is an element of Metro's comprehensive Regional Transportation Plan (RTP), and is being developed in coordination with the 2035 RTP Update, which has an expected completion date of November 2007.

The RFGM Action Plan will identify regional freight system needs – including transportation, economic and community needs – and will evaluate a series of potential solutions to meet goals identified by Metro, its local jurisdiction participants, and stakeholders. The plan is being developed under the guidance of the Freight and Goods Movement Task Force, composed of 34 regional stakeholders representing both the private and public sectors.

In this first background report of the RFGM Action Plan, four key topics are discussed:

- Economic and industry trends and their opportunities and effects on freight movement, both nationally and regionally;
- An inventory and description of the regional multimodal freight transportation system and services;
- The public policy context that governs the public's investments in freight mobility systems; and
- A review of logistics practices utilized by shippers to ensure that the products shipped by suppliers to their facilities, and the finished products shipped to customers, are delivered according to desired delivery schedules.

These four topic areas inform the discussion of regional freight mobility and the considerations by public and private partners when evaluating system performance, congestion effects, access to markets, and how to incorporate system improvements into the community with adverse impacts. Interested stakeholders need to consider all of these components in order to provide the highest quality environment for current and future residents and businesses.

### ***Organization of this Paper***

This background paper is organized around the following four subject areas:

- Section I.     The Effect of Global Trends on Freight Movement – The demands on the regional freight and goods movement transportation system are growing in a dynamic manner that is influenced by market needs and opportunities throughout the world. As the Portland-Vancouver region is both an international gateway and domestic hub, its suppliers, manufacturers, customers and carriers are directly tied into both the international and domestic forces that are currently producing record levels of commodities movement. This upward trend will drive regional transportation and economic needs with respect to the efficient and effective performance of the transportation system and services.

- Section II. Profiles of Freight Transportation Modes in the Portland-Vancouver Metropolitan Region – The region’s freight transportation system is uniquely positioned to handle a wide diversity of commodities movement given that it is served by two interstate highways, two Class 1 railroads, five short-line and terminal switching railroads, trans-oceanic ship services, a river barge network, commercial airport, and a petroleum pipeline system. Shippers use all of these systems to maximize access to far off and local markets. With the variety of modes, and multiple carriers within most of the modes, regional shippers enjoy competitive shipping cost structures. Demand on each of these systems is expected to grow, with trucking seeing the most growth by tonnage and as a percentage of freight mode share. While usage of modes other than trucking is very much in the public interest, the non-highway systems are controlled and operated by private organizations with unique business models and shipping characteristics.
- Section III. Public Policy and Freight Mobility – The public sector has a significant role to play in movement of freight. Public sector agencies plan systems, develop and maintain infrastructure, regulate and oversee private sector services, and provide financing. Federal transportation legislation provides policy direction for state, regional, and local investment and management of the multimodal transportation system. The Oregon Transportation Plan is the state’s guide for long-range, comprehensive multimodal transportation planning. Metro and its local jurisdictions develop plans in accordance with federal and state policy. With increasing freight movement, driven by global economic trends, public transportation policy has expanded to consider the needs and impacts of freight mobility as part of a comprehensive transportation system. Beginning at the federal level and trickling down to state and local levels, public transportation policy is evolving and becoming more sophisticated in how it addresses freight mobility.
- Section IV. Logistics Profiles – It is essential to understand how shippers manage the inbound and outbound flows of goods before making recommendations about the transportation systems they rely on. While logistics practices have always been used to organize the movement of freight, today’s shipping environment is far more highly customized with respect to the size, specialization, handling, inspection, and packaging of goods. Shippers often employ strategies to mitigate for unforeseen impediments in shipping schedules, and monitor the progress of shipments throughout their trips. Meeting customer delivery schedules is so critical because they are often tied directly to production processes, which are often integrally linked with other production processes. While each company uses a different set of logistics practices to meet their particular requirements, the four Logistics Profiles provided in this section are examples of the kinds of internal decision-making being made by shippers to meet the needs of their customers.

This background report sets the stage for the discussions regional stakeholders will be having about how to address the anticipated increase in freight activity throughout the regional transportation system. It is intended to provide particular focus on the relationship between freight movement and the opportunities and needs that will be evaluated throughout the Regional Transportation Plan process.

## Section I: Effects of Global Trends on Freight Movement

A convergence of global and national trends is creating significant change in the movement of freight: increasing its importance to the national and regional economy; altering distribution and logistics industry practices; and effecting transportation infrastructure and the evolution of communities. A basic understanding of the forces shaping the future of freight movement, both globally and here in the Portland-Vancouver metropolitan region, is essential to the development of effective strategies to address its needs and impacts.

*The distribution and logistics industry includes businesses involved in the shipping, storage, and delivery of freight and packages.*

This section provides an overview of global and national trends and their impacts on the movement of freight. It also explores innovations in the distribution and logistics industry in response to the changes. These trends are essential considerations for the development of an effective plan of action for this region's freight and goods movement.

### **The Global Economy**

The global economy is in the midst of change as profound in its effect on society as the Industrial Revolution. As mechanization led to large-scale production capabilities in the 19<sup>th</sup> century, 21<sup>st</sup> century innovations in trade policy, communications, and transportation have altered the sourcing, production, and marketing of products on a global scale.<sup>1</sup>

With the liberalization of policies that lower trade barriers between countries, more freight is moving across international borders than ever before. The use of trade policy to protect national industries is being replaced by those aimed at creating economic development opportunities beyond national borders.

A prime example of changing trade policy is the formation of multinational economic trading blocks. The North American Free Trade Agreement (NAFTA) between the United States, Canada, and Mexico exemplifies this trend. Fully executed in 1994, NAFTA reduced tariffs and quotas on goods traded between the three countries. Today Canada and Mexico comprise nearly one-third of U.S. international merchandise trade. In the future, NAFTA trade, as well as trade with other Latin America countries, will continue to create increased demand on north-south shipping lanes.

*Between 1970 and 1999, the share of U.S. gross domestic product attributed to trade in goods and services has grown from 11% to 27%.*

*Trade: From National to Global Markets, FHWA, 2000*

Beyond NAFTA, the U.S. has over 200 international trading partnerships, including a number of free-trade agreements with countries such as Australia, Chile, India, Israel, and Singapore. Additionally, the U.S. is negotiating free trade agreements with another half dozen nations. All told, free-trade agreement countries represented 42% of US trade exports in 2005.<sup>2</sup> The Pacific Rim represents the greatest trade growth outside NAFTA countries. Half of the top ten U.S. trading partners, measured by value, are located in Asia; with Japan and China alone

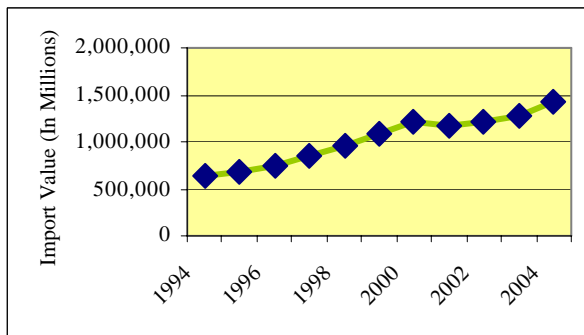
<sup>1</sup> Martin E. Robins and Anne Strauss-Wieder, *Principles for a U.S. Public Freight Agenda in a Global Economy*, The Brookings Institution Series on Transportation Reform, January 2006, pg. 5.

<sup>2</sup> *The 2006 National Export Strategy Report*, Trade Promotion Coordinating Committee, Washington D.C., 2006.

accounting for over 18% of total U.S. trade.<sup>3</sup> The emerging economies of China and India represent some of the fastest growing markets for U.S. exports, with both countries growing at a rate over 20% between 2004 and 2005.<sup>4</sup>

Even more significant is the growth of imports to the U.S. Figure 1.1 shows the steady growth in import as measured by value (in 2000 dollars). In 2005, the U.S. import trade was valued at \$1,671 billion dollars, 45% higher than the value of U.S. exports.<sup>5</sup> In general, the growth in international trade is putting pressure on U.S. gateways to accommodate ever-larger volumes of goods movement, particularly along the West Coast of the U.S.

**Figure 1.1 – Growth in U.S. Imports (1994-2004)**



Source: Foreign Trade Statistics, US Census Bureau  
Import value measured in 2000 dollars

### Information Technology

Information technology is a primary facilitator of the transition to a global economy. The rise of worldwide communication networks allow for the inexpensive and instantaneous transfer of knowledge around the globe. These networks allow complex supply chains to become better integrated and more efficient, and has supported innovations such as coordinated logistics. Using current communication tools, businesses can more easily disperse operations around the world to take advantage of low-cost or high-skilled labor markets as well as access to raw materials improving their competitive advantage in the global marketplace.

The advent of 21<sup>st</sup> century communication technology has spawned new businesses tools and models that impact the distribution of goods and services. The most notable advance in business models is *electronic business* (e-Business) and *electronic commerce* (e-Commerce).

E-Business refers to the use of electronic media such as the Internet, other computer networks, and wireless transmissions, to conduct a full array of business activities such as sales and marketing, customer service, and collaboration with partners. E-Commerce more specifically refers to the buying and selling of goods on the Internet. These e-business/commerce innovations are at the core of the highly efficient distribution and logistics industry practices. For example, carriers such as FedEx and UPS have invested heavily in information technologies to facilitate the movements of goods. A shipping company like DHL can now link more than 635,000 destinations in more than 230 countries.<sup>6</sup>

<sup>3</sup> Freight in America 2006, 46.

<sup>4</sup> *NAFTA Partners Lead Strong U.S. Export Growth*, International Trade Administration, International Trade Update Newsletter, July/August 2006.

<sup>5</sup> Foreign Trade Statistics, US Census Bureau, 2005

<sup>6</sup> *Trade: From National Markets to Global Markets*, FHWA Freight Management Working Papers, 2000, pg. 10.

E-Commerce refers to both consumers using the Internet to purchase goods and services online (business-to-consumer, or B2C), as well as businesses selling and communicating with other businesses through the Internet (business-to-business, or B2B). E-Commerce vastly improves accuracy in shipping and reduces administrative expenses. Customers can quickly and efficiently order goods that can be shipped directly by businesses. Customers and shippers are provided with real-time travel information about the location of packages through electronic container seals and software allowing transactions to be completed instantaneously.

The rise of business-to-consumer e-commerce has increased shipping demand and expanded the distribution and logistics industry. Consumers expect that goods can be shipped virtually anywhere in the world overnight. At the same time, distribution and logistics businesses have taken advantage of e-business solutions to realize greater efficiencies within their businesses, often through third-party services. The result is a growth in smaller and more frequent shipments, which increases demand on the transportation system.

The drive for efficiencies has triggered rapid advances in the application of information technology tools to organize and track freight shipments. An emerging trend is the use of radio frequency identification (RFID) tags to track pallets and equipment. RFID technology allows a scanner to read detailed information at a distance, greatly improving data accuracy and time savings. Organizations like Wal-Mart, Target, and the Department of Defense have RFID initiatives requiring suppliers to use the tags, effecting thousands of companies worldwide<sup>7</sup>. Real-time communication tools like global position devices, cell phones, and Internet are linking trade partners more efficiently than ever before.

### *Supply Chain*

A key outcome of globalization is that goods travel greater distances. As the costs of technology and transportation have fallen, industries have been able to develop complex supply chains that seek out competitive advantages for different parts of the supply chain. Companies may outsource different business functions across several different countries to reduce costs and improve operations. Access to good transportation service has played a crucial role in allowing supply chains to become more complex - both longer and highly specialized.

For more than 20 years, companies have taken advantage of dependable and inexpensive transportation to reduce inventory and deliver goods *just-in-time*, in order to reduce warehousing costs while meeting highly efficient production schedules. Transportation modes have served as mobile storage to support this business practice.

More recently, the distribution and logistics industry has witnessed a shift away from a *push* to a *pull* business model for some sectors. In a traditional *push* model, goods are moved via larger shipments to distribution centers and replenished on fixed cycles. These goods are then *pushed* out to consumers based on demand. *Pull*-based models seek to shorten the time between manufacturing and point-of-sale. Customized goods are shipped in smaller quantities directly to the customer. While inventory-based *push* models are not going to

*A **supply chain** is a coordinated network of organizations, people, activities, information and resources involved in moving a product or service from [supplier](#) to [customer](#). It typically consist of manufacturers, service providers, [distributors](#), sales channels (e.g. [retail](#), [ecommerce](#)) and end consumers. Supply chain activities transform [raw materials](#) and components into finished products.*

<sup>7</sup> Tom Singer, *RFID & Logistics: Four Trends You Need to Know*, Manufacturing.Net, October 12, 2006.

be replaced in the short term, the growth in e-commerce and direct-to-order commodities will facilitate the adoption of *pull*-based systems in the future. Like internet commerce, this business model's reliance on smaller, faster, and more frequent shipments contributes significantly to the growing volume of goods moving on the transportation system.

As supply chains have become more complex, they have also become more vulnerable to congestion, weather, and other events.<sup>8</sup> While distribution and logistics carriers have traditionally been organized around a single transportation mode, companies increasingly seek to optimize the balance between the use of marine, rail, highway, airport, and pipeline facilities. This practice, termed *coordinated logistics*, is intended to reduce cost and avoid disruption. Shippers use the transportation mode or combination of modes that can provide the highest level of service, most reliable transit time, and lowest cost for moving goods. Examples of these activities include the decision to truck goods long distances due to congestion or capacity issues on the rail system, or to use multiple ports rather than a single entry point for international shipping. Companies do not want to be dependent on a single means of shipping, and may even shift delivery routes while goods are in transit. To overcome potential impediments in the supply chain, companies often employ redundant shipping strategies to ensure their goods are delivered on time. The desire to minimize risk of delay in moving goods along a supply chain increases pressure on the intermodal transportation to work seamlessly as goods travel across miles and between modes.

### *The Growth in Freight*

As a result of global trends previously described, international trade volumes are growing at an accelerating rate. According to the Bureau of Transportation Statistics and the Federal Highway Administration (FHWA), over 19 billion tons of freight, valued at \$13 trillion, was carried over 4.4 trillion ton-miles in the United States in 2002.<sup>9</sup> On a typical day in the United States (2002), about 53 million tons of goods valued at about \$36 billion moved nearly 12 billion ton-miles on the nation's multimodal transportation network. In terms of tons transported, domestic freight transportation for truck, rail, water, and air modes grew by 20 percent from 1993 to 2002 and is expected to increase by over 65 percent by 2020.<sup>10</sup> Within the Portland-Vancouver region, the 2002 Commodity Flow Survey forecasts a doubling of the demand for commodity tonnage shipments by 2030. In terms of value, commodities shipped to, from, through, and within the Portland-Vancouver region will increase from \$457 billion dollars in 2000 to \$824 billion dollars per year in 2030<sup>11</sup> (Figure 1.2).

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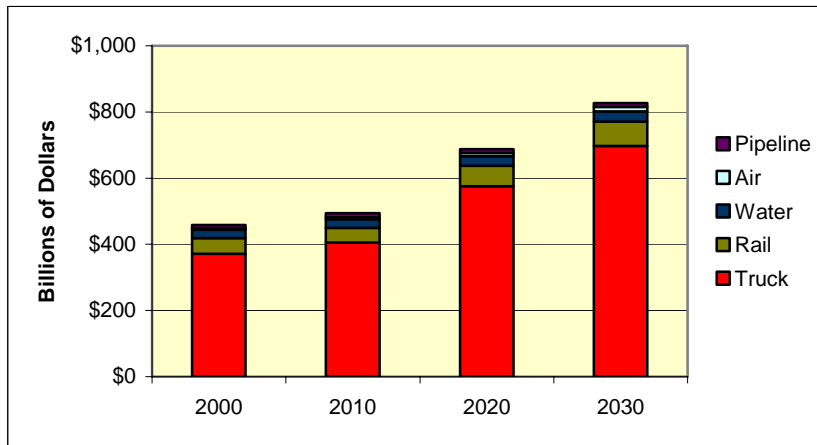
<sup>8</sup> Martin E. Robins and Anne Strauss-Wieder, *Principles*, 7.

<sup>9</sup> Freight in America, 2006

<sup>10</sup> Freight in America, 2006

<sup>11</sup> *Commodity Flow Forecast Update and Lower Columbia River Cargo Forecast*, Port of Portland, June 30, 2002

**Figure 1.2 – Forecasted Value of Commodity Shipments by Freight Mode for Portland-Vancouver Region**



Source: *Commodity Flow Forecast Update and Lower Columbia River Cargo Forecast, Port of Portland, June 30, 2002*

While international shipments will continue to increase, U.S. domestic goods are also moving across longer distances. Nationally, nearly 60 percent of the value of freight shipments for all modes, worth \$4.9 trillion, crossed state lines in interstate commerce.<sup>12</sup> As example, the 1997 Commodity Flow Forecast for the Portland/Vancouver region determined that a significant volume of goods movement is “pass through” traffic, not originating or destined for the region, but instead moving through on the roads, rails, pipelines and waterways that connect the area to other regions (roughly 450 million tons in 1997). In terms of tonnage, this type of traffic is also forecast to double by 2030, with rail and truck movement forecasted to grow the most.<sup>13</sup>

### **Constrained System Resources**

The increased freight volumes are creating challenges for the nation’s transportation infrastructure and for the distribution and logistics industry trying to efficiently move it.

#### *Congestion*

Across the nation, growth in international trade is straining the physical infrastructure intended to facilitate it. For marine terminals and airport infrastructure, the congestion and lack of physical space are exacerbated by the trade imbalances, particularly with Asia, where far more freight is moving into the U.S. than is moving out. For example, at the Ports of Los Angeles and Long Beach approximately three containers are imported for every one exported.<sup>14</sup>

Another factor in port congestion is the decline in facilities expansion. While tonnage at U.S. air and marine ports has increased by 13.8% between 1990 and 2000, physical capacity has only increased marginally. This is due to a combination of factors including the high cost of expansion in developed areas, lack of available undeveloped space, and concern about the community and environmental impacts of expansion.

The increasing volumes particularly challenge the landside rail and road networks. Road network congestion poses a problem for all network users, but for businesses reliant on transportation, it has a number of adverse, and costly, effects. Congestion can increase costs through unmet

<sup>12</sup> Freight in America, 2006

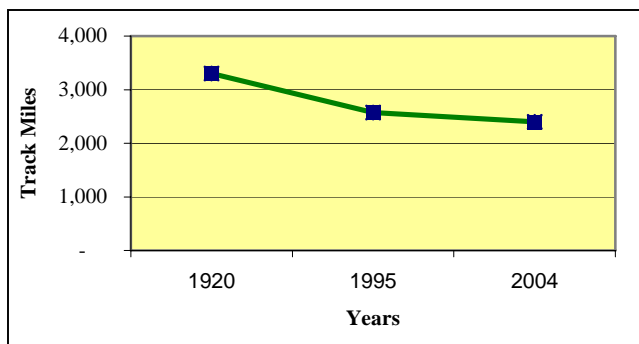
<sup>13</sup> Ibid

<sup>14</sup> John Vande Vate, Frontline Solutions, March 2005

deliveries, added fuel costs, and driver wages. Companies have had to increase inventories, shift shipping to off-peak periods, or move distribution centers to better functioning locations. The 2005 *Cost of Congestion to the Portland Metropolitan Region Study* found that roadway congestion dampens the region’s economic vitality, estimating that without adequate investments to transportation, the region’s economy could potentially lose \$844 million annually by 2025.<sup>15</sup>

The impacts of congestion are also felt on the rail network. Since 1980, deregulation has led to a consolidation in the number of jobs and miles of rail line in the U.S. While overall productivity has increased, the rail system is facing challenges today and into the future. Despite a shrinking national rail, network demand for rail service is at a near all-time high. The resulting increased demand on fewer rail miles forces lines to run at near capacity. Figure 1.3 shows the track decline in Oregon.

**Figure 1.3 Oregon’s Shrinking Rail Network**



Source: *Freight Rail and the Oregon Economy: Final Report*, 2004

*The Freight-Rail Bottom Line Report, commissioned by the American Association of State Highway and Transportation Officials (AASHTO), estimated that \$175 to \$195 billion of investment is needed over the next 20 years just to address the worst bottlenecks and maintain rail’s current mode share.*

The recent *Freight Rail and Oregon Economy: Final Report* found that rail congestion in the Portland Region, measured in terms of hours of delay, is almost half of Chicago’s, despite the fact that Chicago handles almost six times more rail traffic.<sup>16</sup> Continued network congestion means rail companies turn away business, which shifts to comparable modes – most often truck.

Also, the high cost of capital investments in the rail industry makes it difficult for private companies to add new rail capacity that includes additional mainline, sidings, yard space, and equipment.

### Labor

The distribution and logistics industry is also facing difficulty hiring and retaining employees. Difficult working conditions, high turnover, and an aging workforce are contributing to a shortage in the number of available train and truck drivers. The American Trucking Association predicts a shortage as high as 111,000 long-haul truck drivers by 2014.<sup>17</sup> The declining number of younger workers entering the trucking business exacerbates this number. According to the U.S. Bureau of Labor Statistics, the number of working truck drivers aged 55 and older has risen 19 percent since

*A BB&T Capital Research report predicts that “the demand for drivers will be three times as high as the available supply for the next few years, constraining growth and raising trucking rates.”*

<sup>15</sup> *The Cost of Congestion to the Economy of the Portland Region*, Economic Development Research Group, 2005.

<sup>16</sup> *Freight Rail and Oregon Economy: Final Report*, 2004.

<sup>17</sup> *The U.S. Truck Driver Shortage: Analysis and Forecasts*. Global Insight 2005



2000.<sup>18</sup>

Reasons cited for the labor crunch include better wages and working conditions in other blue collar jobs that compete with the trucking industry for employees. Industry economists point to 2000 as the year that wages in construction and similar jobs surpassed those for long-haul trucking.<sup>19</sup> Also, difficult working conditions such as long stretches away from home, unpredictable schedules, time pressures, traffic, dissuade the recruitment and retention of drivers.

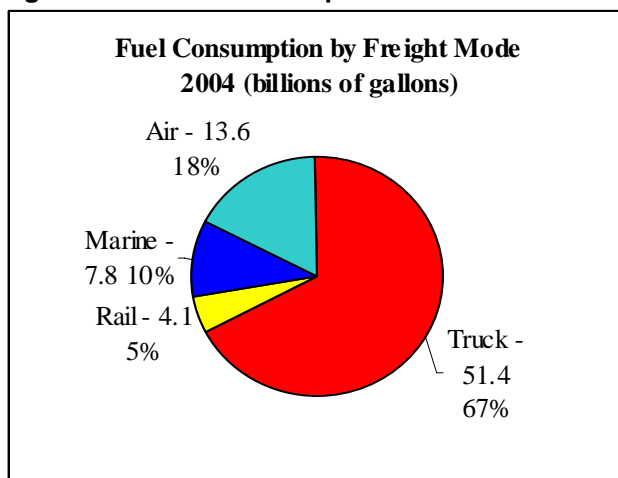
The trucking industry is actively addressing its labor shortage. Strategies include increasing wages; redesigning routes to allow for greater stretches of time at home; and tapping into new sources of labor that haven't traditionally been attracted to the industry, particularly women, retirees, and Hispanics. Companies are also holding appreciate events such as barbeques to recognize and reward drivers for their contribution to the bottom-line.<sup>20</sup>

The rail industry began experiencing its labor shortage around 2002, as a result of railroad company mergers that reduced workers, as well as an unanticipated number of experienced railroad employees opting for early retirement, which left thousands of skilled jobs open. The railroad companies are undertaking a massive recruitment effort to replace its work force. Other occupations in the freight industry are expected to have greater demand than labor supply including air cargo handlers and operators of moving machines and cranes.

### Energy

The rising and volatile fuel prices have a significant impact on freight transportation providers. Fuel is a primary business expense for companies that move freight and goods. In 2004, the combined freight modes (air, rail, truck and water) operating in the U.S. consumed 76.9 billion gallons of fuel (Figure 1.4).

**Figure 1.4 – Fuel Consumption**



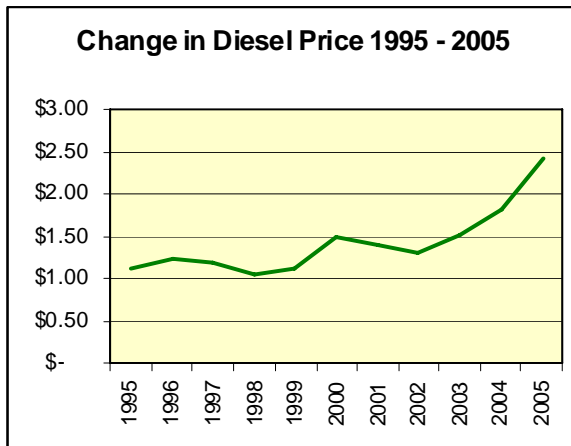
Source: Bureau of Transportation Statistics & American Trucking Association

<sup>18</sup> Robert Malone, "Help Wanted: Truck Drivers", Forbes.com, May 5, 2006.

<sup>19</sup> Ian Urbina, "Short on Drivers, Truckers Offer Perks", February 28, 2006.

<sup>20</sup> Ibid.

**Figure 1.5 – Diesel Price Trends**



Source: Energy Information Agency, U.S. Department of Energy, July 2006

Diesel fuel prices have increased at a steady pace over the past ten years (Figure 1.5). The financial impact of rising fuel prices is being felt across freight modes, albeit at different levels of impact.

The logistics industry has generally responded to rising prices through a combination of fuel surcharges and fuel management strategies. Air cargo, rail, and trucking firms add fuel charges to their shipping rates, indexing the charge to the price of fuel and varying the surcharge on a weekly, bi-weekly, or monthly basis depending upon industry conditions. Fuel management strategies include using operating techniques such as reducing idling, improving aerodynamics on vehicles, driving training, and route optimization.

With the expectation of continuing energy volatility, businesses will be employing long-term strategies to increase energy efficiency. The most common approach is likely to be a better utilization of the physical capacity of equipment. This can be done through increasing shipment sizes to maximize use of equipment. There is also a trend to “right-sized” equipment to match market volume demand. The airline industry has used this approach in recent years to address their rising costs. Also likely are accelerated investments in information technologies that optimize the use of equipment.<sup>21</sup>

### *Industrial Land and Accessibility*

A relatively recent development in transportation systems is the *freight hub* – facilities that provide international and/or domestic intermodal freight handling and services, typically involving transfer of freight between marine, air, rail, and truck modes and may include warehousing-distribution-consolidation facilities and services as part of a larger complex. Freight hubs are important to the national and regional economies as they provide the basic infrastructure for businesses to compete in a global economy as well as a source of employment.

Freight hub facilities are mostly found in older, more established parts of a metropolitan area, developing around historic marine terminals or rail yards, for example. This presents challenges for both expansion and efficient access.<sup>22</sup> Terminal facilities are land-intensive uses and the ability to expand with growth in freight volume is in competition with other uses for the same land, as well as concerns about environmental and community impacts. For example, waterfront

<sup>21</sup> Global Insight, *Portland/Vancouver International and Domestic Trade Capacity Analysis: Assessment of Trade and Economic Dynamics*, August 2006

<sup>22</sup> Transportation Research Board, *Financing and Improving Land Access to U.S. Intermodal Cargo Hubs* (NCHRP Report 497), 2003.

property is highly desirable for both port terminal expansions and for residential and commercial development, creating competing economic development goals.<sup>23</sup>

With regard to efficient road and rail access, freight hubs intensify the volumes of cargo moving through a single location and are characterized by periodic surges of activities as equipment arrives to be loaded or unloaded. These bursts of activity can have spillover effects such as gate backups, increased truck activity on adjacent streets, and blocked at-grade rail crossings – creating congestion and delay. Another constraint on access is that older infrastructure adjacent to intermodal terminals may no longer adequately accommodate new, larger freight vehicles and equipment. The road geometry (curb radii), road dimensions (weight, height, and length), and pavement condition may impede the smooth transfer of loads.<sup>24</sup>

In the Portland region, a combination of policy and regulation define and protect key industrial/employment centers. Metro’s Urban Growth Management Functional Plan defines *Regionally Significant Industrial Areas* in order to protect these employment areas near significant transportation facilities.<sup>25</sup> The City of Portland developed the concept of Industrial Sanctuaries within its Comprehensive Plan as a way to reserve and protect land for existing and future industrial development. Guild’s Lake Industrial Sanctuary in Northwest Portland is one example of a sanctuary that limits non-industrial uses.

## **Community Issues**

Increasing freight activity brings both economic opportunity and livability challenges to a community. The need to balance freight activity with community impacts generally arises when freight activity expands from a background support activity into a “noticeable presence.”<sup>26</sup> Both regionally and nationally, there is growing interest in looking at how to better integrate freight operations with community goals, particularly for the areas of security, safety, and the environment.

### **Security**

The events of September 11<sup>th</sup>, 2001 shook the nation and gave rise to the need for increased transportation system security in the wake of heightened concerns. Since this time, several major pieces of federal legislation that address transportation security have been passed. The *Aviation and Transportation Security Act of 2001* created the Transportation Security Administration, established the Transportation Security Oversight Board, and contained enhanced security requirements for air travel.<sup>27</sup>

The *National Maritime Transportation Security Act of 2002* implements measures to protect ports and waterways from a terrorist attack. It requires area maritime security committees and security plans for facilities and vessels that may be involved in a transportation security incident. The act required the Transportation Security Administration to create a National Maritime Security Plan as well as Security Incident Response Plans.

The *Urban Area Security Initiative (UASI)* is a program of the Department of Homeland Security that provides funding to urban areas that are under potential threat from terrorism. UASI funding

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<sup>23</sup> Transportation Research Board, *Integrating Freight Facilities and Operations with Community Goals* (NCHRP Synthesis 320), 2003.

<sup>24</sup> Transportation Research Board, *Financing*, 35.

<sup>25</sup> Map located at: [http://www.metro-region.org/library\\_docs/land\\_use/rsia\\_map\\_resolution\\_04\\_1040.pdf](http://www.metro-region.org/library_docs/land_use/rsia_map_resolution_04_1040.pdf)

<sup>26</sup> Transportation Research Board, *Integrating Freight Facilities*, 9.

<sup>27</sup> Metro, *Regional Safety and Security Profile*, November 2006.

is allocated based on the presence of international borders, population and population density, the location of critical infrastructure, and other factors. In the Portland metropolitan region, a local group of interested parties, the Urban Area Working Group, meets to discuss emergency preparedness within the context of this program; it is organized by the state Department of Homeland Security. The City of Portland's Office of Emergency Management is the administering agency for the UASI federal grants to the region, which have totaled over \$30 million through fiscal year 2004-2005.

### *Safety*

Rising freight activity increases community concern about safe interactions with freight modes, particularly trucks and trains. The 2003 NCHRP report *Integrating Freight Facilities and Operations with Community Goals*, listed at-grade rail crossing safety, the potential for injury or loss of life along rail corridors, safety on roads with heavy truck volumes, and the handling and transport of hazardous materials as the most commonly identified community safety issues.<sup>28</sup>

With regard to railroad safety, national data on train accidents/incidents show a 10-year average of 3.88 accidents/million train-miles, a relatively flat year-to-year trend over the period.<sup>29</sup> Nationally, 72% of rail accidents/incidents are due to human-operator error (38.4%) and track deficiencies (33.9%).<sup>30</sup> In 2005, the Federal Railroad Administration released the *National Rail Safety Action Plan* to address on-going concerns about rail industry safety and to ensure safe operations with growing rail and vehicle traffic. The plan's primary initiatives include addressing human factor train accidents, track safety, hazardous materials handling, and highway grade crossing incidents. Improving highway grade crossing safety is important because incidents between trains and vehicles account for a large percentage of total rail-related incidents and fatalities. Nationally, between 2000 and 2005, there were 18,908 highway-rail accidents accounting for 21% of total incidents. Of these, 12% resulted in a fatality. Analysis of accident data for the 3-county region of Clackamas, Multnomah, and Washington found that between 2000 – 2005 there were a total of 432 incidents, of which 12% are attributable to grade crossing collisions with vehicles. In that same period, there were 16 fatalities, all attributable to highway/rail conflicts or to trespassing on the tracks.<sup>31</sup>

In Oregon, ODOT's Rail Division is responsible for safety oversight of rail operations and crossings. It acts as an agent for the Federal Railroad Administration (FRA) by inspecting track, railroad equipment and cars, hazardous materials and operating practices, and it has exclusive authority over public at grade highway crossings of rail tracks. The division participates in *Oregon Operation Lifesaver*, part of an international family of non-profit organizations, is devoted to improving safety at highway-railroad crossings and on railroad rights-of-way. They manage a public awareness program to teach communities about rail safety in order to reduce grade crossing and trespassing accidents. Since the program's inception in 1977, the number of collisions at public rail crossings has decreased despite an up tick in both train and vehicle traffic.<sup>32</sup>

The safe interaction of trucks with other roadway users is also a significant issue for communities. Public agencies, such as the Federal Motor Carrier Safety Administration (FMCSA) and the ODOT's Motor Carrier Transportation Division, are charged with ensuring

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28 *Integrating Freight Facilities and Operations with Community Goals*, 2003

29 Federal Railroad Administration, *National Rail Safety Action Plan*, 2005, pg. 2.

30 *National Rail Safety Action Plan*, 2005, pg. 3.

31 [http://safetydata.fra.dot.gov/officeofsafety/accidents and incidents by region/state](http://safetydata.fra.dot.gov/officeofsafety/accidents%20and%20incidents%20by%20region/state)

32 <http://www.oregonol.org/about.html>

safe commercial vehicle operations through education, monitoring, enforcement. Nationally, the truck-involved crash totals have steadily increased with the growth in truck vehicle miles traveled (Table 1.1). From 2001 to 2004, there was a 9% increase in truck vehicle miles traveled (VMT) and a 27% increase in crashes. Almost half of these crashes result in an injury or death, although the percentage of injuries and deaths resulting from truck-involved crashes has declined over the same period.<sup>33</sup>

**Table 1.1 – National Truck-related Crash Data**

	2001	2002	2003	2004	2005
Adjusted Commercial Motor Vehicle VMT	216,109	221,448	224,700	233,191	Not available
Total Truck Involved Crashes	109,530	116,592	127,734	139,271	144,704
% Fatal	4.40%	3.93%	3.70%	3.52%	3.41%
% Injuries	45.72%	47.70%	45.82%	43.62%	41.89%

In Oregon, the statistics are similar to the national experience with regard to truck VMT growth and crash rates. Truck VMT rose 9.12% between 2001 and 2005. In the same period, truck-at-fault crashes increased 16.61% and truck-at-fault rates increased by 5.88%. However, Oregon has consistently outperformed the national crash rates per million miles, with the 2000 – 2004 average crash rate 68% lower than the nation as a whole.<sup>34</sup> Oregon’s increase in truck-involved crashes can be attributed to a variety of factors including:

- More trucks and light vehicles on the road, traveling more miles;
- Increasing congestion, both reoccurring and non-reoccurring;
- Escalated level of ongoing construction activity along roadways, with work zones and detours that create new and sometimes confusing situations for users.
- Above average inclement weather that create treacherous driving conditions; and
- Decreasing Oregon State Trooper presence that strongly correlates with raise in crash rates (an estimated causation range of 6 – 10%).<sup>35</sup>

Strategies for reducing truck-involved crash rates are focused on driver behavior. The FMCSA released the *Report to Congress on Large Truck Crash Causation Study* in March 2006. The methodology looked at a representative sample of large truck fatal and injury crashes between 2001 and 2003. In the majority of the cases studied, action or inaction by the truck driver or other drivers involved lead to the crash. Driving too fast and fatigue were important factors in crashes, with passenger vehicle drivers more often identified with fatigue and truck drivers with speeding. Other factors cited in causation include brake problems (30% trucks, 5% passenger vehicles), roadway problems (16%), weather (13%), and traffic flow interruptions like a work zone, congestion, or previous crash (25%).<sup>36</sup> The FMCSA has launched numerous safety programs direct at the trucking industry that include education, training, and enforcement components. A recent program addition is *Share the Road Safely*, which disseminates road safety information to all road system users.

<sup>33</sup> <http://ai.volpe.dot.gov/CrashProfile/NationalCrashProfileMain.asp>

<sup>34</sup> An analysis of MCTD activities found that removing truck drivers with critical safety violations from the road produced the greatest reduction of truck crash rates. ODOT, MCTD.

<sup>35</sup> ODOT, Motor Carrier Transportation Division, 2006

<sup>36</sup> Federal Motor Carrier Safety Administration, *Report to Congress on Large Truck Crash Causation Study*, March 2006.

In Oregon, ODOT's Motor Carrier Transportation Division takes the lead on safety initiatives for truck movement in the state. The division enforces regulations related to the maintenance and repair of equipment, driving training and licensing, load securement, and hazardous waste transport, in compliance with federal mandates. With regard to general road safety, the division has prepared public awareness materials including a brochure designed to educate motorists' on blind spots around trucks and brochures on dangerous downgrades, including Emigrant Hill in eastern Oregon and the Siskiyou Pass in southern Oregon, targeted to truckers.

Of particular concern is the transport of hazardous materials through populated areas by truck, train, ship, and pipeline. Communities view the movement of toxic and/or explosive materials as a safety concern and, post-9/11/01, as a security issue. Nationally, the number of hazardous materials transport incidents by all modes (air, truck, rail, water) has declined 10% between 2000 and 2005. In Oregon, there has been a 28% decline in incidents involving hazardous waste transport. Table 1.2 provides the reported incidents nationally and for Oregon. Incidents attributed to trucking account for 88% of incidents nationally and 93% in Oregon. Associated injuries and fatalities are extremely low, averaging 2% nationally. Oregon reporting shows only six injuries and no fatalities related to hazardous materials transport between 2000 and 2005.

**Table 1.2 – 2000 - 2005 National and Oregon Reported Hazardous Transport Incidents<sup>37</sup>**

	2000	2001	2002	2003	2004	2005
National Incidents	17,557	17,792	15,114	15,156	14,845	15,841
Oregon Incidents	302	239	214	229	224	218

At the federal level, the Department of Transportation's, Pipeline and Hazardous Materials Safety Administration is responsible for the safe and secure movement of identified hazardous materials by all modes of transportation. Federal regulations govern all elements of hazardous materials handling and transport including training, permitting, reporting, inspection, and incident management. The federal office manages a national safety program to minimize the risks to life and property inherent in commercial transportation of hazardous materials by road, rail, and pipeline.

The Oregon Department of Transportation, Motor Carrier Transportation Division, regulates the transportation of hazardous materials in the state by adopting Federal Hazardous Materials Regulations for both carriers and shippers.

### *Environment*

Large, powerful engines are the required to move freight efficiently, but they have costs for the natural environment and community. Freight operations are a source of air and water pollution. They produce noise and in some instance light impacts that are seen as a nuisance to adjacent residential uses. Low-income and minority communities are often located in the immediate vicinity of freight activity areas and disproportionately receive the brunt of these adverse effects. In many cases, the environmental and public health effects of freight movement can be readily mitigated.

Diesel fuel largely drives the machinery of freight activity. Diesel engines move 94% of the freight in America.<sup>38</sup> Emissions from burning diesel fuel are a mixture of several types of harmful substances including: carbon dioxide, carbon monoxide, nitrogen oxides (NOx), sulfur oxides, hydrocarbon gases, and diesel particulate matter. These substances have been linked to air quality

<sup>37</sup> Office of Hazardous Materials Safety, 2006, <http://hazmat.dot.gov/pubs/inc/hmisframe.htm>

<sup>38</sup> Oregon Departmental of Environmental Quality, 2007.

degradation from ozone formation, reduce visibility from haze, acid rain, and global climate change. Diesel particulate matter also poses a serious health risk. These fine particles are so small that they can lodge deep in lung tissue and can also pass through into the bloodstream carrying a host of other toxic air pollutants. They also aggravate respiratory conditions such as asthma and bronchitis. Finally, diesel particulates have been linked to an increase risk for cardiovascular disease and cancer. Children are particularly sensitive to diesel emissions because they breathe in 50% more air per pound of body weight than adults.<sup>39</sup>

Because of the documented harmful effects of diesel emissions, federal and state agencies are working to reduce diesel emissions on multiple fronts. In 2001, the federal Environmental Protection Agency (EPA) issued an administrative rule for cleaner burning diesel engines to reduce nitrogen oxide (NOx), non-methane hydrocarbons, and particulate emissions starting with the 2007 model year vehicles. The same rule also required the production and use of ultra low sulfur diesel in 2006. Together, the tighter standards mean truck and bus engines fitted with advanced pollution control devices will be up to 95% cleaner than pre-2007 models.

**Table 1.3 – 2007 EPA Standards for Heavy Duty Vehicles and Estimated Effect on Air Quality<sup>40</sup>**

Elements	New Standard	Estimated Reduction by 2030
Diesel Particulate Matter	.01 grams/brake-horse power/hour	110,000 ton/year
Nitrogen Oxide	.20 grams/brake-horse power/hour	2.8 million tons/year
Non-Methane Hydrocarbons	.14 grams/brake-horse power/hour	305,000 tons/year

Diesel engines are durable with an average lifespan of 29 years for a heavy-duty engine.<sup>41</sup> Because pre-2007 trucks will continue to operate for many years to come, there are federal and Oregon programs targeting emissions reductions through retrofitting engines with pollution control devices, idling reduction tools, and encouraging the purchase of newer, cleaner trucks.

In 2004, the EPA issued a rule, the *Clean Air Non-Road Diesel Rule*, expanding regulations for emissions to non-road diesel vehicles used in construction, agriculture, and industrial operations. Beginning in 2008, new non-road vehicle engines will be required to meet new emission standards. The rule also expands the use of ultra-low sulfur fuel to non-road vehicles by 2010. A rule is also under view to extend non-road engine and fuel requirements to train and marine engines.<sup>42</sup> The EPA is also working with its counterparts in Canada and Mexico to develop a North America Sulfur Emission Control Area, under the provisions of an international treaty (Annex VI of MARPOL 73/78) that caps sulfur levels in marine fuel in order to reduce toxic emissions. To date, the U.S. has not ratified the treaty but is preparing the technical evaluation required for ratification.<sup>43</sup>

The impact of freight activities on water quality and aquatic environments is another concern. Unregulated, run off from freight operations carry toxic materials into waterways. There are multitudes of federal and state regulations intended to limit the effects of urban activities such as freight movement on aquatic environments. For example, the Port of Portland has developed a

<sup>39</sup> Environmental Protection Agency, *Diesel Exhaust in the United States*, September 2002.

<sup>40</sup> Environmental Protection Agency, Proposed Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, May 2000.

<sup>41</sup> Clean Air Task Force, *An Analysis of Diesel Air Pollution and Public Health in America*, June 2005.

<sup>42</sup> Environmental Protection Agency, *New Clean Diesel Rule Major Step in a Decade of Progress*, May 2004.

<sup>43</sup> West Coast Collobarative.org

deicing runoff collection system at the Portland International Airport to collect waste materials that are harmful to the area's aquatic life.<sup>44</sup>

The introduction of invasive species from maritime trade is a rising issue for aquatic environments. The EPA estimates that over two-thirds of recent introductions of invasive species in the U.S. are attributed to ships, with the discharge of ballast water being the most universal vehicle of introduction.<sup>45</sup> Invasive species are the second leading cause of species extinction and loss of biodiversity. This issue is of growing international concern, as global shipping moves over 80% of the world's commodities and transfers approximately three to five billion tons of ballast water internationally each year.<sup>46</sup>

*Ballast is any material to weight and/or balance an object. Modern ships carry ballast water to ensure stability, trim, and structural integrity. It is also is a more efficient and economical way to balance cargo loads.*

Source: globallast.imo.org

The release of ballast water may introduce aquatic non-indigenous species (ANS) into a port gateway. Typically, very few ANS survive in new surroundings because temperature, food, and salinity are less than optimal. However, the few that do survive and establish a population have the potential to cause ecological and economic harm. Populations of non-indigenous species may grow very quickly in the absence of natural predators. They may displace native organisms by preying on them or out-competing native species for food and habitat space. Economic damage may occur when an ANS displaces indigenous species that are harvested for food or other goods, or when they damage structures.<sup>47</sup>

This environmental threat from ballast water is of particular concern to Oregon waterways. Bulk carriers are the primary vessel type calling at Oregon ports to load goods for export. These vessels discharge large volumes of ballast water – seven million cubic tons was discharged into the Columbia River in 2005. About 9% of the ballast water was not exchanged. A 2002 survey of the Lower Columbia River reported 32 non-indigenous species of which 91% were likely introduced by ballast water. While the full cost of the ANS introductions in Oregon is unknown, a 2005 study estimated that the ANS zebra mussel could cost the hydropower industry \$23 million/year.<sup>48</sup>

To address the issue, the U.S. Coast Guard established a mandatory ballast water management program for ships entering from outside the 200-mile Exclusive Economic Zone that includes safe discharge practices and reporting requirements. Also, Congress passed the National Aquatic Invasive Species Act of 1996 (NISA), which encouraged the exchange of ship ballast water outside the 200-mile U.S. Exclusive Economic Zone and required a report on whether an exchange had taken place. The Act also authorized important research, linking its results to future decisions about whether additional ballast water regulation was needed. The NISA expired in 2002 and has yet to be reauthorized, although bills were introduced in 2003 and 2005.<sup>49</sup> Because the U.S. Coast Guard program does not require ballast water management for coastal voyages, the Oregon Ballast

*Ballast water exchange refers to the process of discharging biologically rich ballast water loaded from the origin port than taking on new ballast water from the open ocean.*

<sup>44</sup> [http://www.portofportland.com/Env\\_Home.aspx](http://www.portofportland.com/Env_Home.aspx)

<sup>45</sup> [www.epa.gov/owow/invasive\\_species](http://www.epa.gov/owow/invasive_species)

<sup>46</sup> Ibid

<sup>47</sup> <http://massbay.mit.edu/exoticspecies/ballast/fact.html>

<sup>48</sup> Oregon Ballast Water Task Force, Report on Ballast Water Management in Oregon, October 2006.

<sup>49</sup> [http://www.ucsus.edu/invasive\\_species/the-national-aquatic-invasive-species-act.html](http://www.ucsus.edu/invasive_species/the-national-aquatic-invasive-species-act.html)



Water Program was established in 2001 to combat ANS in discharged ballast water. The program requires ballast water reporting and, with limited exceptions, ballast water exchange for all foreign and coastal vessel arrivals, except barges, military and fishing vessels.<sup>50</sup> There is momentum towards strengthening the program to increase compliance.

The concept of *environmental justice* has emerged as a movement over last two decades. A converge of the civil rights movement and growing environmental awareness, environmental justice responds to the concern that minority and low-income groups are disproportionately affected by adverse human health and environmental impacts while having limited access to community benefits such as transportation, recreation, and health care.

In 1994, President Clinton signed an executive order requiring federal agencies to address environmental justice issues in their policies, programs, and activities in order to avoid, minimize, or mitigate for negative impacts to health and the environment and to ensure full and fair participation in decision making by affected communities.<sup>51</sup> The U.S. Department of Transportation and its agencies followed suit with requirements to address environmental justice as part of its mission and activities. State transportation departments and metropolitan planning organizations (MPO), like Metro, are now required to perform an environmental justice assessment and identify mitigation in all phases of planning for transportation.

With regard to freight operations specifically, environmental justice proponents advocate for a voice in decision making when investments, such as port facilities or roadway expansions, impact bordering communities. In the Portland region, the Environmental Justice Action Group (EJAG) is actively addressing health, safety, and environmental issues in North/Northeast Portland, historically a community of color and low-income residents, adjacent to major freight terminals, industrial businesses, and freight transportation corridors.

### ***Implications of Trends for the Portland/Vancouver Region***

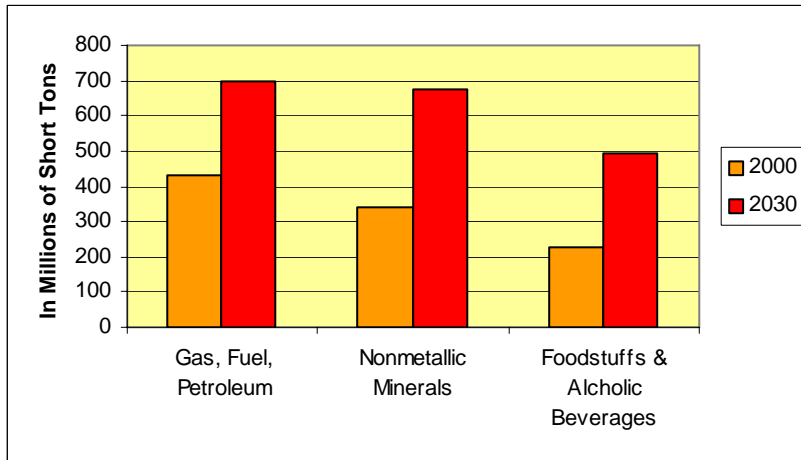
The Portland/Vancouver region, as an international gateway and domestic freight hub, is particularly influenced by the dynamic trends affecting distribution and logistics. As previously discussed, the region's latest commodity flow forecast projected an overall doubling of freight tonnage moved in the region by 2030. The region's forecasted population and job growth, estimated at an additional million residents and 600,000 jobs by 2030, and the associated boost in consumption of goods and services, largely drive the projected increased freight volume. In fact, the top three categories of commodities moved in the region, measured by tonnage, include products consumed by the region's population and businesses including petroleum products, materials used in construction, and foodstuffs and alcoholic beverages (Figure 1.6). These commodities are largely moved by truck, contributing to the overall projected increase in mode share for trucks from about 64% in 2000 to 73% by 2030.

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<sup>50</sup> Oregon Ballast Water Task Force, October 2006, pg. 12 – 13.

<sup>51</sup> <http://www.fhwa.dot.gov/environment/ejustice/facts/index.htm>

**Figure 1.6 – Growth Forecast for Top 3 Commodity Categories**



Source: *Commodity Flow Forecast Update and Lower Columbia River Cargo Forecast Update: Final Report 2002*

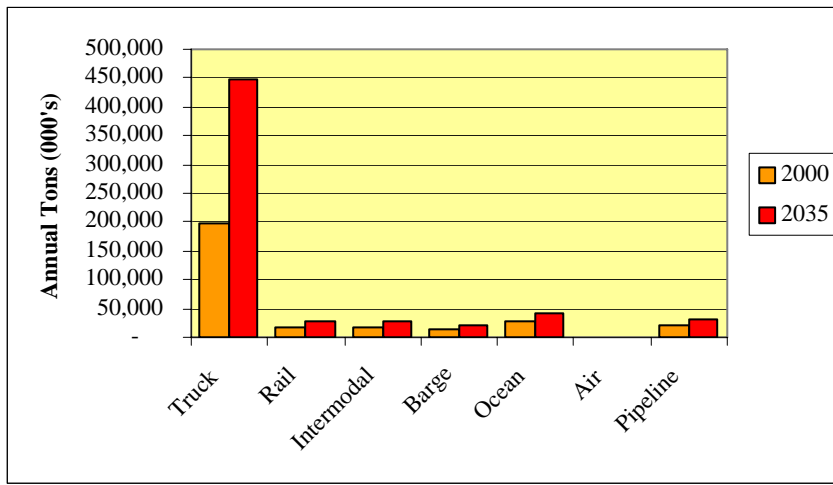
Sparked by the growing freight activity, both public and private sector interests in the Portland-Vancouver region are taking a fresh look at the freight transportation system and its link to economic competitiveness. There is a renewed awareness of the importance of a seamless freight transportation system to the regional and state economy, as evidenced by several recent publications on the topic.

The *Cost of Congestion to the Economy of the Region Study (2005)* reported that the metropolitan region has a higher than average dependency on traded sector industries, particularly computer/electronic products, wholesale distribution services, metals, forestry/wood/paper products, and publishing; business sectors that serve broader regional, national, and international markets and bring outside dollars into the region's economy. These industries depend on a well-integrated and well-functioning international and domestic transportation system to stay competitive in a global economy. Similar to the national findings of growing congestion, the *Cost of Congestion Study* concluded that the region's current and planned transportation system was not adequate to meet the growing demand and will negatively impact regional competitiveness if not addressed.

The *Portland-Vancouver International and Domestic Trade Capacity Study (2006)* sought to identify the likely impacts of growth in West Coast trade activity on the Portland-Vancouver region. The Portland/Vancouver region is one of four primary international trade gateways on the West Coast, the others being Southern California, the Bay Area, and Puget Sound. With the trend toward growth in NAFTA trade as well as in the Asian economies, like China and India, it is expected that demand for trade access into and out of the United States will grow, with significant effect on West Coast gateways.

The study confirmed previous forecasts of regional freight growth doubling in the next 20 – 25 years, but at a compounded annual growth rate of 1.9%, which is slightly slower than the national rate that averages between 2 – 3%. Figure 1.7 demonstrates the projected change in freight tonnage by mode over the next 30 years. All modes of freight transportation are forecasted to experience significant growth in tons. Domestic demand is the largest contributor to the growth, with the lion's share of tonnage moved by truck today (67% mode share in 2000) and into the future (75% mode share by 2035). This has implications for the region's road network.

**Figure 1.7 – Change in Freight Tonnage by Mode (2000 – 2035)**



Source: Global Insight 2006

Air cargo is expected to have the largest % increase in tons moved (269%). However, since air transport is typically used for high value, low weight shipments the overall tonnages when compared with the other modes of freight transportation belie the increasing importance of air cargo in the Portland-Vancouver region.

The study assessed the overall ability of region’s freight marine, rail, and air networks to support the expected demand, addressing both opportunities and challenges to meeting the forecast. General conclusions found:

- The Columbia River dredged to a depth of 43’ will meet the expected mix of carrier vessels to the marine ports.
- Rail service in the region is challenged by infrastructure capacity constraints to track, sidings, and intermodal yards, as well as the Class I rail service provider’s shifting focus to unit train and intermodal business. The role of shortline rail providers will become more critical for service to the region’s businesses.
- Domestic air cargo service, provided by integrated carriers like UPS and Federal Express, will continue to make Portland International Airport an important regional hub but service expansion will need to address the nighttime operation impacts to the community. Direct international air cargo service for the movement of high value commodities is important for region’s business sector.
- Industrial land, in the right location and readily developable, is important for retaining and attracting business in the region. Preparation of waterfront land is particularly important for maximizing growth opportunities, particularly auto imports.
- The road network connecting to marine, rail, and air cargo terminals is a critical link in the reliable movement of freight and protecting and enhancing access to these facilities is key to meeting forecasted demand.

The region’s business community has also weighed in on the importance of freight mobility to the economy with the creation of the *Regional Business Plan* (2006). The plan lays out specific, action-oriented initiatives aimed at ensuring a competitive regional economy, identifying an

initial four areas of focus including: K-20 education, freight mobility, land availability, and economic development/cluster competitiveness. With regard to freight mobility, the *Regional Business Plan* recommends the three action steps:

- Formation of a private sector Freight Mobility Coalition to advocate for transportation investments that improve business competitiveness.
- Transportation policies and projects that support business needs and economic development objectives.
- Funding for transportation investments that are needed and supported by regional businesses.

#### *Assessment of Implications for Regional Freight Mobility*

Global trends are having a profound effect on the movement of freight and significantly on the transportation systems that service mobility. As a gateway for trade, the Portland-Vancouver region will find both opportunity and challenge in an increasingly competitive global trade environment. Tackling the issues of increasing freight growth and economic opportunities will take a concerted effort by public and private sector interests to identify and prioritize actions. Table 1.4 lists the key trends and the policy implications they raise for the region.

**Table 1.4 – Key Findings and Action Plan/Regional Transportation Plan Implications**

Key Findings	Action Plan (RTP) Implications
<ul style="list-style-type: none"> <li>- The domestic and international trade is increasing and is forecasted to continue this trend. The Portland-Vancouver region is a hub for international and domestic trade.</li> <li>- Freight system improvements result in economic benefits and are tied to economic development goals.</li> </ul>	<ul style="list-style-type: none"> <li>- Prioritize transportation investments that support the region’s traded sector industry clusters.</li> <li>- Better coordination of transportation and economic development activities.</li> </ul>
<ul style="list-style-type: none"> <li>- With growth of complexity in supply chain logistics and use of just-in-time business practices, reliability and cost are increasing important factors in decision making.</li> <li>- Logistics management is relying on a mix of modes to move freight “door to door.”</li> </ul>	<ul style="list-style-type: none"> <li>- Increasing importance of efficient connections between marine, air, and rail terminals and the landside networks (road, rail, and pipeline).</li> <li>- Consider rapidly changing dynamics of private sector decision-making (e.g. Siting, shipping, labor).</li> </ul>
<ul style="list-style-type: none"> <li>- The overall freight system is facing constraints as a result of the growth in trade increasing the amount of freight tonnage moved.</li> </ul>	<ul style="list-style-type: none"> <li>- Management of the existing road capacity for movement of freight. Look at when and how to add highway capacity for the primary benefit of truck movement rather than SOV use.</li> <li>- Look at whether freight trips through the area should be consider differently than freight trips with an origin and/or destination in the region.</li> <li>- In addition to highway constraints, identify public sector role in providing increased service/capacity for non-highway modes that directly support private industry.</li> </ul>
<ul style="list-style-type: none"> <li>- Growth in freight movement has spillover effects that can adversely impact community livability.</li> </ul>	<ul style="list-style-type: none"> <li>- Expand focus of air quality assessment to address increasing diesel emissions.</li> <li>- Reinforce existing programs to address water quality and aquatic habitat.</li> <li>- Consider mitigation strategies for noise impacts (e.g. engine braking, train whistles, aircraft engines)</li> <li>- Reinforce existing activities around education, engineering, and enforcement for safety issues related to road and rail.</li> <li>- Address potential for cut-through truck traffic in neighborhoods as main routes become more congested.</li> <li>- Look at commercial freight delivery to centers (e.g. parking/loading, street design)</li> </ul>

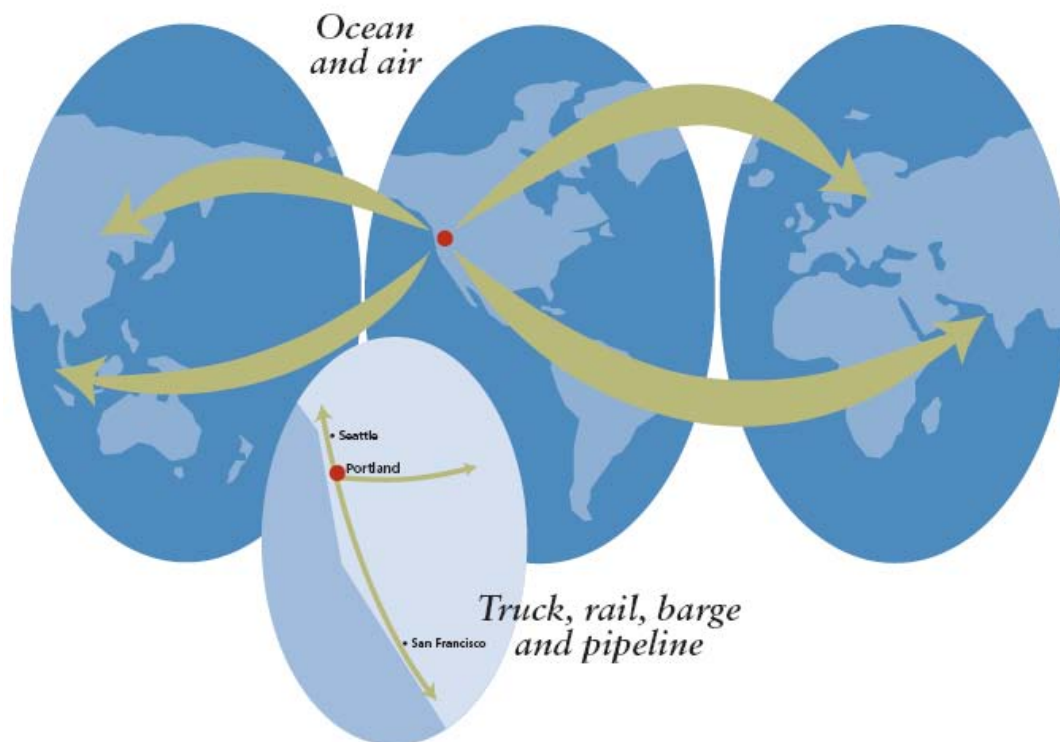
<b>Key Findings</b>	<b>Action Plan (RTP) Implications</b>
<ul style="list-style-type: none"> <li>- Current transportation revenues not adequate to meet all of the transportation needs.</li> </ul>	<ul style="list-style-type: none"> <li>- Look at how to prioritize infrastructure needs based on the best return on public sector investment (i.e., jobs, tax revenues).</li> <li>- Opportunities for other funding mechanisms</li> <li>- Consider potential of public-private partnerships to fund regional transportation priorities for freight.</li> <li>- Determine the public sector role for investment in privately owned infrastructure.</li> </ul>

## Section II: Profiles of Freight Transportation Modes in the Portland-Vancouver Metropolitan Region

### *Introduction*

Portland's geography has led to its location as a major freight hub for multiple freight transportation modes including marine, air, pipeline, rail, and truck. Shippers in the region can choose from a wide array of modes resulting in lower cost shipments, as well as seamless distribution to far-flung domestic and international markets. Figure 2.1 depicts the transportation networks that connect the Portland-Vancouver metropolitan region to domestic and international trade.

**Figure 2.1 – International and Domestic Network Connections**



As demonstrated in the following pages, each freight mode provides a distinct function in the movement of freight. They have different operating and cost characteristics that make them particularly suited to a certain market segments. While the different freight modes compete directly for business in certain instances, more often they are connected, as links in a chain, supplying door-to-door transportation of shipments.

### *Regional Growth in Freight Movement*

The Portland metropolitan region has changed tremendously in the last 30 years. The region's population has grown from about 1.1 million residents in 1972 to over two million in 2005. The region's role as a freight gateway has also expanded. In 1972, the Port of Portland moved 46.8 tons of air cargo, 17,000 marine containers, and 2.5 million tons of grain. In 2005, it handled 275.7 tons of air cargo, 160,479 marine containers, and 3.8 million tons of grain.

The region's role as a gateway for international freight and a hub for domestic freight shipments is expected to continue its growth, in line with general economic and population growth. Table 2.1 shows both the projected growth in freight tonnage and the expected distribution of that growth across the different modes. Trucking is currently the dominant mode for moving freight and is projected to expand its market share in the next 30 years.

**Table 2.1 - Portland Metropolitan Region Commodity Flows by Mode (millions of tons)**

Mode	2000		2035		Growth 2000-2035
	Tons	%	Tons	%	
Truck	197.2	67%	447.2	75%	127%
Rail*	32.9	11%	55.6	9%	69%
Water**	43.5	15%	63.9	11%	47%
Air	0.4	0.01%	1.7	0.02%	325%
Pipeline	22.2	7%	31.1	5%	40%
<b>Total</b>	<b>296.3</b>		<b>599.3</b>		<b>102%</b>

Source: Portland/Vancouver International and Domestic Trade Capacity Analysis, Port of Portland, 2006

\*Combines Rail and Intermodal.

\*\*Combines ocean-going steamships and river barges

That trucking is the primary mode of freight transport in the metropolitan region, now and into the future, is influenced to a certain extent by the regional shipment pattern – how much freight volume originates in the region and is shipped out (outbound); how much is being shipped into the region from other places (inbound); and how much volume has both an origin and destination within the region (internal). Table 2.2 allocates regional freight tonnage by origin/destination. The data in Table 2.2 does not include freight that traveled through the region. Freight movements that are internal to the region primarily use trucks to deliver goods from shipper to customer. Inbound and outbound shipments are more likely to utilize freight modes in addition to trucking, the choice influenced by the type and volume of freight, destination, special handling requirements, and customer specifications.

**Table 2.2 - Freight Origins and Destinations in Years 2000 and 2035**

Origin & Destination	Millions of Tons		Growth 2000-2035
	2000	2035	
Inbound freight traffic	123	221	80%
Outbound freight traffic	99	208	110%
Internal freight traffic	73	170	133%
<b>Total</b>	<b>296</b>	<b>599</b>	<b>102%</b>

Source: Portland/Vancouver International and Domestic Trade Capacity Analysis, Port of Portland, 2006

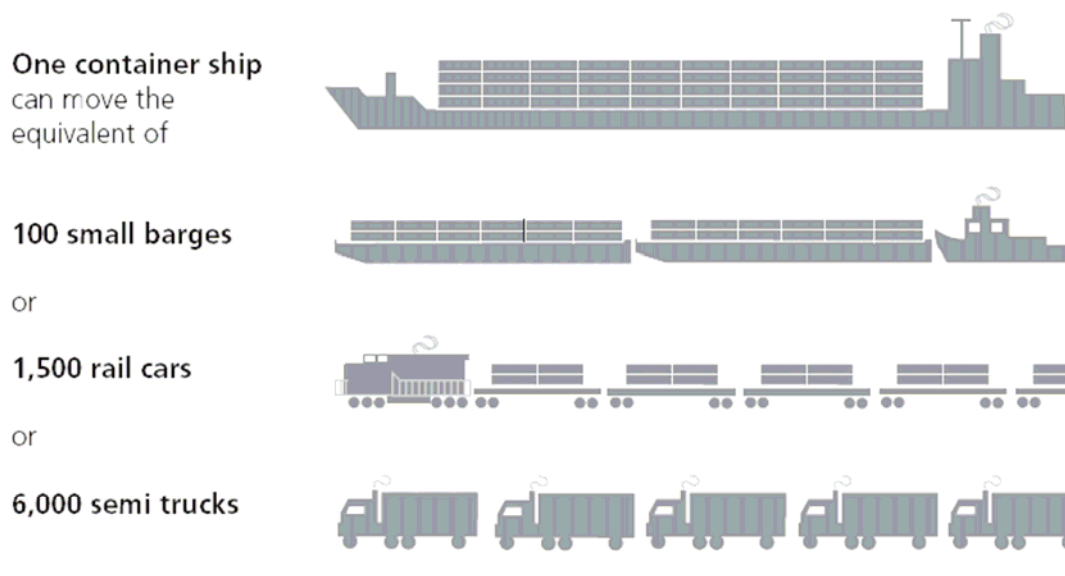
### *General Comparison of Freight Modes*

The capacity of each freight mode and the networks they use are one of the key determinants of usage by a shipper. As Figure 2 shows, one ocean-going ship can carry the equivalent of 1,500 rail cars and 6,000 trucks. For large shipments, steamships, barges and railroads are very efficient, in terms of cost, because of their capacity to handle mass quantities of bulky, heavy freight. For example, it would be less cost-effective to transport one container to Boise by rail than it would be by truck because railroads need to fill up trains before they can deliver goods at a low cost. Similarly, transporting grain from eastern Oregon and Washington by truck would be an expensive and inefficient choice over barges and railroads that can carry mass volumes of grain, and are better equipped to receive and distribute grain directly to and from silos and steamships. In many cases, customers will request a certain mode for shipping product because of warehouse's capabilities or the



need to distribute products to locations without access to certain modes, or the desire to combine different cargoes on a certain mode.

**Figure 2.2 – Comparison of Shipment Capacity by Mode**



Source: U.S. Army Corps of Engineers, Philadelphia District, <http://www.nap.usace.army.mil/dredge/d1.htm>

In addition to carrying capacity, each mode has specific performance parameters with respect to the distances traveled, overall rate of speed, energy consumption, and emissions outputs. As shown in Table 2.3, air cargo generally offers access to distant locations and a high level of service for the handling of perishable and/or fragile cargo, but it also has limited cargo capacity and very high energy costs (i.e., BTUs/ton-mile). River barges and railroads can carry a very large volume of cargo while consuming very little fuel with very few emissions, but they are best suited for high-volume commodities moved long distances. Each of the characteristics below are critical considerations for producers, customers, and public policy agencies.

**Table 2.3 - Comparative Characteristics of Freight Modes\***

	Max Tonnage (gross tonnage weight)	Avg Trip Distance	Avg Long- Haul MPH	Ability to Handle Fragile Goods	BTUs/ Ton-Mile	Emissions/ Ton-Mile
Truck	50/truck	247	50-70	Good	3,337	3.25 gms
Rail	12,000/train	617	50-70	Fair	345	0.5 gms
Ship	10,000-65,000	511	22.5 knots	Fair	471	unavailable
Barge	14,500	511	12-13 knots	Fair	368	unavailable
Air	124	1,070	300-600	Best	28,000	unavailable
Pipeline	na	na	3-4	na	na	na

\* Sources and reference data for the above information provided in Appendix A.

### Distribution Hubs

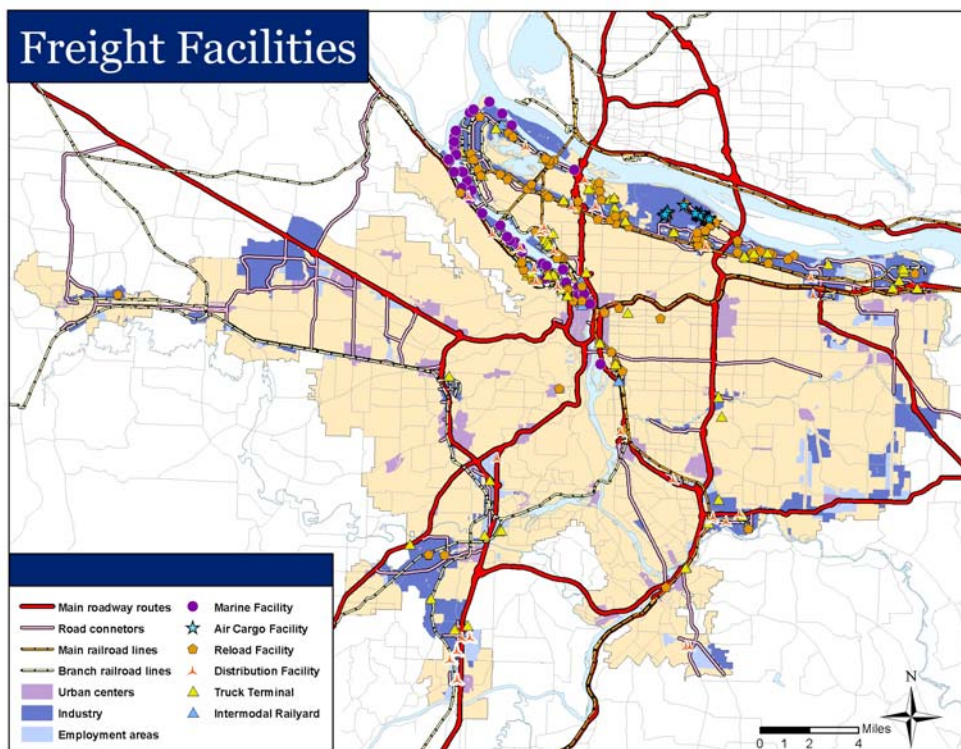
The sophisticated logistics and transportation strategies for moving goods around the globe and the region rely on well-positioned distribution centers to manage automated and customized freight

flows. The goal of distribution centers is to concentrate short-term inventory in a few large facilities to execute “just-in-time” delivery. Unlike traditional warehouses that are primarily storage facilities adjacent to production plants, distribution centers consolidate and process the goods flowing through them. A typical distribution center incorporates loading bays, fast-moving conveyor systems, and electronic information technologies such as radio frequency identification technology (RFID) to organize goods and transactions between receiving docks and shipping docks and modes. Distribution centers are larger than warehouses and are principally located in suburban and ex-urban areas with good connections to highways and railroads. While airports and seaports also provide distribution centers (e.g., Oregon Transfer’s new facility at the Port of Portland’s Terminal 6), the cost of transporting from distant distribution centers far outweigh the higher cost of land, labor, and operations present in urban areas. Trucking is the primary mode moving freight to and from distribution centers.

In the Portland region, several companies trans-ship finished goods to distribution centers. Columbia Sportswear ships from the ports of Los Angeles/Long Beach, Seattle/Tacoma, and Portland to its national distribution center in Kentucky. Georgia-Pacific ships paper product from around the world, including its Camas, WA plant, to its national distribution center in Waukesha, Wisconsin (as well as seven other distribution centers). Esco Corporation uses its national distribution centers in Mississippi and Kentucky to organize and deliver to its customers throughout the U.S. and Canada. In addition to national distribution centers, many companies are building regional distribution centers such as the Dollar Tree chain’s facility in Ridgefield, WA, Lowe’s facility in Lebanon, OR, and Target’s regional center in Albany, OR.

Figure 2.3 shows the location of major freight traffic generators in the region including reload and distribution centers.

**Figure 2.3 – Major Freight Traffic Generators**



### *Importance of Maintaining Reliable Freight Delivery Schedules*

A unifying characteristic of all freight modes is that shipments meet a customer's delivery schedule. This simple requirement is critical to how companies maintain business relationships, keep production and other operations on track, and hold costs down. Many companies directly tie their shipping processes to their production output; e.g., some companies do not have enough on-site space to accommodate many days/weeks of finished product and thus need to have it shipped quickly to their customers. Similarly, some companies require raw materials for their production and if deliveries of those materials are late they may suspend production.

## Motor Carrier

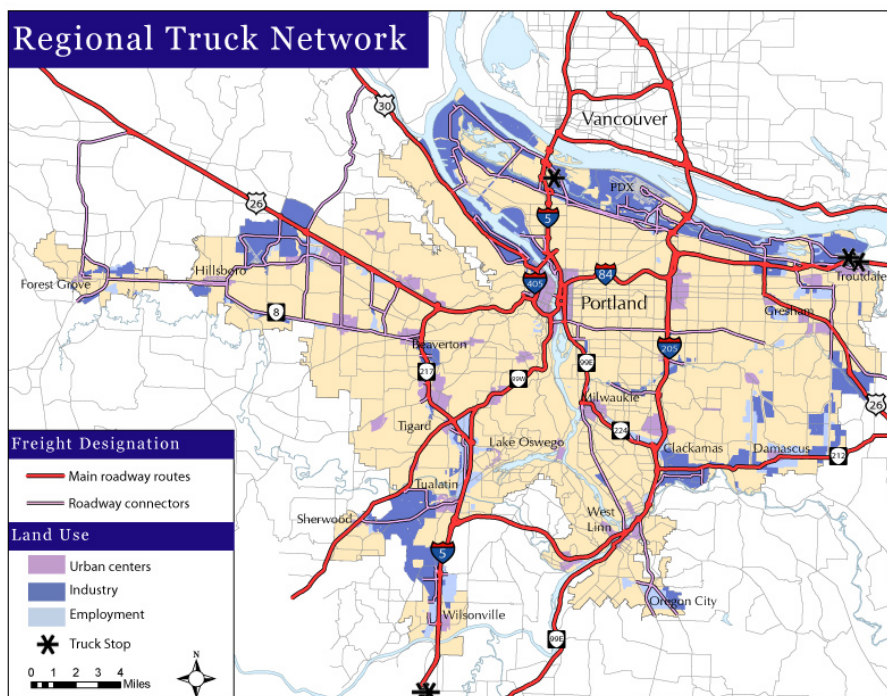
Trucks are the most common means of moving freight, both nationally and in the Portland-Vancouver metropolitan region. In 2006, over two-thirds of the total freight tonnage that flowed into, out of, within and through the region was moved by truck. The dominance of truck is even greater in the movement of goods internal to the region (i.e., with both an origin and a destination within the region). Trucks are not only the primary form of shipping for loads less than 80,000 lbs, but they are also the primary mode for trips under 500 miles. An equally important role played by trucks is in the local moves between freight terminals and between manufacturers and/or shippers and other modes (also known as “drayage”).

Trucks supply restaurants and retail outlets. They transport goods to and from offices, hospitals, cultural and government institutions, and residences. Because of the multitude of motor carriers in the region, truck deliveries can often be arranged quickly and their travel time has a high degree of predictability in comparison to other modes. Trucks have the added advantage of being able to accommodate fragile and perishable packages with limited damage. Finally, motor carriers often provide shippers with services beyond transport such as warehousing, logistics, inspection, certification, and other administrative services.

## Truck Network

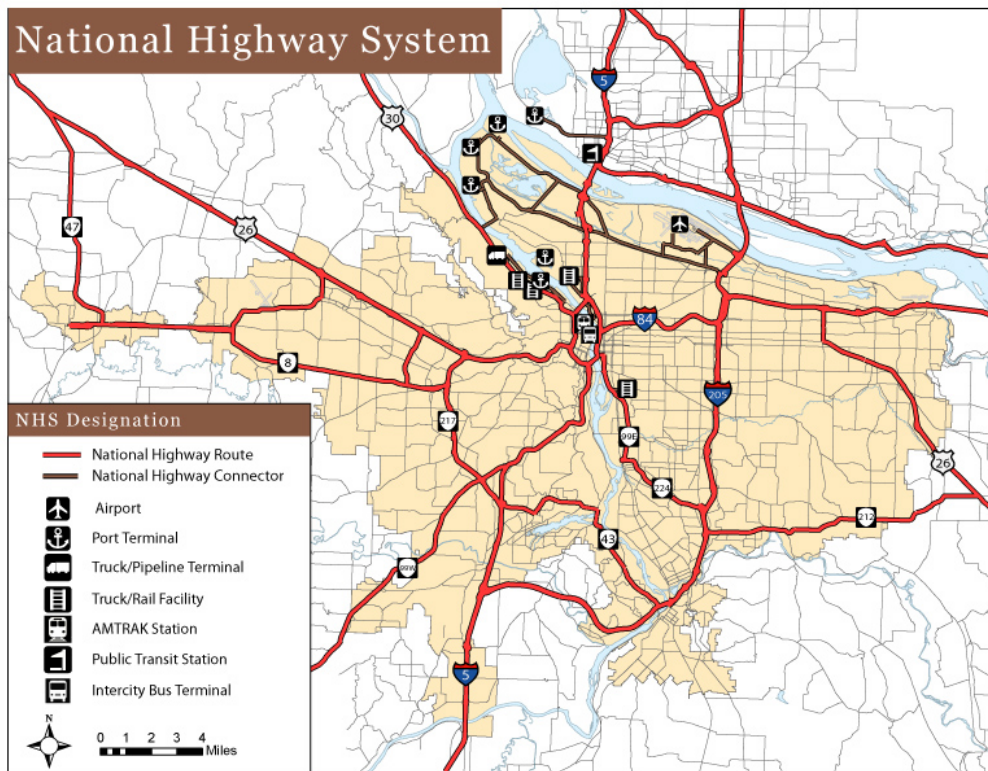
While trucks are generally permitted to travel on all roadways (in some cases, through-truck travel is prohibited and certain routes have weight and height restrictions), the region has designated a basic network of highways and arterials that connect regional freight activity centers to each other and to areas beyond the metropolitan region for the purposes of functional design and financing. Figure 2.3 depicts the currently designated regional truck network. Additionally, many local jurisdictions in the region have identified truck routes.

**Figure 2.4 – Regional Truck Network**



The federal government also designates the National Highway System (NHS), a network of roads important to the nation’s economy, defense, and mobility. The region’s NHS network is shown in Figure 2.5. Officially designated in 1995, the system is a 161,000-mile interconnected network of roadways that link primary intermodal facilities including airports, international border crossings, marine ports, rail yards, passenger terminals, and major freight activity centers. The system is intended to identify the most critical connections in the nation in order to focus federal resources for improvements.

**Figure 2.5 – National Highway System in Metropolitan Region**



In addition to the basic truck network, there are routes identified for special types of truck movement. Over-sized (over 14’ tall, 8’6” wide, or between 50-75’ long trailers, depending on configuration) and over-weight (105,500 lbs in total weight) trucks are required to use over-dimensional truck routes for through travel – that is, roadways and associated structures that can accommodate over-dimension vehicles. These routes are identified in the permit provided by ODOT for the trip by the over-dimensional truck. In some instances, the vehicle dimensions are such that a pilot car and special signage is required (e.g., movement of a trailer home); in some cases, hours of travel may be restricted and some form of escort may be required (e.g., very large machinery and/or construction equipment)

Trucks carrying hazardous materials are limited to travel on a hazardous routes network. Vehicles carrying non-radioactive hazardous materials (such as spent fuel) are not required to purchase an Oregon permit, but they must comply with all federal rules and permits, and they must display a placard stating that they are carrying hazardous materials. Oregon also requires notification of the routes and schedule of travel of these loads. Commercial vehicles carrying radioactive material

must not only comply with federal permits and regulations, but must obtain an Oregon permit to travel on state roads, as well as display a placard that they are carrying radioactive material. Some regional roadways completely prohibit transportation of hazardous materials. (Awaiting list from ODOT)...

### *Types of Truck Service*

The business of trucking includes many sectors, specialized to meet the needs of different customers and shipment types. At the simplest level, truck delivery is generally classified as either full truckload (TL) to and from a single source, or less-than-truckload (LTL) services that combine multiple packages for multiple customers to fill a truck. TL movements are primarily between shipper and ports/railroads, and directly to customer. LTL trips are nearly always between shippers and customers, and for local moves (except for express delivery truck). The equipment for TL shipments can include full liquid tanks, dry bulk cargoes, food, and beverages requiring refrigerated trailers, and containers. TL shipments often involve drayage activity, where trucks are used to move goods from ships, barges, railcars, or airplanes to an intermediate location (e.g., a warehouse) before final delivery to a customer.

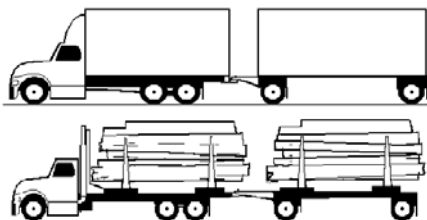
In addition to these basic types of truck delivery methods, the trucking industry is also segmented by types of service providers. *Common carriers* are trucking companies that provide interstate transportation services to the general public on a regular schedule at published rates. A *contract carrier* provides for-hire services by continuing contract to a limited number of customers. A *for-hire carrier* provides trucking services to the general public by fee but can meet specialized delivery needs. *Private carriers* are trucking fleets that are owned or leased by a business to meet their own logistic needs.

### *Types of Trucks*

The trucking industry includes many different types of trucks, specialized to meet the particular needs of the freight being moved.



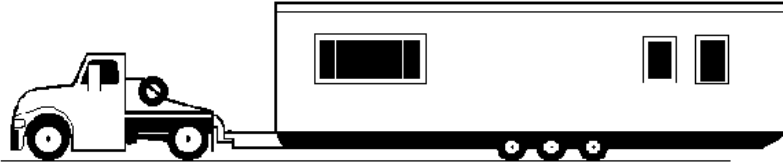
Tractor (TR) - a motor vehicle designed and used exclusively to pull trailers.



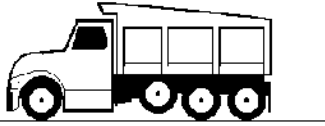
Truck/Trailer (TT) - a motor vehicle designed and used for carrying a load and for pulling trailers with loads.



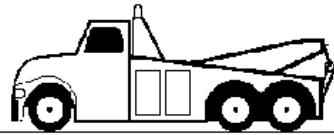
Bus (BS) - a motor vehicle designed and used to carry more than ten passengers.



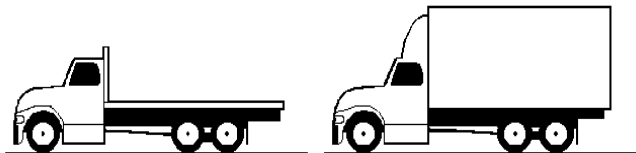
Mobile Home Toter (MT) - a motor vehicle designed and used EXCLUSIVELY to pull mobile homes on their own axles.



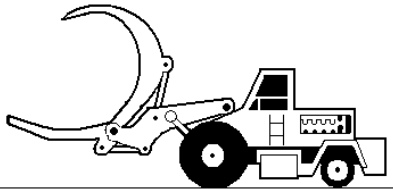
Dump Truck (DT) – a vehicle from which contents are unloaded by tilting the truck bed backward with the tailgate open.



Tow Truck (TW) - a vehicle designed and used, with a special towing license, to tow disabled vehicles.



Solo Truck (TK) - a motor vehicle designed and used to haul property, and NOT used to pull a trailer.



Fixed Load Vehicle (HF) - a vehicle with a gross weight and lightweight that is the same.

### *Vehicle Size*

As many as 27 states (including Oregon, and neighboring states of Washington, Nevada, and Idaho) issue load permits for trucks with divisible loads over the federal maximum gross vehicle

weight standard of 80,000 lb<sup>1</sup>. Like Oregon, Idaho, Washington and Nevada allow for maximum allowable trucks weights of 105,500 lbs. However, these neighboring states do not permit triple-trailer configurations (Oregon does) and they require a separate permit to operate up to 105,500 lbs. To the south, California does *not* permit trucks carrying more than 80,000 lbs (gross tonnage weight), except for over-dimensional loads, which require an elaborate set of permits and requirements. These differences from state to state compel carriers (and in some instances, shippers) to evaluate whether it's appropriate to transfer loads into different configurations at state borders, or to start and end trips that cross borders with equipment and loads that can be accommodated without special operational changes.

With respect to other truck equipment factors, Oregon and its four neighboring states share common standards for maximum height (14'), maximum width (8'6"), and maximum allowable length (105').

### *Regulations Governing Truck Movements*

In addition to regulations identified on truck route networks, truck movements and services are governed by a host of national and state rules involving licensing (equipment and drivers), vehicle registration and taxes, hours of service regulations (a driver is not allowed to drive more than 11 hours in any 24-hour period), and a range of environmental rules including idling regulations and emissions standards, and truck loading areas.

Federal rules cover the licensing of truck drivers; the hours of service they are permitted to operate; the safety and inspection of equipment; means of securing cargo; truck emissions and energy consumption objectives; vehicle registration and tax payments; and a broad range of regulations for specific commodity movements (e.g., such as fuels).

Oregon's motor carrier rules reinforce many of the federal rules, and provide additional regulations about truck equipment include height, length, width and weights, use of traction devices, for over-dimensional loads, and transportation of specific commodities.

Finally, many cities and counties adopt regulations covering truck movements and parking at certain locations, such as signs that restrict through truck movement on local streets, or control on-street space for loading and parking activities.

### *Innovations in Truck Equipment*

Truck performance has improved with improved acceleration and braking and reduced air and noise emissions levels (due in part to use of less diesel fuel; as well as plug-in power sources to maintain engine power without idling).

Motor carriers also make good use of electronic communications technologies allowing drivers and dispatchers to report on estimated arrival times, road conditions, and changes to schedules and pickup locations, etc.

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<sup>1</sup> Ibid.



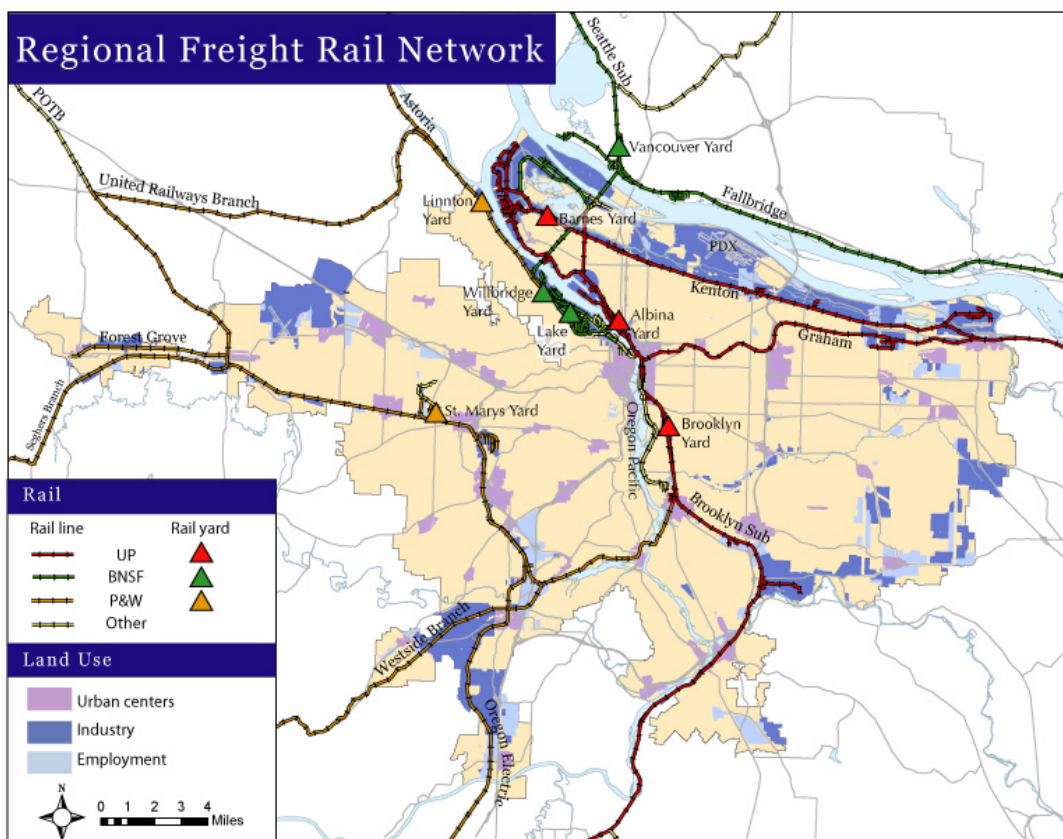
## Railroad

The Portland region is served by North America's largest and second largest railroads – Union Pacific Railroad (UP) and BNSF Railway Company (BNSF), respectively – as well as three short-line operators – Portland & Western Railroad (PNWR), Oregon Pacific Railroad (OPR) and the Port of Tillamook Bay Railroad (POTB). Two terminal switching carriers, Portland Terminal Railroad (PTRC) and Peninsula Terminal Company (PT), exist within the City of Portland. Figure 2.5 shows a map of the region's rail network.

UP and BNSF provide direct service throughout the U.S., including the nation's major rail terminals/ports at Chicago, Los Angeles/Long Beach, Oakland, Seattle/Tacoma, Dallas, Houston, and Kansas City, and intersect with rail service to Mexico and Canada. In addition, Amtrak's long-distance and *Amtrak Cascades* Vancouver, B.C.-Eugene, OR corridor services use UP and BNSF track.

The short line railroads principally originate and terminate interstate shipments moving via UP and BNSF but a growing segment of their business is hauling local cargo between shippers and receivers within Oregon. Local switch engines move rail cars to assemble large trains within and between rail yards.

Figure 2.6 – Regional Freight Rail Network



### *Rail terminals*

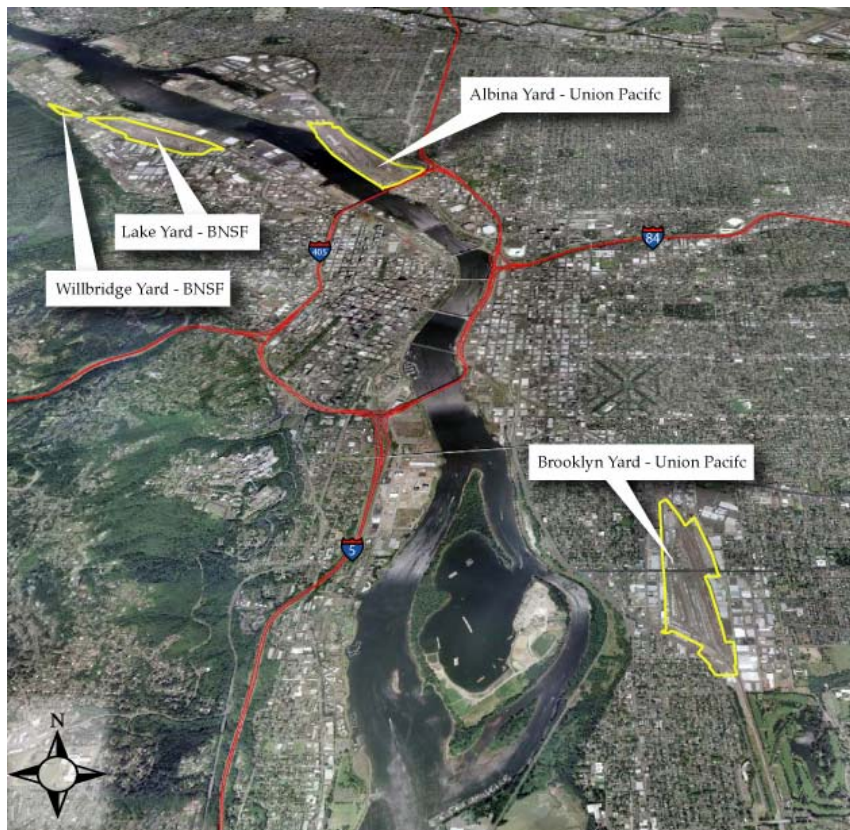
Each railroad exchanges and organizes rail freight at their rail yards including UP's Brooklyn, Albina and Barnes yards, BNSF's Vancouver, Willbridge and Lake Yard facilities, and PNWR's St. Marys and Linnton yards. Figure 6 identifies the location of the rail yards in the region.

The Port of Portland's terminals 2, 4, 5, and 6 accommodate the largest concentration of rail traffic in the Portland region, followed by the Port of Vancouver's terminal 2. The ports are the destinations for the largest tonnages brought to and from the region by the UPRR and the BNSF, and are where railroads are loaded with commodities destined for locations throughout North America.

**Figure 2.7 – Rail Yards in the Portland-Vancouver Region**



*Several rail terminals are located near marine facilities.*



Both BNSF and Union Pacific have rail yards near downtown Portland.

### Types of trains

The range of trains operating in the region includes 1.5-mile-long bulk commodity trains, mixed commodity manifest freight trains, unit trains of containers and trailers, intercity passenger trains, and coming in 2008 commuter rail operating on the Portland & Western tracks between Wilsonville and Beaverton.

Track occupancy is governed by train dispatchers in the Midwest utilizing remote signals/communications to ensure safe and convenient operation in respect to each train's priority. For example, passenger trains are issued the highest priority in the system. Intermodal trains have priority over other freight trains because their movements are coordinated with other scheduled modes. Auto and merchandise trains generally receive the next highest priority when possible. Bulk commodity trains (such as coal, grain, potash, and trash) are run with varying priorities depending upon customers' needs. Local transfer and switching operations make multiple trips throughout the day between rail yards -- including movements across BNSF's Columbia River and Oregon Slough bridges between BNSF's Vancouver Yard and Portland area facilities -- and generally have the lowest priority in terms of allotted time/capacity on the mainline. Another consumer of mainline capacity involves time needed for bridge openings for marine vessels passing through BNSF's three draw spans (as many as 20-30 times/month).



**Table 2.4 – Daily Activity of Class 1 Trains in Region\***

Type of Service	Amtrak	BNSF	UP
Passenger	10		
Intermodal		7	16
Auto		2	2
Merchandise		13	14
Premium Merchandise			5
Grain (loaded)		5	2
Grain (empty)		3	2
Potash			4
Other Unit		4	

Source: I-5 Rail Capacity Study, HDR, Inc., 2001

\*“Class 1” railroads are defined by the Surface Transportation Board as: “...a railroad with 2004 operating revenues of at least \$289.4 million.”

### *Infrastructure*

The Portland-Vancouver region has approximately 358 route miles of rail track.<sup>2</sup> As with highways and roads, the track and associated infrastructure govern speed limits and control movements throughout the system. These speed limits are influenced by horizontal and vertical track curvature, grade, yard operations, junctions with mainline and lead tracks, drawbridges, presence of at-grade railroad crossings, grade-separated structures, and other features and operations within the system. Though a rare occurrence, trains may occasionally be assembled with inadequate locomotive power to attain posted speed limits (e.g., local switcher trains moving car loads from one rail yard to another across the mainline.)

### *Drawbridges*

The preponderance of regional freight crossing the Columbia, whether UP or BNSF, uses the BNSF’s Columbia River/Oregon Slough two-track spans. A significant portion of BNSF’s north/south freight crosses the Columbia River via BNSF’s single-track drawbridge connecting BNSF’s mainline on the north bank near Wishram, WA with jointly used (with UP) trackage along the Deschutes River to Bend and south. In Portland, the Willamette is crossed by BNSF’s Willbridge span, and UP’s Steel Bridge. Bridge tenders man these bridges around the clock and coordinate needs of marine (both commercial and recreational) and rail traffic for bridge occupation.

### *Commodities Carried by Rail*

Railroads are best suited for high-volume and low-cost commodities, and in most cases, for commodities shipped long distances. In the Portland area, unit trains carrying coal, soda ash, grains, wood products and paper goods to the ports of Portland and Vancouver are a near daily experience. Intermodal goods in containers flow on both the UPRR and BNSF systems. Petroleum, metals, logs, finished wood products, paper goods, fertilizers, mail, solid waste, and automobiles are also regularly moved on both the Class I and the short-line railroads.

### *Innovations in Rail Equipment & Operations*

Most technological advances have been focused on engine performance (increasing horsepower), track, and signal upgrades, lengthening sidings and developing higher-capacity freight cars.

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<sup>2</sup>Metro (4-county region – Clackamas, Multnomah, Washington, & Clack Co. WA), 2006

Sophisticated radio communication systems now permit the engineer of a locomotive pulling a train to remotely control an additional locomotive pushing at the rear, a process the railroads call Distributed Power Units (DPUs). Design of freight rolling stock now reflects the special needs of commodities, with specialized cars for containers and trailers, liquid and dry bulk commodities, and specially equipped box cars for products especially sensitive to in-transit shocks. A variety of rail users as well as port and regional transportation authorities are working to improve rail terminal efficiency, including use of third-party switching operators at some locations.

### *Regulations Associated with Railroad Systems and Services*

Railroad systems and their infrastructure must meet design standards published and regulated by the Federal Railroad Administration. As with passenger rail equipment, freight trains operating in the region must meet a wide variety of safety and performance values. System signage, structures (including height and width clearances), design of track, placement and type of signal communications must meet minimum standards that are reviewed and enforced by both the State of Oregon (through ODOT's Rail Division) and the Federal Railroad Administration. Transportation of hazardous materials and/or waste by railroads is regulated by these agencies as well.

The areas where rail service regulations are most commonly known by the general public and regional agencies include crossing protection and design of at-grade railroad-roadway crossings, and noise from train whistles. At both public and private crossings, ODOT has the authority to require a certain type and amount of crossing protection (from gates to signals to signs to crossings, etc.), as well as to meet pavement design specifications. Moreover, ODOT has the authority to close and/or consolidate crossings. With respect to train noise, ODOT has the authority to identify "quiet zones" where trains are not required to blow their whistles for safety reasons because added safety protection may be present at a grade crossing.

## River Barge

The Portland region is the primary destination for the busy barge traffic operating on the Columbia Snake River System. The inland marine system extends 365 miles eastward to Lewiston, ID on the Snake River, and 100 miles westward to the Pacific Ocean. The capacity for moving goods by barge was significantly increased with the construction of the Columbia and Snake River dams (8 in all), which established a series of slack water reservoirs and a navigable river environment.

### Commodities Carried by Barge

Barges, which are pushed by towboats, can carry mixed cargo with as many as six barges attached. Barges connect with steamships, railroads and trucks, and carry a variety of commodities – primarily grains, but also paper and wood products, “pulses” (peas and lentils), fertilizers, and petroleum. Grains are moved in bulk cargoes, while paper/wood products and pulses are often containerized. Products shipped down river by barge are ultimately exported to Asia, South America, and Europe. Table 2.5 lists the type and quantity of commodities shipped by barge.



**Table 2.5 - Total Commodities Moved by Barge in Portland/Vancouver Region in 2004**

Commodity	Volume
Wheat and Barley	5.489M tons
Containers	16,262 TEU
Wood Products	1.018M tons
Petroleum	1.853M tons
Solid Waste	0.300M tons
Other	1.119M tons

Source: *Waterborne Commerce of the United States, 2004*, U.S. Army Corps of Engineers (wheat & barley, wood products, petroleum, other); Tidewater Barge Lines (solid waste); Port of Portland (containers)

### Types of Barge Services

Barges are an extremely efficient means of moving large quantities of cargo – a typical barge tow carries the equivalent of 140 rail cars, or 480 trucks. Barge transportation is the least expensive mode of shipping, with rates about one-third the cost of using a truck, and one-half that of rail<sup>3</sup>.

There are four barge operators in the Portland region, operating 20 tugboats, 84 grain barges, 15 bin barges, 10 container barges, 6 double-hulled and 4 single-hulled petroleum barges. The barges used in the region have been specially designed for the Columbia Snake River System<sup>4</sup>, which features a 14’ draft, and eight locks measuring approximately 86’ wide and over 660’ long.

<sup>3</sup> *Breaching the Lower Snake River Dams: Transportation Impacts in Oregon*, prepared for the Port of Portland et al, by HDR Engineering, Inc., Executive Summary page 10, February 2000

<sup>4</sup> A grain barge on the Mississippi River system can be purchased for \$200,000-\$300,000, while a Columbia-Snake River grain barge can cost over \$2,000,000.

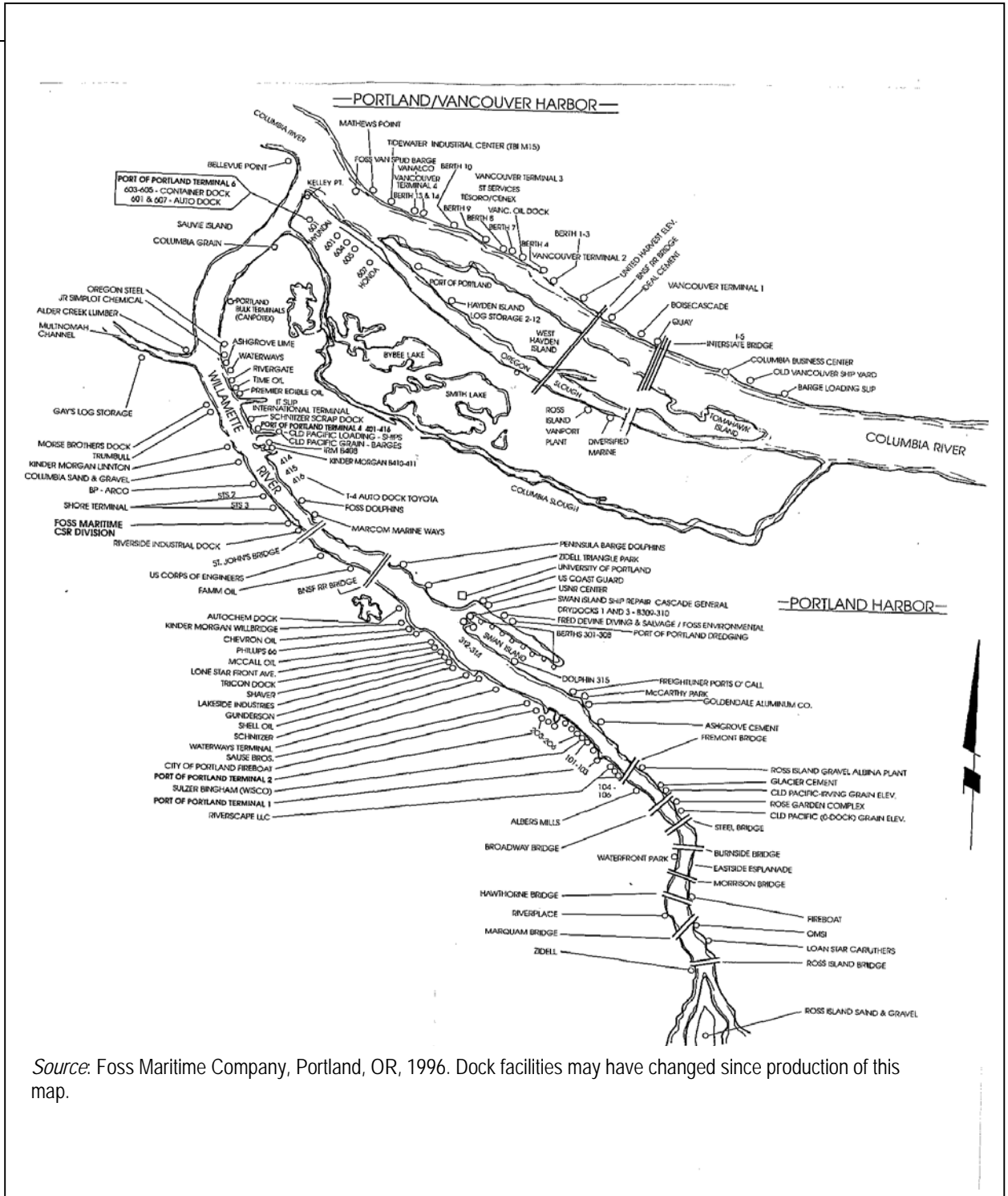
Barges used on the system are typically 42' wide and 225' long. They are often lashed together into tows, with typical barge tows measuring 84' wide and 650' long.

Barges cross under several highway and rail bridges in the Portland region, including several that are equipped with lift or swing spans to allow passage. Because each lift takes approximately 20 minutes from start to finish and can result in congestion on those bridges, Columbia River Towboater's Association (CRTA) members agreed in 2000 to not request lifts during peak commuter hours on the I-5 Interstate Bridge. There is no such agreement for the Willamette River bridges

### *Terminals*

Figure 2.8 shows the location of the public and private dock facilities served by barge in the Portland-Vancouver Harbor area.

Figure 2.8 – Portland-Vancouver Harbor Barge Docks



Source: Foss Maritime Company, Portland, OR, 1996. Dock facilities may have changed since production of this map.



## Deep Draft Marine Vessels

More than 1,000 ocean-going vessels call on the Portland Harbor each year. These vessels annually transport 18 to 20 million short tons of cargo to and from public and private facilities located in the Portland-Vancouver Harbor. Another 8 to 10 million tons of inland barge cargo is also handled at these facilities. In total, \$12 billion in foreign trade moves through Portland Harbor facilities each year.

With respect to public terminals, trans-oceanic ships carrying both containers, break-bulk, dry and liquid bulk, and automobile cargo visit the Port of Portland's terminal 2, 4, 5 and 6, and at the Port of Vancouver's terminals 2, 3 and 4. In 2006, nine international container services are regularly visiting these terminals, including both Panamax ships carrying as many as 4,000 containers (or 65,000 tons), and Handymax ships with storage for between 10,000 and 50,000 tons of general cargo. The region trades with countries in Asia (China, Japan, South Korea, Taiwan, Indonesia, India, Turkey, and Israel); Central and South America (Mexico, Venezuela, Brazil and Guatemala); Europe (Netherlands, Germany, Italy, Spain, Romania, Belgium and Denmark); and Canada. Table 2.6 provides data on the vessel traffic to the public terminals along the Columbia and Willamette Rivers.

**Table 2.6 – Public Terminal Vessel Traffic (2005)**

Vessel Type (Commodities)	Port of Portland	Port of Vancouver
Containers	62	1
Autos	242	38
Dry Bulks	308	148
Breakbulk	36	122
Other	6	43
<i>Total</i>	<i>684</i>	<i>352</i>

Source: Jim Daly - Port of Portland, 9/25/2006; Katy Brooks- Port of Vancouver, 9/26/2006

Typically, marine cargo is loaded and unloaded over a period of two to five days in a regular rotation using cranes, fork-lifts, and other transfer equipment to load to and from docks. The time a vessel stays at a berth largely depends on the type of cargo being loaded or unloaded, and the size of the shipment. A panamax grain carrier receiving a 60,000-ton shipment may stay at berth for the better part of a week. By comparison, a typical automobile vessel can discharge its load in less than eight hours and is on berth for less than one day. A container vessel will be on berth typically one to two days.

Once loaded or discharged from vessels, cargo is moved to and from Portland Harbor marine terminals (including grain silos and soda ash storage facilities) by barge, truck, and rail. Portland enjoys the benefits of a thriving inland barge system that connects it with upriver ports in Oregon, Washington, and Idaho. The predominant cargos moving upstream are petroleum products and fertilizers; the predominant downstream cargos are grain, containers, and wood products.

### Types of Vessels

The typical cargo ships visiting the region are known as Handymax ships, which are used to carry grains, minerals, lumber and wood products, automobiles, other bulk cargoes, and containers. Container ships regularly visit the Port of Portland and occasionally the Port of Vancouver, and include "Panamax" ships – so named because they are designed to be as large as possible and still be able to navigate through the Panama Canal. Typical Panamax ships hold approximately 4,000 twenty-foot equivalent units or TEUs, and require a minimum 43' draft.

So called Post-Panamax ships – a series of ever-growing ships which can hold between 6,000 and 14,000 TEUs, and require drafts of at least 46’-50’ -- cannot navigate the Columbia River and Portland Harbor. These ships are generally used for Trans-Pacific and Asian-European trade. It is estimated that as much as 40 percent of the new cargo ships currently on order are of the Post-Panamax class.<sup>5</sup>



*Panamax ship carrying containers through Panama Canal, courtesy Wikipedia. The Free Encyclopedia*

### Commodities Moved by Vessels

In addition to its enormous grain exports by sea, the region’s marine ports are listed as the eighth largest U.S. port in terms of total export tonnage, and the 15th largest container port.

The Port of Portland also ranks as the number one port gateway for automobiles on the West Coast, and handles the fourth highest volume of automobiles in the country. Table 2.8 lists the volume of cargo moved by commodity type.

**Table 2.7 – Cargo Volumes by Commodity Type (2005)**

Commodity Type	Port of Portland*	Port of Vancouver**
Containers (TEUs)	288,000	8,160
Intermodal (TEUs)	13,000	na***
Breakbulk (Metric Tons)	473,000	670,859
Automobiles (Units)	397,140	46,865
Bulk Grains (Metric Tons)	2,920,000	2,124,074
Bulk Minerals (Metric Tons)	3,825,000	678,774

Source: \* Provided by Jim Daly - Port of Portland, 9/25/2006

\*\* Provided by Katy Brooks - Port of Vancouver, 9/26/2006

\*\*\* Port of Vancouver does not report cargo as intermodal

### Marine Facilities

Port of Portland marine terminal facilities include:

- Terminal 6 (T-6) is the region’s primary ocean container terminal on the Columbia River with rail, barge and steamship connections, and an integrated on-dock intermodal facility.
- Terminal 5 features the Columbia Grain, Inc. grain elevator, and a mineral bulk exporting facility (potash and other bulk commodities).
- Terminal 4 is a multi-purpose facility with seven ship berths handling grain, autos, forest products, steel, and dry and liquid bulks.
- Terminal 2 offers direct vessel to rail cargo movements, for general cargoes ranging from lumber and forest products to steel, machinery, and packaged goods.

<sup>5</sup> *Maritime Transportation Service Report to Congress: Trends and Competitive Pressures*, USDOT Maritime Transportation Service, Washington, DC, 2004, page III-2.

The Port of Vancouver marine terminals include:

- Terminal 4 accommodates the port’s auto terminal (Subaru), lay berth facility, and sand and gravel cargo shipping, staging, and storage areas at three berths.
- Terminal 3 has two deep-water berths handle a wide-range of project and break-bulk commodities including wind turbines, trucks, pulp, lumber, plywood and steel, with corresponding storage/staging areas.
- Terminal 2 facilities accommodate five distinct types of cargo: project cargo; break-bulk; dry bulk (commodities such as copper concentrate and bentonite clay); liquid bulk (petroleum products); and, the United Grain Corporation’s grain terminal. Direct transfer between railcar and vessel is offered, and track capable of handling 110-railcar unit trains meets each of the berths/storage facilities.

**Figure 2.9 – Locations of Portland Region Marine Terminals**



## Aviation

While air cargo accounts for less than one percent of cargo tonnage moved in the region, the monetary value of that cargo is approximately \$13,000/ton versus \$1,300/ton for all of the region's cargo combined. Air cargo represents the fastest and most reliable means of shipping over long distances, as well as the mode with the highest cost, and generally moves shipments that are relatively small-sized, light in weight, and of high value. Air cargo is moved on both passenger (9% of total) and cargo aircraft, with the lion's share of domestic cargo moved by integrated carriers such as Fed Ex, UPS, DHL/Airborne. In 2005, air cargo movement involved over 34,000 separate flights and is expected to continue growing as evidenced in Table 2.9.

**Table 2.8 - PDX Air Cargo Aircraft Operations (in 1,000's)**

	2005	2010	2020
Jet/Air Carrier	12	14	20
Turboprop/Commuter	22	25	30
<b>Total</b>	34	39	50

Source: *Portland International Airport Master Plan Low Growth Scenario (adopted after 9/11/01 terrorist attacks)*

## Air Facilities

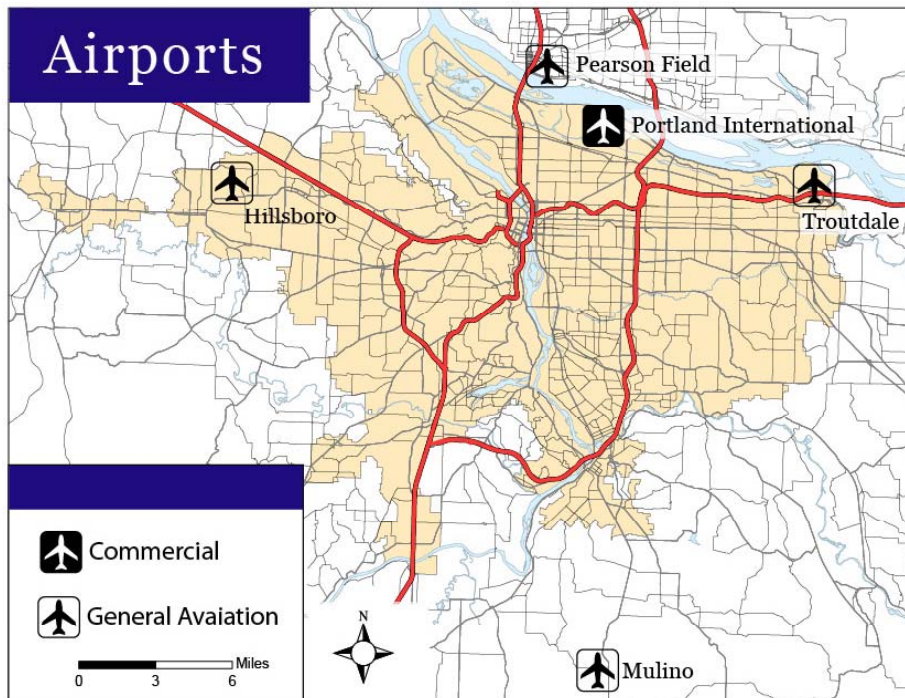
Five airports, three of which are commercial facilities, serve the region (Figure 2.9). The Portland International Airport (PDX) handles 100% of international air cargo, and as much +90% of domestic air cargo. According to the Port of Portland Aviation Master Plan, PDX's two runways are expected to be operating at or near capacity before the year 2020. Another potential constraint to air cargo operations at PDX is noise levels of aircraft traveling during late night through early morning hours: the peak period for integrated air carriers. According to a recent report to the Port of Portland, "there are no problems anticipated regarding the airspace"<sup>6</sup> surrounding PDX (i.e., there is adequate "airspace" capacity for landings and take-offs).

There are currently 12 cargo facilities with a combined 661,000 sq. ft operating at PDX. In addition, PDX accommodates U.S. Customs and inspection activities at other facilities within the airfield property. Airfreight is also collected and distributed by freight-forwarders and customs brokers who are typically located at off-airport facilities.

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<sup>6</sup> Portland/Vancouver International and Domestic Trade Capacity Analysis: Growth Opportunities and Challenges Assessment for Air Cargo Market (Draft), prepared for the Port of Portland by The Campbell-Hill Aviation Group, Inc., pages 9-10, August, 2006

**Figure 2.10 – Locations of Portland Airports**



### *Groundside Facilities at PDX*

Since virtually all air cargo moves to and from a truck, the operations of the airport's gate, local roads, and regional highways are all critical components in the logistics of air cargo movement. Given the high dollar value and time-sensitivity factors associated with airfreight, efficient movement to and from groundside and airside is essential.

Access through PDX's air cargo gates is governed by security protocols that are evolving and changing just as they are at air passenger gates. Security clearances are mandatory for every truck driver moving goods into the gate areas.

A short haul transfer by truck is the way most air cargo moves between the airport and local warehouses and other facilities. Because air shipping operates under a very tight schedule, congestion on local roadways due to air passenger traffic and/or non-airport travel may impede the ability to meet flight schedules, potentially delaying shipments by a day or more.

Similarly, access between the airport and the local highway system, as well as the performance of the highway system near the airport, is a critical component of the air cargo shipment pattern, particularly for those carriers transporting cargo directly from a shipper to the airport.

### *Origins and Destinations.*

The region's air cargo services provide the opportunity for shippers to reach the world's most far-flung markets. While direct airfreight service to Seoul, South Korea was suspended in May 2006, PDX provides direct air cargo movements to Japan, Germany, Canada, and Mexico. As shown in Table 2.10, 23,000 tons of international air cargo was moved to and from PDX in 2005.

**Table 2.9 - Air Cargo Tonnage Carried in 2005**

	Mail	Express Freight	General Freight	Total
Domestic	11,040	227,870*	26,050*	264,960
International	860*	na	na	23,040

Source: *Portland/Vancouver International and Domestic Trade Capacity Analysis: Growth Opportunities and Challenges Assessment for Air Cargo Market (Draft)*, pages 6-8 August, 2006  
\* Estimated

### *Air Cargo Handling and Transfer Equipment*

Cargo planes typically load freight on pallets which are lifted into the belly of the aircraft (main level) which is fitted with rollers allowing for up to 30 pallets (i.e., on a Boeing 747 -400 plane, the mainstay of the integrated carrier fleet) measuring anywhere between 8’ and 10’ wide and 10’ tall. A level below the main level, from which freight is loaded from the side of the aircraft, can carry as many as 14 specialty containers called “air stables” which measure about 64 inches. Some planes also load from the nose of the aircraft, which can be used for irregularly shaped cargo.



*Cargo-hold area in the belly of a plane.*



*Loading cargo through the nose of a 747-400*

Larger aircraft known as “Super Transporters” such as the Airbus “Beluga” are equipped with very large doors and cargo space that stretches the entire length and width of the plane. Often used for military purposes, these planes can carry as much as 47 tons of freight.

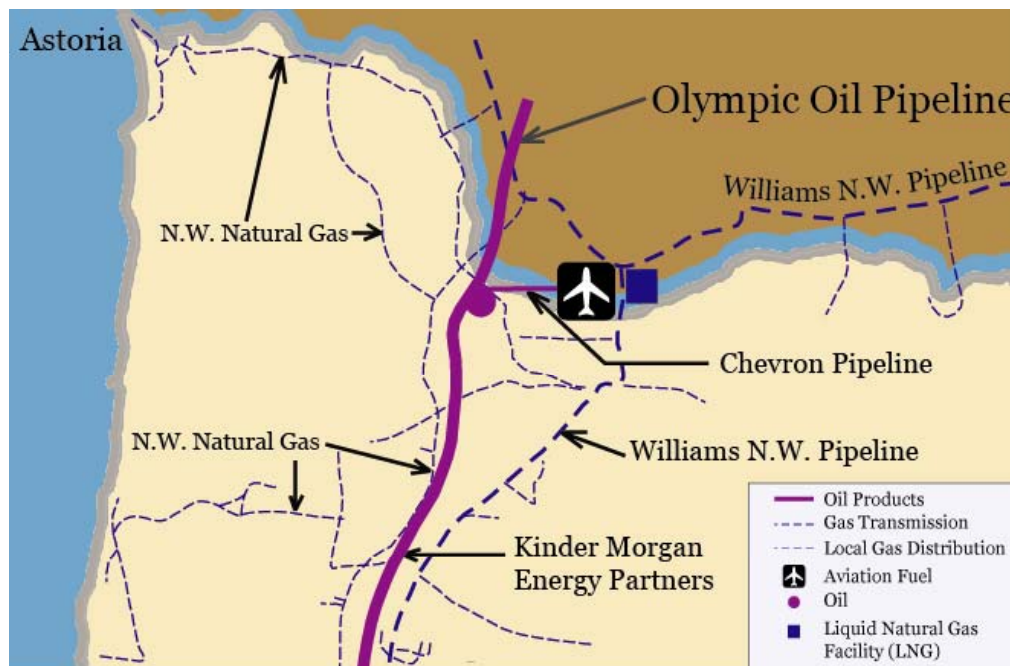
## Pipeline

Petroleum products (gasoline, diesel fuel, and aviation jet fuel) make their way to Portland via the underground Olympic Pipeline (jointly owned by BP and Shell) between four refineries in the north Puget Sound to a distribution center in Renton, WA, to tank terminals in the NW Industrial District (also known as the Portland “tank farm”). From the “tank farm,” petroleum product is distributed through local transmission pipes, including jet fuel to the Portland International Airport, and gasoline directly to industries and distribution centers.

## Commodities Moved

While barges and trucks move some petroleum product into Oregon, the 400-mile long Olympic Pipeline is Oregon’s principal source (65%) of petroleum transport, accounting for 2.1 billion gallons annually. According to the Pipeline and Hazardous Materials Safety Administration<sup>7</sup>, if the pipeline was not available, “it would take a constant line of tanker trucks (about 750 per day), loading up and moving out every two minutes, 24 hours a day, seven days a week, to move the volume of even a modest pipeline. The railroad-equivalent of this single pipeline would be a train of 75 2,000-barrel tank rail cars everyday.” Figure 2.10 illustrates the types and general routing of the region’s pipeline network.

Figure 2.11 – Pipelines in the Portland-Vancouver Region



## Terminal Facilities

The Olympic pipeline terminates in the City of Portland’s Linnton –Willbridge area, along Highway 30. The area is home to the region’s petroleum terminals owned by Kinder-Morgan and the BP West Coast Products and is the primary entry point and wholesale distribution hub for most of the region’s processed petroleum products. From here, gasoline, diesel, and jet fuel is

<sup>7</sup> <http://www.phmsa.dot.gov/index.html>

distributed to end-users by truck, rail, or pipeline. Barges transport petroleum products to eastern Oregon and beyond. Due to the its agglomeration of terminals and transport modes, and its significance to the regional and state economy, the area has been informally dubbed the “Linnton Energy Cluster.”<sup>8</sup>

### *Underground Networks*

Except for valve stations, the entire pipeline system is located underground (approximate depth averages between 7 and 10 feet; regulatory minimum of 3 feet, terrain permitting), including a tunnel under the Columbia and Willamette rivers.

### *Pipeline Dimensions*

The dimension of the mainline pipeline between the Puget Sound refineries and the Renton center is a combination of 16” and 20” diameter pipe. Between Renton and Portland the pipeline is 14” in diameter. In addition, there are three lateral lines off the mainline ranging from 6” - 14” in diameter.

### *Local Distribution*

Given the slow velocity of pipeline transmission (about the same as walking speed), delivery schedules must be planned 30 to 45 days in advance.

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<sup>8</sup> *The Energy Cluster in Linnton*, Olympic Pipeline Company, BP West Coast Products LLC, Kinder-Morgan Energy Partners LP, June 27, 2005.



## Section III: Public Policy and Freight Mobility

### Introduction

This section provides an overview of the current policy and regulatory landscape governing the multimodal freight system at the different levels of government. Table 4.1 captures the complex and multifaceted role of public sector involvement in the movement of freight and goods in the Portland-Vancouver region.

**Table 3.1 – Role of Public Sector Agencies in the Region’s Freight Transportation System**

Level	Agency	Infrastructure Development, Operations & Maintenance					Regulatory & Oversight					System Planning					Financing				
		R	T	A	O	W	R	T	A	O	W	R	T	A	O	W	R	T	A	O	W
Federal	US Treasury/US Customs						X	X	X	X	X										
	Federal Highway Admin (FHWA)	X	X				X	X	X	X	X		X				X	X			
	Federal Aviation Admin (FAA)			X					X					X					X		
	Maritime Admin (MARAD)											X	X		X						
	Federal Railroad Admin (FRA)	X					X					X				X					
	Motor Carrier Safety Administration							X													
	Economic Development Administration		X			X											X			X	
	Transportation Security Admin (TSA)						X	X	X	X	X										
	Army Corps of Engineers				X					X					X					X	
	Surface Transportation Board						X														
Environmental Protection Agency (EPA)						X	X	X	X	X											
State	Oregon Department of Transportation (ODOT)	X	X				X	X				X	X			X	X				
	Oregon Department of Aviation			X					X					X				X			
	Department of Environmental Quality (DEQ)						X	X	X	X	X										
	Oregon Economic & Community Development Dept (OECCDD)																X			X	
Local	Metro							X			X	X	X	X	X	X	X	X	X	X	X
	Port of Portland	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	County governments		X				X	X			X	X	X	X	X	X	X	X			X
	Local governments		X				X	X			X	X	X	X	X	X	X	X			X

R - Railroads  
T - Trucking  
A - Air Cargo  
O - Ocean/Waterborne Cargo  
W - Warehousing

### Federal

#### ISTEA to SAFETEA

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) was a landmark piece of federal transportation legislation, altering how all levels of government plan for and invest in the multimodal transportation system. ISTEA initiated a policy directive to develop a national intermodal transportation system that is economically efficient, environmentally sound, and move people and goods in an energy efficient manner. It recognized that with the interstate highway system largely complete, it was time to shift to managing and maintaining the system. As a result of ISTEA, state, regional, and local governments gained greater control and flexibility for transportation investment decisions in their jurisdictions. ISTEA amended state and metropolitan planning agency (MPO) requirements for better linkages: to non-traditional stakeholders, such as the freight industry; between the different transportation modes; and to transportation impacts on communities and the environment. Intermodal freight movement was identified as one of the 15 sound planning factors for MPO planning processes.

Since its adoption, subsequent transportation legislation has passed that continues and builds on the ISTEA paradigm shift. The Transportation Equity Act for the 21<sup>st</sup> Century (TEA 21) enacted

in 1998, was a \$198 billion investment package continuing the ISTEA legacy of multimodal investment including freight system improvements, environmental protection, and safety improvements. The most recent reauthorization legislation, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), was signed into law in August of 2005. Table 4.2 provides an overview of freight provisions within SAFETEA-LU.

**Table 3.2 – Freight Provisions within SAFETEA-LU**

Section	Name	Description	Allocation
Section 1301	Projects of National and Regional Significance	Projects of national and regional significance. Legislation requires that these projects be multi modal. Includes freight railroad projects.	\$1.779 billion over 5 years
Section 1302	National Corridor Infrastructure Improvement Program	For projects in corridors of national significance to promote economic growth and international or interregional trade, such as connecting highway segments, serving freight volumes, reducing congestion, and serving high-value cargo.	\$1.948 billion over 5 years for 33 designated projects
Section 1303	Coordinated Border Infrastructure Program	Program funds to border states to make operational improvements, construct and support transportation infrastructure, coordinate international planning operations in the border regions.	\$833 million over 5 years
Section 1305	Truck Parking Facilities	Pilot program to address shortage of long-term parking. Includes construction of new facilities, modifying existing facilities, ITS.	\$25 million over 4 years
Section 1306	Freight Intermodal Distribution Pilot Grant Program	Projects are to reduce congestion in/out of ports and establish/expend intermodal facilities and inland freight distribution centers.	\$30 million over 5 years for 6 designated projects
Section 5204	(h) Training and Education; Freight Planning and Capacity Building Program	Initiative to support enhancements to freight planning to better target investment and strengthen decision-making capacity of state and local agencies.	\$3.5 million over 4 years
Section 5209	National Cooperative Freight Transportation Research Program	National research program to be established in partnership with the National Academy of Sciences.	\$15 million over 4 years
Section 1601	Transportation Infrastructure Finance and Innovation Act	Program project eligibility expanded to include public freight rail facilities or private (freight rail) facilities providing public benefit to highway users; intermodal freight transfer facilities; and access to facilities.	\$610 million over 5 years. Minimum project size reduced to \$50 million, ITS project minimum reduced to \$15 million
Section 11-1143	Private Activity Bonds	Amended IRS statutes to add Tax-exempt financing of privately owned or operated highway projects and rail-truck transfer facilities. Added a new qualifying entity: "qualified highway or surface freight transfer facility."	National Limit of \$15 billion
Section 9002	Capital Grants for Rail Line Relocation Projects	Projects for local rail line relocation and improvement. Projects to result in improved vehicle traffic flow, improve quality of life and economic development	\$1.4 billion of 4 years
Section 9003	Rehabilitation and Improvement Financing	Loans or loan guarantees for projects to enhance rail service and capacity.	\$36 billion loan authority

### National Highway System

The U.S. National Highway System (NHS) comprises approximately 160,000 miles of roadway, including the Interstate Highways system and other roads, which are important to the nation’s economy, defense, and mobility. Congress adopted the highway routes in the NHS as part of the National Highway System Designation Act of 1995. The United States Department of Transportation (DOT) in cooperation with the states, local officials, and metropolitan planning organizations (MPOs) developed the NHS network. Oregon’s NHS routes total 470 miles of urban roads and 3,264 miles of rural roads. These roads provide access to air cargo terminals, deep draft ports, shallow draft cargo handling ports, and numerous other types of intermodal facilities. A map of the NHS is provided in Section II, map 2.5.

Primary and secondary criteria for designating NHS routes are identified in Table 3.3.

**Table 3.3 – National Highway System Criteria**

Facility Type	Primary Criteria
Commercial Airport	<ul style="list-style-type: none"> <li>▪ 250,000 annual enplanements for passengers</li> <li>▪ 100 trucks/day in each direction on principal connecting route, or</li> <li>▪ 100,000 tons/year moving to/from airport by truck</li> </ul>
Marine Port	<ul style="list-style-type: none"> <li>▪ Container terminals handle 50,000 TEU/year, or</li> <li>▪ Bulk terminals handle 500,000 tons/year by truck</li> <li>▪ 100 trucks/day in each direction on principal route</li> <li>▪ Passenger terminal handles 250,000 passengers/year or 1,000 passengers/day for at least 90 days/year</li> </ul>
Rail Intermodal Yard	<ul style="list-style-type: none"> <li>▪ 50,000 TEU/year,</li> <li>▪ 100 trucks/day each direction on principal route</li> </ul>
Pipeline Terminal	<ul style="list-style-type: none"> <li>▪ 100 trucks/day each direction on principal route</li> </ul>
Amtrak	<ul style="list-style-type: none"> <li>▪ 100,000 passengers/year</li> </ul>
Intercity Bus	<ul style="list-style-type: none"> <li>▪ 100,000 passengers/year</li> </ul>
Public Transit	<ul style="list-style-type: none"> <li>▪ Park and ride lots with 500 or more spaces</li> <li>▪ 5,000 daily bus or rail passengers – high percentage arriving by highway</li> </ul>
Ferries	<ul style="list-style-type: none"> <li>▪ 1,000 passengers/day for at least 90 days/year</li> </ul>
<b>Secondary Criteria</b>	
Intermodal Terminal with significant highway interface	<ul style="list-style-type: none"> <li>▪ Intermodal terminals handle 20% of passenger or freight volumes in state</li> <li>▪ Intermodal terminal identified as major facility in state or MPO transportation plans</li> <li>▪ Significant investment in, or expansion of, an intermodal terminal</li> <li>▪ Connecting routes targeted by state, MPO or others for investment to address an existing or anticipated deficiency due to increased traffic</li> </ul>

Congress also designated major intermodal facilities as part of the National Highway System. In the Portland region, these include:

- The Port of Portland's Terminals 1,2,4,5, and 6
- Port of Vancouver, Washington
- Swan Island Ship Yard
- Portland International Airport
- NW Industrial Area Pipeline Terminal
- BNSF Lake Yard and Willbridge Yards
- Union Pacific Albina and Brooklyn Yards
- Portland Greyhound Bus Terminal
- Portland Amtrak Union Station
- City of Vancouver, Washington 7th Street Transit Center

Beginning with the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), several corridors on the National Highway System have been designated in Federal transportation legislation as high priority corridors. Specific funding in ISTEA, TEA-21, and SAFETEA-LU has been set aside for these corridors. Interstate 5 along the entire west coast is designated a high-priority corridor.

### *National Network*

In 1982, the federal government enacted the Surface Transportation Assistance Act (STAA). The act requires states to allow larger vehicles (trucks) on a national network of roadways comprised of the Interstate Highway System and the non-Interstate Federal Aid Primary System. The STAA specifies the legal limit for height, width, length, and weight of trucks using the National Network roadways. The current federal gross vehicle weight limit is 80,000 lbs. The maximum federal width is 102 inches. Vehicles exceeding these limits require over-dimensional permits subject to Oregon Department of Transportation regulations.

The act also directs states and local jurisdictions to provide reasonable access for STAA legal-sized vehicles on their networks. State and local jurisdictions may not enact or enforce laws that deny reasonable access between the National Network and points of loading or unloading for legal-sized truck tractor-trailer and semi-trailer combinations, household goods carriers, or passenger motor carriers. In addition, STAA legal vehicles must be given access within one mile of a National Network route using the most practicable and reasonable route available except for specific safety issues on individual routes.

In the Portland region, the National Network consists of the following routes:

- I-5, I-405, I-84, I-205
- US 26: I-405 to US 101
- US 30: I-405 (Portland) to US 101 (Astoria)
- OR 99E: I-84 (Portland) to OR 224 (Milwaukie)

### *National Initiatives*

In April of 2006 the US Department of Transportation drafted a “Framework for a National Freight Policy.” The framework has seven main objectives:

- Improve the operations of the existing freight transportation system.
- Add physical capacity to the freight transportation system in places where investment makes economic sense.
- Use pricing to better align all costs and benefits between users and owners of the freight system and to encourage deployment of productivity-enhancing technologies.
- Reduce or remove statutory, regulatory, and institutional barriers to improved freight transportation performance.
- Proactively identify and address emerging transportation needs.
- Maximize the safety and security of the freight transportation system.
- Mitigate and better manage the environmental, health, energy, and community impacts of freight transportation.

In May 2006, then US DOT Secretary Mineta announced the “National Strategy to Reduce Congestion on America’s Transportation Network,” which provides the framework for government officials and the private sector to take the steps to reduce congestion. The Department has a six-point plan for addressing congestion relief:

- Relieve urban congestion.
- Unleash private sector investment resources.
- Promote operational and technological improvements.
- Establish a “Corridors of the Future” competition.
- Target major freight bottlenecks and expand freight policy outreach.
- Accelerate major aviation capacity projects and provide a future funding framework.

### **State**

Oregon’s statewide planning goals, adopted in 1974, established state policies in 19 different areas, including Goal 12: Transportation (OAR 660-015-0000(12)), which states “To provide and encourage a safe, convenient and economic transportation system.” The goal requires transportation plans that consider all modes of transportation, including mass transit, air, water, pipeline, rail, highway, bicycle and pedestrian.

Like all statewide planning goals, this goal is achieved through local comprehensive planning. State law requires each city and county to adopt a comprehensive plan and the zoning and land-division ordinances needed to put the plan into effect. The local comprehensive plans must be consistent with the Statewide Planning Goals. Plans are reviewed for consistency by the state’s Land Conservation and Development Commission (LCDC).

### *Transportation Planning Rule*

The Land Conservation and Development Commission adopted the Transportation Planning Rule (TPR) (OAR 660-012) in 1991 to implement Statewide Planning Goal 12. The rule requires the

state, the four metropolitan areas (Medford, Eugene, Salem and Portland), and all other cities and counties to adopt Transportation System Plans (TSPs). Each TSP is required to determine transportation needs and plans for roadway, transit, bicycle, pedestrian, air, rail, water, and pipeline facilities. TSPs in larger jurisdictions also are required to address transportation system management, demand management, parking, and finance. The TPR requires the development of modal system plans, including those for road, rail, and aviation systems.

Among other things, the TPR:

- requires the Oregon Department of Transportation (ODOT) to prepare a State Transportation System Plan (TSP) and identify a system of transportation facilities and services adequate to meet identified state transportation needs;
- directs counties and metropolitan organizations to prepare regional transportation system plans that are consistent with the state TSP;
- requires counties and cities to prepare local transportation system plans that are consistent with the regional plans.

Section 1(d) of the TPR, refers specifically to the efficient and safe movement of freight: *“Facilitate the safe, efficient and economic flow of freight and other goods and services within regions and throughout the state through a variety of modes including road, air, rail and marine transportation.”*

The TPR defines the elements required in a Transportation System Plan (OAR 660-012-0020). Section 2(b) defines the road elements required. Section 2(e) defines the air, rail, water, and pipeline elements:

*“(e) An air, rail, water and pipeline transportation plan which identifies where public use airports, mainline and branchline railroads and railroad facilities, port facilities, and major regional pipelines and terminals are located or planned within the planning area. For airports, the planning area shall include all areas within airport imaginary surfaces and other areas covered by state or federal regulations”*

### *Oregon State Transportation System Plan*

Section 15 of the Transportation Planning Rule (OAR 660-012-0015) calls on the Oregon Department of Transportation to prepare, adopt, and amend the state Transportation System Plan.

The state TSP consists of the Oregon Transportation Plan and modal and topic plans (including the Aviation System Plan, the Bicycle/Pedestrian Plan, various Corridor Plans, the Oregon Highway Plan, the Public Transportation Plan, the Rail Plan, the Transportation Safety Action Plan, and the Willamette Valley Transportation Strategy).

The following is a summary of major elements of the state TSP that impact freight.

### *Oregon Transportation Plan*

The Oregon Transportation Plan (OTP), adopted in September 2006, is the state’s guide for transportation policy and long-range, comprehensive planning for the multimodal transportation system. Developed by the Oregon Department of Transportation, the plan builds on the policies drafted in the 1992 plan and emphasizes maintaining the assets in place, optimizing the existing system performance through technology and better system integration, creating sustainable funding and investing in strategic capacity enhancements.

Goal 1 (Mobility and Accessibility) calls for several strategies in the development of an integrated multimodal system:

Strategy 1.1.1

Plan and develop a multimodal transportation system that increases the efficient movement of people and goods for commerce and production of goods and services that is coordinated with regional and local plans. Require regional and local transportation plans to address existing and future:

- Centers of economic activity;
- Routes and modes connecting passenger facilities and freight facilities;
- Intermodal facilities and industrial land; and
- Major intercity and intra-city transportation corridors and supporting transportation networks.

Strategy 1.1.2

Promote the growth of intercity bus, truck, rail, air, pipeline and marine services to link all areas of the state with national and international transportation facilities and services. Increase the frequency of intercity services to provide travel options.

Strategy 1.1.3

Identify transportation needs that extend beyond state borders to increase multimodal passenger and freight connections to state systems and to enhance interstate access to major destinations within and beyond Oregon. Cooperate with neighboring states to improve interstate travel.

Goal 3, Economic Vitality, calls for an integrated and efficient freight system:

*“It is the policy of the State of Oregon to promote an integrated, efficient and reliable freight system involving air, barges, pipelines, rail, ships and trucks to provide Oregon a competitive advantage by moving goods faster and more reliably to regional, national and international markets”*

The policy includes the following strategies:

- Develop coordinated state, regional, and local transportation plans and master plans that address current and future freight needs, issues, and economic strategies. Co-locate economic activities and appropriate transportation facilities with convenient and reliable access to freight transportation options.
- Work with local governments, ports, state agencies and landowners to protect industrial land near key transportation corridors and facilities.
- Encourage innovative technology, management and information sharing that will facilitate goods movement and economic strategies.
- Encourage communication among shippers, transportation providers, government agencies and jurisdictions to address freight transportation issues, challenges and opportunities across modes.
- Improve system efficiency and reduce conflicts by developing grade separations at rail and highway or roadway crossings whenever appropriate, by improving transportation networks and by enhancing connections with intermodal facilities.

- Systematically address barriers to efficient truck movements on roads and highways, including intermodal connectors, while balancing the needs and safe access of all modes.
- Give priority to freight mobility projects that are located on identified freight routes of statewide or regional significance, remove identified barriers to the safe, reliable and efficient movements of goods, and facilitate public and private investment that creates or sustains jobs.
- Encourage public/private partnerships to make strategic investments to respond to current and forecasted needs of rail shippers and transportation providers and to provide multimodal transportation options for industry.
- Cooperate and coordinate with state and federal agencies, other states, shippers and transportation providers to maintain and enhance current and forecasted air freight and passenger movements by supporting strategic, market-supported investments in air cargo terminals, airport facilities and equipment and links with surface transportation systems.
- Work with port districts, state and federal agencies, shippers and transportation providers to support strategic investments in marine transportation facilities to respond to current and forecasted needs.
- Support and facilitate expansion and development of capacity in pipelines to meet market demand and supply and enhance links with other modes.

### *Oregon Highway Plan*

The Oregon Highway Plan (OHP), adopted in 1999, focuses specifically on Oregon’s state highway system. The plan emphasizes efficient system management, partnerships with regional and local agencies, connecting land use and transportation, access management, connectivity between modes, and environmental and scenic resources.

The plan designates the State Highway Freight System in Policy 1C, which is intended to facilitate interstate, intrastate, and regional movements of trucks. This freight system, made up of the Interstate Highways and certain Statewide Highways on the National Highway System, includes routes that carry significant tonnage of freight by truck and serve as the primary interstate and intrastate highway freight connection to ports, intermodal terminals, and urban areas. The policy states:

*“It is the policy of the State of Oregon to balance the need for movement of goods with other uses of the highway system, and to recognize the importance of maintaining efficient through movement on major truck freight routes”*

The policy calls for four actions including:

- Apply performance standards appropriate to the movement of freight on freight routes.
- Prepare a statewide freight study to address the role of trucks and other freight modes in Oregon's economy, freight mobility and accessibility issues, current, near-term and long-term needs, and other topics.
- The development of corridor plans, which treat designated freight routes as Expressways where the routes are outside of urban growth boundaries and unincorporated communities. Continue to treat freight routes as Expressways within urban growth boundaries where existing facilities are limited access or where corridor or transportation system plans indicate



limited access; and Recognize and balance freight needs with needs for local circulation, safety and access in Special Transportation Areas.

- Consider the importance of timeliness in freight movements in developing and implementing plans and projects on freight routes.

Policy 4A: Efficiency of Freight Movement pertains directly to freight movement:

*It is the policy of the State of Oregon to maintain and improve the efficiency of freight movement on the state highway system and access to intermodal connections. The State shall seek to balance the needs of long distance and through freight movements with local transportation needs on highway facilities in both urban areas and rural communities.*

The policy identifies seven implementing actions, including:

- Identify roadway obstacles and barriers to efficient truck movements on state highways. These include bridges with load limits and geometric constraints that prohibit the travel of legal size vehicles. Set up a process through the Statewide Transportation Improvement Program to systematically improve the highway segments that hinder or prevent freight movements.
- Encourage uniform commercial vehicle regulations at the regional and national levels where the safety and efficiency of Oregon's transportation system will benefit. These might include regulation regarding vehicle design.
- Support further development, standardization, and/or compatibility of Intelligent Transportation System Commercial Vehicle Operation technology in the western United States.
- Maintain and improve roadway facilities serving intermodal freight facilities that are part of Oregon's Intermodal Management System, and support development of new intermodal roadway facilities where they are part of a local or regional transportation system plan.
- Support the establishment of stable funding or financing sources for transportation systems that will benefit the efficiency of freight movement on the highway system. These transportation systems include non-highway freight modes and intermodal connectors.
- Work with the private sector (e.g., carriers, shippers), local governments, metropolitan planning organizations, port authorities and others to improve planning coordination between public investments in highways and other investments in the freight movement infrastructure.
- Support the maintenance and improvement of non-highway infrastructure that provides alternative freight-moving capacity in critical corridors where doing so will maintain or improve the overall performance of the highway system.

In the Portland region, the State Highway Freight System includes:

- I-5, I-405, I-84, I-205
- US 26: I-405 to US 101
- US 30: I-405 (Portland) to US 101 (Astoria)
- OR 18/OR 99W: I-5 (Tigard) to US 101 (Lincoln City)
- OR 99E: I-84 (Portland) to OR 224 (Milwaukie)

- OR 217: US 26 (Beaverton) to I-5 (Tigard)
- OR 224/OR 212: OR 99E (Milwaukie) to US 26

### *Special Transportation Areas*

The Oregon Highway Plan allows for ODOT to work with local jurisdictions in the creation of Special Transportation Areas (STAs). The plan defines an STA as a designated compact district located on a state highway within an urban growth boundary in which the need for appropriate local access outweighs the considerations of highway mobility except on designated Freight Highways. While traffic moves through an STA and automobiles may play an important role in accessing an STA, convenience of movement within an STA is focused upon pedestrian, bicycle and transit modes. In these areas freight needs are balanced with local accessibility needs. Speeds typically do not exceed 25 miles per hour.

Examples of Special Transportation Areas in the Portland region include State Street along Highway 43 in downtown Lake Oswego, Hall Boulevard east of Scholls Ferry Road in Washington Square Town Center, Tualatin-Valley Highway between 20<sup>th</sup> and 10<sup>th</sup> in Cornelius, and McLoughlin Boulevard between Scott Street and Blue Bird Street in Milwaukie.

### *Overdimensional Routes*

Policy action 4A.2 of the Oregon Highway Plan states “*Encourage uniform commercial vehicle regulations at the regional and national levels where the safety and efficiency of Oregon's transportation system will benefit.*” Oregon and its four neighboring states share common standards for maximum height (14’), maximum width (8’6”), and maximum allowable length (105’). Vehicles over those dimensions require a Special Transportation Permit.

The Oregon Motor Carrier Transportation Division oversees regulations concerning over-dimension operations. ORS Chapter 818 defines the allowable vehicle limits on roadways. The division also provides information on bridges in the state with weight restrictions.

### *Oregon Rail Plan*

The Oregon Rail Plan, developed by ODOT in 2001, contains policies and plans concerning freight rail in the state. Included in the vision is the call to:

*“...work with carriers, shippers and other groups to maintain and improve access to the national rail freight system, maintain a competitive environment for rail customers, strengthen the retention of local rail service, and assure a level playing field for all modes”*

In 1994, the Oregon Transportation Commission adopted four policies relating to rail freight service:

Policy 1: Increase economic opportunities for the State by having a viable and competitive rail system.

- Stabilize and improve Oregon’s access to the national rail system by maintaining a competitive environment for rail customers, assuring a level playing field for each mode, and assisting in removing capacity restraints.
- Promote intermodal centers where freight may be interchanged between rail and other modes by identifying suitable locations with adequate potential volumes and, if necessary, funding rail improvements and providing adequate highway access.

- Identify opportunities for improved rail service to Oregon’s deep water ports, which will promote foreign trade by funding support facilities to reduce congestion and increase efficiency.

Policy 2: Strengthen the retention of local rail service where feasible.

- Where necessary, seek alternative ownership and/or operation of rail facilities in order to preserve service.
- Encourage increased use of rail service by promoting rail service opportunities, providing a wide range of intermodal facilities, and assisting localities and rail users to understand railroad economics, revenue needs of individual lines, and land use requirements.
- Utilize federal or state funds for rail service continuation assistance where appropriate. Preference should be given to those lines that upon analysis have a positive benefit over cost ratio and will not require public assistance for ongoing operations.

Policy 3: Protect abandoned rights-of-way for alternative or future use.

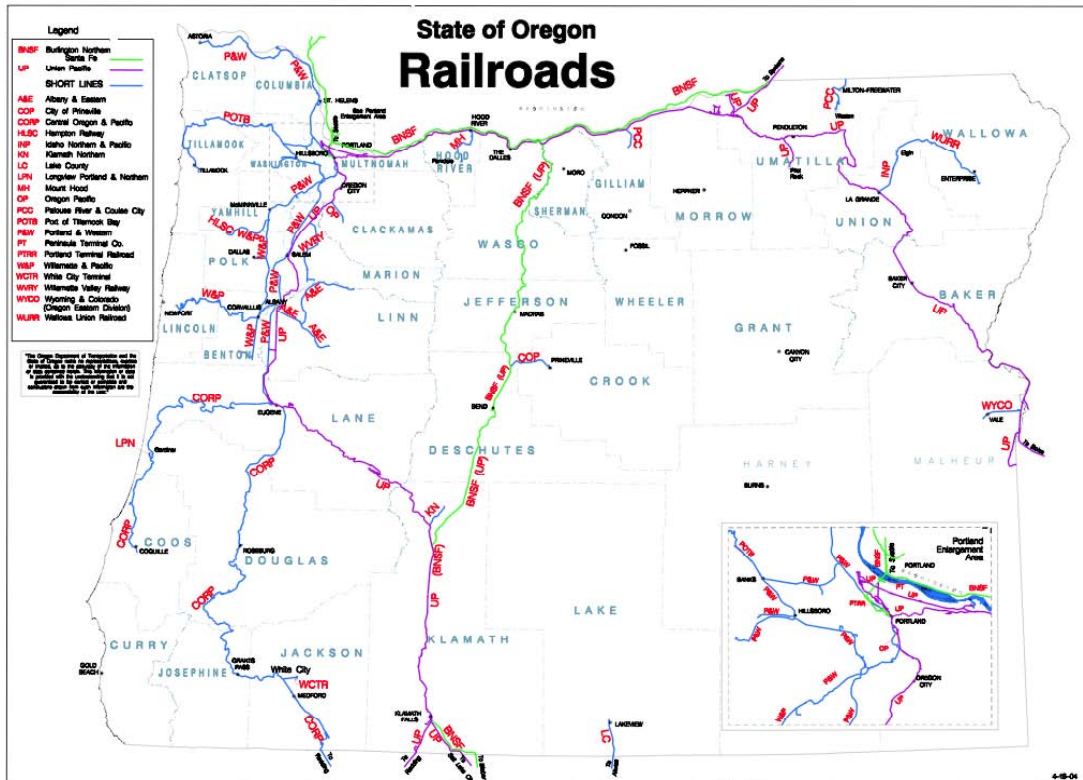
- Ensure that political jurisdictions and private groups are familiar with how to preserve and convert abandoned rail rights-of-way for Public Use and Interim Trail Use, as allowed under federal law.
- Use federal, state, and local funds to preserve rail rights-of-way for future transportation purposes.

Policy 4: Integrate rail freight considerations into the State’s land use planning process.

- Recognize the social, economic, and environmental importance of rail freight service.
- Encourage land use zoning and ordinances that enhance and protect existing rail freight service.
- Work with communities to minimize conflicts between railroad operations and other urban activities.
- Assist in removing constraints to improved railroad operating efficiency within urbanized areas. Work with communities to consolidate or close existing grade crossings and prevent the establishment of unjustifiable new grade crossings.

- Encourage local jurisdictions to identify alternative uses for low-density branch line rights-of-way.

Figure 3.1 - Oregon Railroad System Map



### Oregon Aviation Plan

Oregon Aviation Plan was adopted in 2000 by the Oregon Department of Aviation. The plan defines policies and investment strategies for Oregon’s public-use aviation system for the next 20 years.

Policy 4, Economic Development, calls for supporting economic development by providing access to regional, state, national, and international markets. Policy 5, Intermodal Accessibility, calls for access to the air transport system and its connections. The policy states:

*“Provide Oregon with an airport system that is integrated with surface transportation modes, and allows for a choice of modes for the movement of people and goods.”*

The policy has four primary actions:

- Work with airport owners and the FAA to identify airport ground access issues.
- Develop a comprehensive approach to airport ground access as part of local and regional transportation system plans, of corridor planning, and of modal planning.
- Provide information to airport owners on highway and other surface mode planning and programming efforts affecting airports.

- Encourage and support the integration of airports into local corridor and regional planning.

The Oregon Aviation Plan classifies the region’s airports into five functional categories, as shown in Table 3.3:

**Table 3.4– Oregon Airport Functional Categories**

Category	Significant Function	Designation Criteria
1 Commercial Service Airports	Accommodate scheduled major/national or regional/commuter commercial air carrier service.	Scheduled commercial service.
2 Business or High Activity General Aviation Airports	Accommodate corporate aviation activity, including business jets, helicopters, and other general aviation activities.	30,000 or more annual operations, of which a minimum of 500 are business related (turbine) aircraft.
3 Regional General Aviation Airports	Accommodate a wide range of general aviation users for large service areas in outlying parts of Oregon. Many also accommodate seasonal regional fire response activities with large aircraft.	Generally less than 30,000 operations. Geographically significant location with multiple communities in the service area. Nearest Category 1 airport is more than 90 minutes average travel time by road.
4 Community General Aviation Airports	Accommodate general aviation users and local business activities.	2,500 or more annual operations or more than ten based aircraft.
5 Low Activity General Aviation Airports	Accommodate limited general aviation use in smaller communities and remote areas of Oregon. Provide emergency and recreational use function.	Less than 2,500 annual operations and ten or fewer based aircraft.

For the Portland region, the Aviation Plan designates airports as follows:

- Portland International: Category 1
- Hillsboro: Category 2
- Troutdale: Category 2
- Mulino: Category 4

*Oregon Freight Advisory Committee*

The Oregon Freight Advisory Committee (OFAC) was first established in August 1998 to provide increased visibility for freight mobility and its vital role in the state’s trade and transportation dependent economic sectors, such as forest products, agriculture, high-tech manufacturing, the commercial and retail trades, maritime commerce and the transportation equipment industry. In 2001, the Oregon Legislature formalized the committee through the passage of House Bill 3364, which called for the ODOT Director to appoint members of a Freight Advisory Committee to advise the Director and the Oregon Transportation Commission (OTC) on issues, policies and program that impact multimodal freight mobility in Oregon.

The mission of the Freight Advisory Committee is to advise the Oregon Department of Transportation, Oregon Transportation Commission, and Oregon Legislature on priorities, issues and funding needs that impact multi-modal freight mobility and to advocate the importance of a

sound freight transportation system to the economic vitality of the State of Oregon and the Pacific Northwest.

## ***Regional***

### ***Metro 2040 Growth Concept***

In 1995, Metro adopted the 2040 Growth Concept to define how the region should grow and develop over a 50-year planning horizon. The primary tenets of the concept include:

- Efficient use of land
- Protection of farmland and natural areas
- Balanced transportation system
- Healthy economy
- Diversity in housing options

The concept provides a strategy for guiding the region's growth into mixed-use centers and corridors with higher densities of development supported by a balanced transportation system. The concept identifies industrial areas as a primary component and acknowledges the importance of maintaining these areas as sanctuaries for long-term industrial activities.

The Regional Framework Plan, adopted in 1997, is the implementing plan for the 2040 Growth Concept. It provides the specific policies and guidelines that the local governments under Metro's jurisdiction incorporate in their local policies and strategies to implement 2040.

### ***Regional Transportation Plan***

The Regional Transportation Plan (RTP), adopted by Metro in 2000 and updated in 2004, is the Portland region's policy and investment guide for the multimodal transportation system. The Regional Transportation Plan is the transportation component of the 2040 Growth Concept and Regional Framework Plan. Policy 15 involves the Regional Freight System:

#### ***Policy 15.0. Regional Freight System***

Provide efficient, cost-effective and safe movement of freight in and through the region.

- a. Objective: Provide high-quality access between freight transportation corridors and the region's freight intermodal facilities and industrial sanctuaries.
- b. Objective: Maintain a reasonable and reliable travel time for moving freight through the region in freight transportation corridors that enhances the region's economic competitive advantage.
  - Freight operation (such as weigh-in-motion, automated truck counts, enhanced signal timing on freight connectors).
  - Where appropriate, consider improvements that are dedicated to freight travel only.
- c. Objective: Consider the movement of freight when conducting multi-modal transportation studies.
- d. Objective: Work with the private sector, local jurisdictions, ODOT and other public agencies to:
  - develop the regional Intermodal Management System (IMS) and Congestion Management System (CMS)

- monitor the efficiency of freight movements on the regional transportation network
  - identify existing and future freight mobility problems and opportunities
  - reduce inefficiencies or conflicts on the freight network
  - maximize use of ship, rail, air and truck for a multi-modal freight system
  - address safety concerns related to freight.
- e. Objective: Coordinate public policies to reduce or eliminate conflicts between current and future land uses, transportation uses and freight mobility needs, including those relating to:
- land use changes/encroachments on industrial lands; and
  - transportation and/or land use actions or policies that reduce accessibility to terminal facilities or reduce the efficiency of the freight system.
- f. Objective: Ensure that jurisdictions develop local strategies that provide adequate freight loading and parking strategies in the central city, regional centers, town centers and main streets.
- g. Objective: Develop improved measures of freight movement as defined in the 2040 Growth Concept.
- h. Objective: Correct existing safety deficiencies on the freight network relating to:
- roadway geometry and traffic controls;
  - bridges and overpasses;
  - at-grade railroad crossings;
  - truck infiltration in neighborhoods; and
  - congestion on interchanges and hill climbs.

*Policy 15.1. Regional Freight System Investments*

Protect and enhance public and private investments in the freight network.

- a. Objective: Improve opportunities for partnerships between the private freight transportation industry and public agencies to improve and maintain the region’s integrated multi-modal freight network:
- work with the private transportation industry, Oregon Economic Development Department, Portland Development Commission, Port of Portland and others to identify and realize investment opportunities that enhance freight mobility and support the state and regional economy
- b. Objective: Analyze market demand and linkages in estimating and expanding the life of public investments in the freight network.
- c. Objective: Encourage efforts to provide flexible public funding for freight mobility investments.

The Regional Transportation Plan defines the Regional Freight System, which include the following categories:

- **Main roadway route.** Main roadway routes connect major activity centers in the region to other areas in Oregon or other states throughout the U.S., Mexico and Canada.
- **Road connectors.** A road that connects freight facilities or freight generation areas to the main roadway route.

- **Main railroad line.** Class I rail lines (e.g., Union Pacific and Burlington Northern/Sante Fe).
- **Branch railroad lines.** Non-Class I rail lines, including shortline or branch lines.
- **Marine facility.** A facility where freight is transferred between water-based and land-based modes.
- **Reload facility.** A facility that serves as the primary gateway for freight entering and leaving the region by truck.
- **Air cargo facility.** A facility that has direct access to an airport runway and transfers commodities between airplanes and land-based modes.
- **Distribution facility.** A facility where freight is reloaded from one land-based mode to another for further distribution.
- **Truck terminal.** A facility that serves as a primary gateway for commodities entering/leaving the region by truck. A truck terminal operates only truck to truck transfers of commodities.
- **Intermodal facility.** An intermodal facility is a transportation element that accommodates and interconnects different modes of transportation and serves the statewide, interstate and international movement of people and goods.
- **Intermodal railyard.** An intermodal railyard is a railyard that facilitates the transfer of containers or trailers between truck and rail.

### *Port of Portland*

The Port of Portland is the port district responsible for overseeing Portland International Airport, general aviation, and marine activities in the Portland region. The Port owns seven marine terminals, seven business parks, and four airports.

The Port developed the Marine Terminals Master Plan 2020. The plan has three primary goals:

- Optimize Port marine facilities through the identification and prioritization of improvements required to maintain, redevelop, and build-out existing marine Terminals 2, 4, 5 and 6;
- Create a 10-year Capital Improvement Plan using a 20-year planning horizon; and
- Develop a road map for investment decisions by the Port, its stakeholders and customers.

The Portland International Airport Master Plan was developed in 2000. The plan includes a facility plan with forecasts for passengers, cargo, and operations and facility development to meet projected growth. It also includes sections on environmental planning, citizen involvement, capacity preservation, and strategies to maintain viability.

The Port of Portland completed an update to the Hillsboro Airport's Master Plan in 2005. The goal of the master plan is to ensure that Hillsboro Airport meets future demand for aviation services while also being sensitive to local community issues. The Troutdale Airport Master Plan update was completed in 2004. Among other findings, the report determined that the airport facilities are generally well-suited their for current and future role, and that the airport has adequate aviation capacity and land supply for the next 20 years. The Port of Portland is currently in the process of updating the 1993 Mulino Airport Layout Plan.



### *Port of Vancouver*

The Port of Vancouver is a multi-purpose port authority located in Vancouver, Washington. The port is comprised of three districts encompassing an area of 111 square miles with a population of almost 300,000. The Port is governed by three elected Commissioners who are responsible for setting the overall policy and goals for Port operations and development.

### *County and City Transportation System Plans*

As required by the state Transportation Planning Rule, local jurisdictions include freight policies and network maps within their Transportation System Plans. The City of Portland adopted the Portland Freight Master Plan in 2006.



## Section IV - Logistics Profiles

Shipping and receiving goods between producers and customers often involves multiple transfers of those goods between different modes and distribution centers. During transit, those goods may be consolidated with other shipments, re-packaged, inspected, re-loaded, require special handling and other delivery requirements, all while maintaining inventory control and monitoring of their transport progress. Moreover, each mode and terminal has different operating practices and time windows, and in combination with the above represent the new standard for moving goods through domestic and international global supply chains. Expediting and organizing these processes is known as “logistics.”

This paper examines the logistics systems of the following four major Portland area shippers: Albertsons Grocery Chain, Intel, Nike, and Stimson Lumber. These organizations are representative of some of the largest traded sectors in metropolitan area, including food products, apparel, hi-technology and timber products. Each of these shippers use multiple modes to move goods, including trans-oceanic ship, airplane, rail, and truck between regional, U.S., Canadian and Mexican destinations, and in the case of Nike and Intel, throughout the world.

In addition, these organizations were selected for interview because they were surveyed about their logistics practices in 2003<sup>1</sup>. The previous interviews – which included surveys of 19 other metropolitan area companies – identified logistics practices and how the regional transportation network influenced them. The interviews also included their opinions about some of the strengths and weaknesses in the area’s freight transportation network. These companies were interviewed again because the nature of domestic and international freight movement is so dynamic that some of the conclusions made in 2003 were believed to have changed. As shown in these four “Logistics Stories”, there have been comprehensive changes in not only the methods companies use to move freight, but where they are storing and moving their goods. Moreover, their opinions for how the regional freight transportation works has changed in the three years since they were last interviewed.

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<sup>1</sup> *Industry Supply Chain Profile*”, prepared by Cambridge Systematics, Inc. for the Port of Portland, July 11, 2003

## ***Logistics Story I: Albertsons, Inc***

17505 NE San Rafael, Portland, OR 97230-5923

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Each week the national Albertsons grocery chain receives 525 truckload and 25 containers at its Portland distribution center, and ships 525 truckloads to 130 stores throughout Oregon, Washington and northern Idaho. Except for two containers/month shipped to Portland during peak season periods, all overseas imports are received at their Meridian, ID distribution center via the port of Long Beach. The majority of their goods are delivered to and from Portland by their own fleet (96% outbound deliveries and 33% inbound deliveries), with inbound deliveries dominated by LTL carriers bringing in brand name products from local manufacturers or distribution centers. All goods received at and shipped from the Portland Distribution Center arrive and depart by truck.

Inbound shipments of groceries are sourced from all over the U.S., with some sundries products shipped from overseas. The most pressing performance criteria for inter-plant shipments using third party carriers include on-time delivery, equipment availability, price and adequate insurance. In addition to the outbound deliveries directly to stores, Albertsons moves products between their distribution centers, sometimes using LTL services.

They identified several transportation network and operations issues that affect their logistics plans. Congestion on I-5, particularly in the Puget Sound, I-205 in the region, and the two regional Columbia River crossings (i.e., lack of another crossing) are at the heart of their operational problems. In addition, some city ordinance curfews restrict deliveries to certain portions of the day.

### ***Recent Changes in Logistics Practices and Networks***

In January 2006 Supervalu Stores purchased the Albertsons food chain and major changes in the logistics governing the Portland Distribution Center are expected. For example, Albertsons used 19 distribution centers throughout the U.S. (Portland was the second or third largest) and they were headquartered in Boise, ID. Supervalu Stores is headquartered in Eden Prairie, MN and uses many more distribution centers in many more locations for its logistics. While interviews were not held with the Supervalu Stores logistics staff, it is likely that there will be some consideration of changes to the current Portland Distribution Center's operations.

### ***Strengths and Weaknesses of the Portland Region's Distribution Network***

Albertsons reiterated many of the comments they made in 2003 about the region's transportation systems and networks. They continue to believe that the region provides good rail rates, that ODOT provides a high level of road maintenance, that the weigh-in-motion program saves time, the higher truck weights save money, and there are no tolls in the region. Weaknesses include road congestion, and the lengthy rail transit time in the area. They believe another crossing of the Columbia River is needed, and that more highway lanes are needed throughout the region.

## ***Logistics Story II: Intel, Inc***

HF2-08, 5200 NE Elam Young Pkwy, Hillsboro, OR 97124-6497

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Ranked 53<sup>rd</sup> on the Fortune 100, Intel is an international manufacturer of wafers and finished computer chips (processors), employing 82,000 people worldwide, including 17,000 at its seven campuses in Washington County. It is the company's largest and most complex site in the world<sup>2</sup>. According to a 2003 study, Intel has generated \$9 billion in economic impact within Oregon<sup>3</sup>, considered the largest economic impact of any single employer in the state<sup>4</sup>. Its 2005 revenues were \$38.8 billion.

Intel receives raw materials and equipment from all points of the globe via air, ocean, truck, and small package services. Raw materials are shipped by ocean carrier with more than 20 FEUs/month year-round (the number of air and truck trips was not provided but were indicated to be "sizable"). Construction equipment is also a heavy source of freight because Intel is continuously changing its infrastructure to accommodate their technological advances. There are a variety of critical performance criteria for their inbound shipments including handling (i.e., damage) and security capability, service, price, on-time delivery, and interface with Intel's inventory systems.

Intel manages its logistics and transportation operations, and uses DGF<sup>5</sup> for marine, DGF and EGL for air, EGL for long-haul truck, and Fed Ex, DGF and UPS for small package service. They use warehouse space provided by third party logistics providers, including United Van Lines in Portland and BAX at their Ronler Acres and Aloha facilities. BAX and EGL deliver raw materials, computer systems, equipment, and mail between the Washington County facilities multiple times each day.

Challenges for inbound cargo include: 1) traffic congestion on US 26 which results in 1.5 hours travel time between Hillsboro facilities and PDX Airport; 2) lack of choice and consistency in international airline services; and, Customs being closed over weekends. The lack of international service has resulted in Intel using San Francisco as their gateway for Oregon inbound shipments, and trucking those goods to the Washington County facilities.

Outbound shipments share many of the characteristics as inbound (e.g., destinations are international and domestic, involve same products, and are impacted by similar air service and highway congestion issues), with the major exception being that most shipments travel by intermodal to the East Coast and Europe.

### ***Recent Changes in Logistics Practices and Networks***

Three fabrication facilities that were under construction in 2003 are now in full operation, and traffic congestion on roadways used to and from local facilities, interstate highways, and air and marine facilities have grown worse as development has increased. Production and market demand have increased since 2003, and construction of additional facilities will probably occur within the next five years, further straining the logistics strategies that are in use. Intel is still concerned

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<sup>2</sup> Intel, Inc. Web Site – Intel in Your Community, Oregon, 2006,

<http://www.intel.com/community/oregon/index.htm>

<sup>3</sup> *Economic Impact of Intel's Oregon Operations*, ECONorthwest, Inc., 2003,

<http://download.intel.com/community/oregon/downloads/ECONorthwest.pdf>

<sup>4</sup> Ibid.

<sup>5</sup> DGF acquired Excel and DHL in the past few years.

about the lack of international airline service in the region, and drays most of its outbound cargo through Sea-Tac Airport (i.e., about twice as much as cargo shipped through PDX Airport)

*Strengths and Weaknesses of the Portland Region's Distribution Network*

Intel repeated many of the comments they made in 2003 about the advantages of Portland's freight transportation network (i.e., there are some direct-call ocean carriers, and carriers are flexible), and the weaknesses of the regional network (i.e., lack of alternate routes and signal synchronization). They believe the most important transportation operations changes that could be made in the region are focused on increasing air service.

### ***Logistics Story III: Nike, Inc***

One Bowerman Drive, Beaverton, OR 97005-6453

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Founded in 1964, Nike is perhaps Oregon's best known regional headquartered brand, and is the only Oregon-based company in the Fortune 500. The company employs 26,000 people worldwide, including 14,000 in the U.S., and 7,000 at its Beaverton campus. In addition to the Nike brand, the company owns and operates six other sportswear and sports equipment subsidiaries, and over 200 retail outlets, which generated revenues of \$15 billion in 2006. Nike operates eight (8) U.S. distribution centers: Wilsonville, OR, Tigard, OR, Memphis, TN, Greenland, NH, and the California cities of Foothill Ranch, Ontario, Fontana, and Costa Mesa.

While most of Nike's manufacturing and assembly occurs in Asia, Latin America and Europe, its Beaverton and Tigard facilities still manufacture airbags and golf clubs, respectively. Nike's footwear line – which produced entirely overseas – travel by ship (62,000 TEUs using four ocean carriers) to the ports of Los Angeles/Long Beach (54%), Seattle (25%), various east coast ports (9%), Portland (7%), and Oakland, CA (5%). Air shipments (10 million kilos allocated over three air lines) travel primarily through Los Angeles and Chicago. From marine ports and airports, goods are generally shipped by rail to distribution centers, including 950 containers/year to the Wilsonville facility. Nike also contracts with integrated motor carrier services such as Federal Express and UPS, and long-haul motor carriers including C.H. Robinson, Schneider Trucking and Gordon Trucking.

#### ***Recent Changes in Logistics Practices and Networks***

Nike will be closing its Wilsonville distribution center in 2008 (moving those operations to Memphis, TN), and cease using the Port of Portland that same year for footwear products “unless Portland gets a first call vessel for their containers.” They intend to transfer Port of Portland footwear shipments to the ports of Seattle/Tacoma and will be selling the Wilsonville facility. The Tigard facility will continue to manufacture golf clubs, but Nike promotions have moved from Tigard to Memphis, TN, and footwear samples moved from the Portland region to Chicago because “Chicago is an international air freight gateway; with Portland Nike always needed to add two days from other international gateways like Los Angeles.”<sup>6</sup>

With respect to logistics challenges, Nike remains concerned with infrastructure congestion issues especially in the Southern California area and along the rail routes to Memphis and other Mid-West destinations. Nike's cargo is time sensitive so they utilize a number of West Coast and several East Coast ports in order to create as many service options as possible. Nike is looking ahead to the 2008 International Longshore and Warehouse Union (ILWU) negotiations in hopes the parties reach a favorable agreement; and thereby, avoid a strike or work stoppage such as the 11-day work stoppage that occurred in 2002.

#### ***Strengths and Weaknesses of the Portland Region's Distribution Network***

Nike reiterated several points it made in its 2003 interview, namely the Portland area is free of the congestion issues facing other West Coast ports, and customs services here work very well. The loss of Korean Airlines for air freighter service was a disappointment. The rail network between Portland and Seattle has created delays for container shipments to Wilsonville and with the lack of certainty on transit time, more containers are being drayed by truck from Seattle-Tacoma by

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<sup>6</sup> Comments by John Isbell, Director of Corporate Delivery Logistics for Nike in interview with Sorin Garber (Sorin Garber Consulting Group) on October 19, 2006

truck to Wilsonville. The Free Trade Zone at T-6 is a positive attribute for Portland. From Nike's perspective, the major weakness for the Port of Portland is that there are no ocean carriers that Nike uses that have first direct calls to Portland. From a longer-term perspective, the Columbia River channel depth and the resulting inability to accommodate post-Panamax ships may create other issues for the Port.

As a general comment, Nike believes Oregon has a good transportation system. When asked about other states they operate in, Nike pointed to the State of Washington as being a good model for how the public sector can effectively invest in infrastructure: "generally they're (the State of Washington) pro-active and tend to get things done."



## ***Logistics Story IV: Stimson Lumber Company***

520 SW Yamhill Ste 700, Portland, OR 97204-1330

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Based in Portland, OR, and with over 400,000 acres of company-owned timber-land in Idaho, Montana, Oregon and Washington, Stimson Lumber Company is one of the oldest, continuously operating forest products companies in the United States. Stimson Lumber sells forest products and manufactured wood products throughout the U.S., as well as to customers in Australia, Japan, China and other Asian destinations, from ten manufacturing facilities including Forest Grove, St. Helens, Clatskanie, and Tillamook.

Stimson Lumber's supply chain extends from its timber harvest lands to their ten plants and mills, before being shipped by rail and truck to private and public reload centers, customer distribution centers (e.g., Lowes and Home Depot), and marine, rail and truck terminals. International shipping is completed solely by ship (four ocean carriers) from the ports of Portland, Seattle and Coos Bay (85% containerships, 15% bulk ships). Rail (shortline operators to the Union Pacific Railroad-UPRR and Burlington Northern & Santa Fe Railway-BNSF) is used to ship throughout the west and other U.S. destinations (6,000 rail cars annually), as well as truck (5,000 truck loads).

### ***Recent Changes in Logistics Practices and Networks***

Since the 2003 interview, Stimson has sold its Chehalis, WA gluelam beam plant and transferred stud manufacturing from a plant in Priest River, ID to its Hauser, ID facility. Overall production has remained steady, but production has increased at its Forest Grove facility by 33%, and decreased by 60% from its Tillamook operation. Shipping overseas has dropped by 50 containers (40' equivalents) per year, or 25%. In addition, the railroads they use have encouraged them to use 65' center-beam rail cars (i.e., moving away from the standard 50' box car), which carries more product, but is not always the most cost-effective equipment for their shipments. Finally, they see that their predominant use of 65' "maxi-trailer" trucks is becoming out-moded in the industry; a trend which they believe will increase their shipping costs by truck.

### ***Strengths and Weaknesses of the Portland Region's Distribution Network***

Stimson's goals are to move from truck to rail as much as possible, however, use of rail has presented two major challenges. First, the "paper barrier" issues that exist between the short line operators they use and the restrictions placed on them by the Class 1 carriers (e.g., UPRR and BNSF do not permit unrestricted access to other railroads, terminals customers, etc., from the shortline operations -- such as the Portland & Western Railroad -- they work with) forces them to use trucks more often than they'd like. In addition, some of the capacity and operating characteristics of the shortline carrier's infrastructure restricts movements and speeds. While Stimson does not expect much relief from the "paper barrier" restrictions, they are encouraged by efforts by the State of Oregon through its *ConnectOregon* program which granted funds to upgrade Portland & Western Railroad track along the Segher's Branch to be able to handle 286,000 lb loads and result in an increase in speed from 10mph to 25mph to and from its Forest Grove mill.

As a short-haul operation, Stimson is very much challenged by growing congestion on Portland region freeways. For example, they can only reliably complete two trips to Vancouver/day where they were able to make three trips to Vancouver/day in 2003.



## Appendices

### Appendix A – Comparative Characteristics of Modes References

Reference Sources for Information provided in table: *Comparative Characteristics of Freight Modes*.

#### Comparative Characteristics of Freight Modes

	<i>Max Tonnage (gross tonnage weight)</i>	<i>Avg Miles /Trip</i>	<i>Avg Long- Haul MPH</i>	<i>Ability to Handle Fragile Goods (g)</i>	<i>BTUs/ Ton-Mile</i>	<i>Emissions/ Ton-Mile</i>
Truck	50/truck (a)	247 (f)	50-70 (g)	Good	3,337 (k)	3.25 gms (n)
Rail	12,000/train (b)	617 (f)	50-70 (g)	Fair	345 (k)	0.5 gms (n)
Ship	10,000-65,000 (c)	511 (f)	22.5 knots (h)	Fair	471 (k)	unavailable
Barge	14,500 (d)	511 (f)	12-13 knots (i)	Fair	368 (l)	unavailable
Air	124 (e)	1,070 (f)	300-600 (g)	Excellent	28,000 (m)	unavailable
Pipeline	na	na	3-4 (j)	na	na	na

#### Notes:

- (a) Oregon permits truck gross tonnage weights up to 105,500 lbs; excluding over-dimensional loads.
- (b) Typical unit freight trains in the Pacific Northwest range in size from 100 to 110 rail cars, with capacity of 112-tons/rail car.
- (c) *Wikipedia, The Free Encyclopedia*, <http://en.wikipedia.org/wiki/Panamax> and <http://en.wikipedia.org/wiki/Handymax>, and confirmed by Jim Daly, Port of Portland, September 2006
- (d) *Alternate Transportation Mode Comparison*, US Army Corps of Engineers; Columbia/Snake River barges have maximum capacity of 3,500 tons, and four can be towed together.
- (e) *Boeing Commercial Airplanes: 747 Freighter Family Background*, [http://www.boeing.com/commercial/747family/pf/pf\\_400f\\_back.html](http://www.boeing.com/commercial/747family/pf/pf_400f_back.html)
- (f) *TRANSEARCH and USDOT Freight Analysis Framework Project* (unpublished data), Reebie Associates, 2002 – See Figure 3. <http://climate.dot.gov/workshop1002/caldwell.pdf#search=%22Length%20of%20average%20air%20cargo%20trips%22>
- (g) Professional judgment
- (h) *The Time Factor in Liner Shipping Services*, Theo Nottebaum, Table 6, 2001, [http://www.palgrave-journals.com/mel/journal/v8/n1/fig\\_tab/9100148t6.html](http://www.palgrave-journals.com/mel/journal/v8/n1/fig_tab/9100148t6.html)
- (i) *Utilizing Inland Waterway, Coastal and Open Ocean Barging of Containerized Agricultural Products to Overcome Existing Service*, U.S. Dept of Agriculture, 8/2005. <http://www.ams.usda.gov/tmd/FSMIP/FY2004/OR0431.pdf#search=%22travel%20speed%20of%20fully%20loaded%20Columbia%20River%20barges%22>
- (j) Minutes of Portland Freight Committee meeting (9/1/2005) of Presentation by BP, <http://www.portlandonline.com/shared/cfm/image.cfm?id=95575>
- (k) *Transportation Energy Data Book: Edition 24* Oak Ridge National Laboratory, (Oak Ridge, TN: 2004, [http://www.ops.fhwa.dot.gov/freight/freight\\_analysis/nat\\_freight\\_stats/docs/05factsfigures/table5\\_10.htm](http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/05factsfigures/table5_10.htm)

- (l) *Impacts of a Snake River Drawdown on Energy and Emission Based on Regional Economic Co-efficients*, Trent Ball and Ken Casavant, Washington State University-Department of Agricultural Economics, Aug 2001 <http://ntl.bts.gov/DOCS/TNW2001-06.html>
- (m) *Energy Use in Freight Transportation*, Alice Rivlin, Congressional Budget Office, 1982 <http://www.cbo.gov/showdoc.cfm?index=5330&sequence=0>
- (n) *Railroads: Building a Cleaner Environment*, American Association of Railroads, July 2004

## **Appendix B - Glossary<sup>1</sup>**

**Average Annual Daily Truck Traffic (AADTT)** - The total annual volume of truck traffic on a highway segment, divided by the number of days in the year.

**Backhaul** - The process of a transportation vehicle (typically a truck) returning from the original destination point to the point of origin. A backhaul can be with a full or partially loaded trailer.

**Barge** - The cargo-carrying vehicle that inland water carriers primarily use. Basic barges have open tops, but there are covered barges for both dry and liquid cargoes.

**Belly Cargo** - Airfreight carried in the belly of passenger aircraft.

**Bill of Lading** - A transportation document that is the contract of carriage containing the terms and condition between shipper and carrier.

**Bottleneck** - A section of a highway or rail network that experiences operational problems such as congestion. Bottlenecks may result from factors such as reduced roadway width or steep freeway grades that can slow trucks.

**Boxcar** - An enclosed railcar, typically 40 or more feet long, used for packaged freight and some bulk commodities.

**Breakbulk Cargo** - Cargo of non-uniform sizes, often transported on pallets, sacks, drums, or bags. These cargoes require labor-intensive loading and unloading processes. Examples of breakbulk cargo include coffee beans, logs, or pulp.

**Broker** - A person whose business it is to prepare shipping and customs documents for international shipments. Brokers often have offices at major freight gateways, including border crossings, seaports, and airports.

**Bulk Cargo** - Cargo that is unbound as loaded; it is without count in a loose unpackaged form. Examples of bulk cargo include coal, grain, and petroleum products.

**Cabotage** - A national law that requires coastal and intercoastal traffic to be carried in its own nationally registered, and sometimes built and crewed ships.

**Capacity** - The physical facilities, personnel, and process available to meet the product of service needs of the customers. Capacity generally refers to the maximum output or producing ability of a machine, a person, a process, a factory, a product, or a service.

**Cargo Ramp** - A dedicated load/unload facility for cargo aircraft.

**Carload** - Quantity of freight (in tons) required to fill a railcar; amount normally required to qualify for a carload rate.

**Carrier** - A firm that transports goods or people via land, sea, or air.

**Centralized Dispatching** - The organization of the dispatching function into one central location. This structure often involves the use of data collection devices for communication between the centralized dispatching function, which usually reports to the production control department and the shop manufacturing departments.

**Chassis** - A trailer-type device with wheels constructed to accommodate containers, which are lifted on and off.

**Claim** - Charges made against a carrier for loss, damage, delay, or overcharge.

**Class I Carrier** - A classification of regulated carriers based upon annual operating revenues-motor carrier of property greater than or equal to \$5 million; railroads: greater than or equal to \$50 million; motor carriers of passengers; greater than or equal to \$3 million.

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<sup>1</sup> Federal Highway Administration – Freight Professional Development Program, Office of Operations, <http://ops.fhwa.dot.gov/freight/fpd/glossary/>

**Class II Carrier** - A classification of regulated carriers based upon annual operating revenues-motor carrier of property \$1- \$5 million; railroads: \$10-\$50 million: motor carriers of passengers; less than or equal to \$3 million.

**Class III Carrier** - A classification of regulated carriers based upon annual operating revenues-motor carrier of property less than or equal to \$1 million; railroads: greater than or equal to \$10 million.

**Classification Yard** - A railroad terminal area where railcars are grouped together to form train units.

**Coastal Shipping** - Also known as short-sea or coastwise shipping, describes marine shipping operations between ports along a single coast or involving a short sea crossing.

**Contract Carrier** - A carrier that does not serve the general public, but provides transportation for hire for one or a limited number of shippers under a specific contract.

**Commodity** - An Item that is traded in commerce. The term usually implies an undifferentiated product competing primarily on price and availability.

**Consignee** - The receiver of a freight shipment, usually the buyer.

**Consignor** - The sender of a freight shipment, usually the seller.

**Container** - A "box" typically ten to forty feet long, which is used primarily for ocean freight shipment. For travel to and from ports, containers are loaded onto truck chassis' or on railroad flatcars.

**Container on Flatcar (COFC)** - Containers resting on railway flatcars without a chassis underneath.

**Containerization** - A shipment method in which commodities are placed in containers, and after initial loading, the commodities per se are not re-handled in shipment until they are unloaded at destination.

**Containerized Cargo** - Cargo that is transported in containers that can be transferred easily from one transportation mode to another.

**Contract Carrier** - Carrier engaged in interstate transportation of persons/property by motor vehicle on a for-hire basis, but under continuing contract with one or a limited number of customers to meet specific needs.

**Cubage** - Cubic volume of space being used or available for shipping or storage.

**Deadhead** - The return of an empty transportation container back to a transportation facility. Commonly used description of an empty backhaul.

**Detention Fee** - The carrier charges and fees applied when rail freight cars, ship, and carriers are retained beyond a specified loading or unloading time.

**Demurrage** - The carrier charges and fees applied when rail freight cars and ships are retained beyond a specific loading or unloading time.

**Direct to store** - Process of shipping direct from a manufacturer's plant or distribution center to the customer's retail store, thus bypassing the customer's distribution center.

**Dispatcher** - An individual tasked to assign available transportation loads to available carriers.

**Distribution Center (DC)** - The warehouse facility which holds inventory from manufacturing pending distribution to the appropriate stores.

**Dock** - A space used or receiving merchandise at a freight terminal.

**Double-stack** - Railcar movement of containers stacked two high.

**Drayage** - Transporting of rail or ocean freight by truck to an intermediate or final destination; typically a charge for pickup/delivery of goods moving short distances (e.g., from marine terminal to warehouse).

**Drop** - A situation in which an equipment operator deposits a trailer or boxcar at a facility at which it is to be loaded or unloaded.

**Durable Goods** - Generally, any goods whose continuous serviceability is likely to exceed three years.

**Exempt Carrier** - A for-hire carrier that is free from economic regulation. Trucks hauling certain commodities are exempt from Interstate Commerce Commission economic regulation. By far the largest portion of exempt carrier transports agricultural commodities or seafood.

**Flatbed** - A trailer without sides used for hauling machinery or other bulky items.

**For-hire Carrier** - Carrier that provides transportation service to the public on a fee basis.

**Freight All Kinds (FAK)** - Goods classified FAK are usually charged higher rates than those marked with a specific classification and are frequently in a container that includes various classes of cargo.

**Freight Forwarder** - A person whose business is to act as an agent on behalf of a shipper. A freight forwarder frequently consolidates shipments from several shippers and coordinates booking reservations.

**Free Trade Zone (FTZ)** - An area or zone set aside at or near a port or airport, under the control of the U.S. Customs Service, for holding goods duty-free pending customs clearance.

**Fuel-Taxed Waterway System** - Eleven thousand miles of the U.S. waterway system designated by the Water Resources Development Act of 1986. Commercial users of this system pay a per gallon fuel tax which is deposited in the Inland Waterways Trust Fund and used to fund inland navigation projects each year.

**Four P's** - Set of marketing tools to direct the business offering to the customer. The four P's are product, price, place, and promotion.

**Gross Vehicle Weight (GVW)** - The combined total weight of a vehicle and its freight.

**Hazardous Material** - A substance or material which the Department of Transportation has determined to be capable of posing a risk to health, safety, and property when stored or transported in commerce.

**Hours of Service** - Ruling that stipulates the amount of time a driver is allotted to work.

**Hub** - A common connection point for devices in a network. Referenced for a transportation network as in "hub and spoke" which is common in the airline and trucking industry.

**In-bond Shipment** - A shipment status in which goods are permitted to enter a country and temporarily stored for transport to a final destination where the duty will be paid.

**Inbound Logistics** - The movement of materials from shippers and vendors into production processes or storage facilities.

**Interline Freight** - Freight moving from point of origin to destination over the lines of two or more transportation lines.

**Intermodal terminal** - A location where links between different transportation modes and networks connect. Using more than one mode of transportation in moving persons and goods. For example, a shipment moved over 1000 miles could travel by truck for one portion of the trip, and then transfer to rail at a designated terminal.

**Inventory** - The number of units and/or value of the stock of good a company holds.

**Just-in-Time (JIT)** - Cargo or components that must be at a destination at the exact time needed. The container or vehicle is the movable warehouse.

**Lead-time** - The total time that elapses between an order's placement and its receipt. It includes the time required for order transmittal, order processing, order preparation, and transit.

**Less-Than-Containerload/Less-Than-Truckload (LCL/LTL)** - A container or trailer loaded with cargo from more than one shipper; loads that do not by themselves meet the container load or truckload requirements.

**Level of Service (LOS)** - A qualitative assessment of a road's operating conditions. For local government comprehensive planning purposes, level of service means an indicator of the extent or degree of service provided by, or proposed to be provided by, a facility based on and related to the operational characteristics of the facility. Level of service indicates the capacity per unit of demand for each public facility.

**Lift-on/Lift-off (lo/lo) Cargo** - Containerized cargo that must be lifted on and off vessels and other vehicles using handling equipment.

**Line Haul** - The movement of freight over the road/rail from origin terminal to destination terminal, usually over long distances.

**Liquid Bulk Cargo** - A type of bulk cargo that consists of liquid items, such as petroleum, water, or liquid natural gas.

**Live Load** - As situation in which the equipment operation stays with the trailer or boxcar while being loaded or unloaded.

**Lock** - A channel where the water rises and falls to allow boats to travel a dammed river.

**Logbook** - A daily record of the hours an interstate driver spends driving, off duty, sleeping in the berth, or on duty not driving.

**Logistics** - All activities involved in the management of product movement; delivering the right product from the right origin to the right destination, with the right quality and quantity, at the right schedule and price.

**Lumpers** - Individuals that assist a motor carrier owner operator in the unloading of property; quite commonly used in the food industry.

**Neo-bulk Cargo** - Shipments consisting entirely of units of a single commodity, such as cars, lumber, or scrap metal.

**Node** - A fixed point in a firm's logistics system where goods come to rest; includes plants, warehouses, supply sources, and markets.

**OS&D** - Over, short and damaged. Report is issued at warehouse when goods are damaged; claim is usually filed with the carrier.

**On-dock Rail** - Direct shipside rail service. Includes the ability to load and unload containers/breakbulk directly from rail car to vessel.

**Outbound Logistics** - The process related to the movement and storage of products from the end of the production line to the end user.

**Operating Ratio** - A measure of operation efficiency defined as:  $(\text{Operating Expenses}/\text{Operation Revenues}) \times 100$ .

**Owner-operator** - Trucking operation in which the owner of the truck is also the driver.

**Placard** - A label that identifies a hazardous material shipment and the hazards present.

**Piggyback** - A rail/truck service. A shipper loads a highway trailer, and a carrier drives it to a rail terminal and loads it on a flatcar; the railroad moves the trailer-on-flatcar combination to the destination terminal, where the carrier offloads the trailer and delivers it to the consignee.

**Pool/Drop Trailers** - Trailer that are staged at a facilities for preloading purposes.

**Point of Sale (POS)** - The time and place at which a sale occurs, such as a cash register in a retail operation, or the order confirmation screen in an on-line session. Supply chain partners are interested



in capturing data at the POS because it is a true record of the sale rather than being derived from other information such as inventory movement.

**Port Authority** - State or local government that owns, operates, or otherwise provides wharf, dock, and other terminal investments at ports.

**Private Carrier** - A carrier that provides transportation service to the firm that owns or leases the vehicles and does not charge a fee.

**Private Warehouse** - A company owned warehouse.

**Prepaid** - A freight term, which indicates that charges are to be paid by the shipper. Prepaid shipping charges may be added to the customer invoice, or the cost may be bundled into the pricing of the product.

**Proof of Delivery** - Information supplied by the carrier containing the name of the person who signed for the shipment, the time and date of delivery, and other shipment delivery related information.

**Pull Logistics System** - "Just in time" logistics system driven by customer demand and enabled by telecommunications and information systems rather than by manufacturing process and inventory stockpiling.

**Purchase Order (PO)** - The purchaser's authorization used to formalize a purchase transaction with a supplier. The physical form or electronic transaction a buyer uses when placing an order for merchandise.

**Push Logistics System** - Inventory-based logistics system characterized by regularly scheduled flows of products and high inventory levels.

**Rail Siding** - A very short branch off a main railway line with only one point leading onto it. Sidings are used to allow faster trains to pass slower ones or to conduct maintenance.

**Reefer Trailer** - A refrigerated trailer commonly used for perishable goods.

**Regional Railroad** - Railroad defined as line-haul railroad operating at least 350 miles of track and/or earns revenue between \$40 million and \$266.7 million.

**Reliability** - Refers to the degree of certainty and predictability in travel times on the transportation system. Reliable transportation systems offer some assurance of attaining a given destination within a reasonable range of an expected time. An unreliable transportation system is subject to unexpected delays, increasing costs for system users.

**Reverse Logistics** - A specialized segment of logistics focusing on the movement and management of products and resources after the sale and after delivery to the customer. Includes product returns and repair for credit.

**Receiving** - The function encompassing the physical receipt of material, the inspection of the shipment for conformance with the purchase order (quantity and damage), the identification, and delivery to destination, and the preparation of receiving reports.

**Return to Vendor (RTV)** - Material that has been rejected by the customer or buyer's inspection department and is awaiting shipment back to supplier for repair or replacement.

**Radio Frequency (RFID)** - A form of wireless communication that lets users relay information via electronic energy waves from a terminal to a base station, which is linked in turn to a host computer. The terminals can be placed at a fixed station, mounted on a forklift truck, or carried in the worker's hand. The base station contains a transmitter and receiver for communication with the terminals. When combined with a bar-code system for identifying inventory items, a radio frequency system can relay data instantly, thus updating inventory records in so-called "real time".

**Roll-on/Roll-off (ro/ro) Cargo** - Wheeled cargo, such as automobiles, or cargo carried on chassis that can be rolled on or off vehicles without using cargo handling equipment.

**Seasonality** - Repetitive pattern of demand from year to year (or other repeating time interval) with some periods considerably higher than others. Seasonality explains the fluctuation in demand for various recreational products, which are used during different seasons.

**Shipper** - Party that tenders goods for transportation.

**Shipping Manifest** - A document that lists the pieces in a shipment.

**Short Line Railroad** - Freight railroads, which are, not Class I or Regional Railroads that operate less than 350 miles of track and earn less than \$40 million.

**Short-sea Shipping** - Also known as coastal or coastwise shipping, describes marine shipping operations between ports along a single coast or involving a short sea crossing.

**Sleeper Team** - Two drivers who operated a truck equipped with a sleeper berth; while one driver sleeps in the berth to accumulate mandatory off-duty time, the other driver operates the vehicle.

**Stock Keeping Unit (SKU)** - A category of unit with unique combination of form, fit and function.

**Stock Outs** - Merchandise that is requested by a customer but is temporarily unavailable. Also referred to as (OOS).

**Stop Off Charge** - Charge associated with a load that has more than one drop off point. Typically, the first stop of a multi-stop load is free, and then the charge applies to the subsequent stops.

**Strategic Highway Network (STRAHNET)** - A network of highways which are important to the United States' strategic defense policy and which provide defense access, continuity, and emergency capabilities for defense purposes.

**Strategic Rail Corridor Network (STRACNET)** – Interconnected/continuous 38,000 mile rail line network serving over 170 defense installations.

**GloSwitching and Terminal Railroad** - Railroad that provides pick-up and delivery services to line-haul carriers.

**Supply Chain** - Starting with unprocessed raw materials and ending with final customer using the finished goods.

**TEU** - Twenty-foot equivalent unit, a standard size intermodal container.

**Third-party Logistics (3PL) Provider** – Logistics specialist who may provide a variety of transportation, warehousing, and logistics-related services to buyers or sellers. These tasks were previously performed in-house by the customer.

**Throughput** - Total amount of freight imported or exported through a seaport measured in tons or TEUs.

**Ton-mile** - A measure of output for freight transportation; reflects weight of shipment and the distance it is hauled; a multiplication of tons hauled by the distance traveled.

**Trailer on Flatcar (TOFC)** - Transport of trailers with their loads on specially designed rail cars.

**Transit time** - Total time that elapses between a shipment's delivery and pickup.

**Transloading** - Transferring bulk shipments from the vehicle/container of one mode to that of another at a terminal interchange point.

**Truckload (TL)** - Quantity of freight required to fill a truck, or at a minimum, the amount required to qualify for a truckload rate.

**Twenty-foot Equivalent Unit (TEU)** - The 8-foot by 8-foot by 20-foot intermodal container is used as a basic measure in many statistics and is the standard measure used for containerized cargo.

**Unit Train** - A train of a specified number of railcars handling a single commodity type which remain as a unit for a designated destination or until a change in routing is made.

**Vehicle Miles of Travel (VMT)** - A unit to measure vehicle travel made by a private vehicle, such as an automobile, van, pickup truck, or motorcycle.

**Warehouse** - Storage place for products. Principal warehouse activities include receipt of product, storage, shipment, and order picking.

## Appendix C - Acronyms

<b>AAAA</b>	American Association of Port Authorities
<b>AASHTO</b>	American Association of State Highway and Transportation Officials
<b>ACE</b>	Automated Commercial Environment
<b>ATA</b>	American Trucking Association
<b>BTS</b>	Bureau of Transportation Statistics
<b>CBP</b>	Customs Border Protection
<b>CDL</b>	Commercial Drivers License
<b>CFS</b>	Commodity Flow Survey
<b>CMAQ</b>	Congestion Mitigation Air Quality Act
<b>CMV</b>	Commercial motor Vehicle
<b>CTPAT</b>	Customs Trade Partnership Against Terrorism
<b>CVISN</b>	Commercial Vehicle Information Systems and Networks (CVISN), a national program administered by the Federal Motor Carrier Safety Administration to improve motor carrier safety and enhance administrative efficiency for industry and government.
<b>CVO</b>	Commercial Vehicle Operations
<b>DOD</b>	Department of Defense
<b>FAST</b>	Free and Secure Trade
<b>FHWA</b>	Federal Highway Administration
<b>FMCSA</b>	Federal Motor Carrier Safety Administration
<b>FPD</b>	Freight Professional Development
<b>FRA</b>	Federal Railroad Administration
<b>GIS</b>	Geo Information Systems
<b>GPS</b>	Global Positioning System
<b>HERS</b>	Highway Economic Requirements Systems
<b>HPMS</b>	Highway Performance Monitoring System
<b>ITE</b>	Institute of Transportation Engineers
<b>ITS</b>	Intelligent Transportation System
<b>MPG</b>	Miles Per Gallon
<b>MUTCD</b>	Manual on Uniform Traffic Control Devices
<b>NAFTA</b>	North American Free Trade Agreement
<b>NHS</b>	Nation Highway System
<b>NVOCC</b>	Non- Vessel Operating Common Carriers
<b>P&amp;D</b>	Pick up and delivery.
<b>POD</b>	Proof of Delivery
<b>POE</b>	Port of Entry
<b>SED</b>	Shipper's Export Declaration
<b>SCAC</b>	Standard Carrier Alpha Code
<b>SCAC</b>	Standard Carrier Alpha Code
<b>SCAC</b>	Standard Carrier Alpha Code
<b>SLSC/SLDC</b>	Shipper Load, Shipper Count/Shipper Load, Driver Count
<b>STCC</b>	Standard Transportation Commodity Classification
<b>SCAC</b>	Standard Carrier Alpha Code
<b>SLSC/SLDC</b>	Shipper Load, Shipper Count/Shipper Load, Driver Count
<b>STCC</b>	Standard Transportation Commodity Classification
<b>TRANCAD</b>	Transportation Computer Assisted Design
<b>UFC</b>	Uniform Freight Classification