

Strategic Freight Transportation Analysis

Freight Movements on Washington State Highways: Results of the 2003-2004 Origin and Destination Study

SFTA Research Report # 10

October 2004

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SFTA Research Reports: Background and Purpose

This study is the tenth in a series of reports prepared using data from the Strategic Freight Transportation Analysis (SFTA) study. SFTA is a six-year comprehensive research and implementation analysis assisting local, state, regional and national organizations by providing information (data and direction) for use in addressing issues of freight mobility.

The overall SFTA scope includes the following goals and objectives:

- Improving knowledge about freight corridors
- Assessing the operations of roadways, rail systems, ports (marine and inland) and identifying freight chokepoints
- Analyze modal cost structures and competitive mode shares
- Assess potential economic development opportunities
- Conduct case studies of public/private transportation costs
- Evaluate the opportunity for public/private partnerships

The five specific work tasks identified for SFTA are:

- Work Task 1 – Scoping of Full Project
- Work Task 2 – Statewide Origin and Destination Truck Survey
- Work Task 3 – Shortline Railroad Economic Analysis
- Work Task 4 – Strategic Resources Access Road Network (Critical State and Local Integrated Network)
- Work Task 5 – Adaptive Research Management

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DISCLAIMER

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Previous SFTA Reports Now Available

1. Casavant, Kenneth L. and Eric L. Jessup. "SFTA Full Scope of Work." SFTA Research Report Number 1. December 2002.
2. Clark, Michael L., Eric L. Jessup and Kenneth L. Casavant. "Freight Truck Origin and Destination Study: Methods, Procedures and Data Dictionary." SFTA Research Report Number 2. December 2002.
3. Casavant, Kenneth L. and Eric L. Jessup. "Value of Modal Competition for Transportation of Washington Fresh Fruits and Vegetables." SFTA Research Report Number 3. December 2002.
4. Ripplinger, Toby, Kenneth L. Casavant and Eric L. Jessup. "Transportation Usage of the Washington Wine Industry." SFTA Research Report Number 4. May 2003.
5. Clark, Michael L., Eric L. Jessup and Kenneth L. Casavant. "Dynamics of Wheat and Barley Shipments on Haul Roads to and from Grain Warehouses in Washington State." SFTA Research Report Number 5. September 2003.
6. Casavant, Kenneth L., Eric L. Jessup and Joe Poiré. "An Assessment of the Current Situation of the Palouse River and Coulee City Railroad and the Future Role of the Port of Whitman County." SFTA Research Report Number 6. September 2003.
7. Tolliver, Denver, Eric L. Jessup and Kenneth L. Casavant. "New Techniques for Estimating Impacts of Rail Line Abandonment on Highways in Washington." SFTA Research Report Number 7. September 2003.
8. Tolliver, Denver, Eric L. Jessup and Kenneth L. Casavant. "Implications of Rail Line Abandonment on Shipper Costs in Eastern Washington." SFTA Research Report Number 8. September 2003.
9. Jessup, Eric L. and Kenneth L. Casavant. "Rail Line Investment Alternatives Resulting from Abandonment: A Case Study of Moses Lake, Washington." SFTA Research Report Number 9. July 2003.

Table of Contents

EXECUTIVE SUMMARY	1
Overview	2
Eastern Washington Truck Movements	2
Western Washington Truck Movements	3
Out of State Origin Movements.....	4
Truck Movements on Major Freight Corridors.....	4
Cargo Weight, Trailer Type and Axle Count of Freight Trucks	5
OVERVIEW	7
SECTION 1: METHODOLOGY.....	8
Data Collection Methods and Issues	8
Data Management, Analysis and Modeling Procedures	9
Data Management	9
Data Analysis and Modeling	11
SECTION 2: FREIGHT TRUCK MOVEMENTS ON WASHINGTON HIGHWAYS	13
Overview	13
Characteristic Profile of Truck Trips Originating in Eastern Washington.....	17
Cargo Value and Tonnage of Freight Shipped from Eastern Washington	22
TYPE OF FACILITY AT PLACE OF ORIGIN AND DESTINATION	23
ANALYSIS OF ORIGINS AND DESTINATIONS IN EASTERN WASHINGTON	
SUBREGIONS	26
Major Highway Corridors in Eastern Washington	26
Subregion 1: Truck Trips Originating in Okanogan, Chelan and Douglas Counties ..	26
Subregion 2: Truck Trips Originating in Ferry, Stevens and Pend Oreille Counties...	29
Subregion 3: Truck Trips Originating in Spokane and Lincoln Counties	31
Subregion 4: Truck Trips Originating in Asotin, Columbia, Garfield, Walla Walla and Whitman Counties	33
Subregion 5: Truck Trips Originating in Grant, Adams, Franklin and Benton Counties	35

Subregion 6: Truck Trips Originating in Kittitas, Yakima and Klickitat Counties	38
Characteristic Profile of Truck Trips Originating in Western Washington.....	40
Type of Facility at Place of Origin and Destination	45
Analysis of Origins and Destinations in Western Washington Subregions	47
Subregion 7: Truck Trips Originating in Pierce, Thurston, Lewis, Cowlitz, Clark and Skamania Counties.....	48
Subregion 8: Truck Trips Originating in Clallam, Jefferson, Mason, Grays Harbor, Pacific and Wahkiakum Counties	51
Subregion 9: Truck Trips Originating in Whatcom, Skagit, Island, Snohomish, King and Kitsap Counties.....	53
Characteristic Profile of Truck Trips Originating Outside of Washington	55
Most Frequent Origins	55
Most Frequent Destinations	57
Cargo Value and Tonnage of Freight Shipped from Origins Outside Washington State	61
Type of Facility at Place of Origin and Destination	66
Comparative Analysis of Cargo Content on Washington State Highways	69
Interstate 5.....	69
Interstate 82.....	70
Interstate 90.....	70
US 97.....	70
US 395 North of Spokane.....	70
Mean Cargo Tonnage by Commodity	72
Analysis and Implications of Multiple Trailer Configurations on Key Freight Corridors in Washington State.....	74
 SECTION 4: IMPLICATIONS OF FUTURE GROWTH IN FREIGHT VOLUMES AND THE EFFICIENT MOVEMENT OF FREIGHT CARGO IN WASHINGTON STATE.....	 79
Implications of Future Growth	79
 SUMMARY AND CONCLUSIONS.....	 81
 APPENDICES	 83
Appendix A: Origin and Destination Survey Questionnaire	84
Appendix B: Survey Locations	86
Site Location Information	87
Appendix C: Data Sources	89

List of Tables

Table 1.1: Potential Applications for Freight Truck Origin and Destination Data	12
Table 2.1: Region of Origin, Tonnage and Economic Value of Cargo Transported Each Year on Washington Highways.....	13
Table 2.2: Region of Trip Destination for Major Origin Regions	16
Table 2.3: Most Frequent Eastern Washington Origins for Truck Trips on State Highways	18
Table 2.4: Cities Reported Most Frequently as Destinations for Truck Trips Originating in Eastern Washington.....	19
Table 2.5: Most Frequent Out-of-State Destinations for Truck Trips Originating in Eastern Washington	20
Table 2.6: Commodity Content for Truck Trips Originating in Eastern Washington	21
Table 2.7: Comparison of Average Volume and Value of Cargo Shipped from Eastern Washington Counties.....	23
Table 2.8: Type of Facility at Place of Origin for Truck Trips Originating in Eastern Washington.....	24
Table 2.9: Type of Facility at Place of Destination for Truck Trips Originating in Eastern Washington.....	24
Table 2.10: Major Highway Corridors Defining Traffic Flows Within Eastern Washington Subregions	27
Table 2.11: Most Frequent City Origins for Truck Trips Originating in Okanogan Chelan and Douglas Counties	27
Table 2.12: Most Frequent Destinations for Truck Trips Originating in Okanogan, Chelan and Douglas Counties	28
Table 2.13: Most Frequent City Origins for Truck Trips Originating in Ferry, Stevens and Pend Oreille Counties.....	29
Table 2.14: Most Frequent Destinations for Truck Trips Originating in Ferry, Stevens and Pend Oreille Counties.....	30
Table 2.15: Most Frequent City Origins for Truck Trips Originating in Spokane and Lincoln Counties	31
Table 2.16: Most Frequent Destinations for Truck Trips Originating in Spokane and Lincoln Counties	32
Table 2.17: Most Frequent City Origins for Truck Trips Originating in Asotin, Columbia, Garfield, Walla Walla and Whitman Counties	34
Table 2.18: Most Frequent Destinations for Truck Trips Originating in Asotin, Columbia, Garfield, Walla Walla and Whitman Counties	35
Table 2.19: Most Frequent City Origins for Truck Trips Originating in Grant, Adams, Franklin and Benton Counties	36
Table 2.20: Most Frequent Destinations for Truck Trips Originating in Grant, Adams, Franklin and Benton Counties	37
Table 2.21: Most Frequent City Origins for Truck Trips Originating in Kittitas, Yakima and Klickitat Counties	39
Table 2.22: Most Frequent Destinations for Truck Trips Originating in Kittitas, Yakima and Klickitat Counties	39
Table 2.23: Most Frequent Western Washington Origins of Trucks Traveling on State Highways	42

Table 2.24: Most Frequent City Destinations for Truck Trips Originating in Western Washington.....	42
Table 2.25: Most Frequent Out-of-State Destinations for Truck Trips Originating in Western Washington	43
Table 2.26: Commodity Content for Truck Trips Originating in Western Washington ...	44
Table 2.27: Comparison of Average Volume and Value of Cargo Shipped from Western Washington Counties.....	45
Table 2.28: Type of Facility at Place of Origin for Truck Trips Originating in Western Washington.....	46
Table 2.29: Type of Facility at Place of Destination for Truck Trips Originating in Western Washington	46
Table 2.30: Origins for Truck Trips Originating in Pierce, Thurston, Lewis, Cowlitz, Clark and Skamania Counties.....	49
Table 2.31: Most Frequent Destinations for Truck Trips Originating in Pierce, Thurston, Lewis, Cowlitz, Clark and Skamania Counties.....	50
Table 2.32: Most Frequent City Origins for Truck Trips Originating in Clallam, Jefferson, Mason, Grays Harbor, Pacific and Wahkiakum Counties	52
Table 2.33: Most Frequent Destinations for Truck Trips Originating in Clallam, Jefferson, Mason, Grays Harbor, Pacific and Wahkiakum Counties	52
Table 2.34: Most Frequent City Origins for Truck Trips Originating in Whatcom, Skagit, Island, Snohomish, King and Kitsap Counties	54
Table 2.35: Most Frequent Destinations for Truck Trips Originating in Whatcom, Skagit, Island, Snohomish, King and Kitsap Counties	54
Table 2.36: Major Out-of-State Trip Origins for Trucks Traveling on Washington Highways	56
Table 2.37: Major City Origins for Truck Trips Originating Outside Washington	56
Table 2.38: Washington Cities Reported Most Frequently as Destinations for Truck Trips Originating Out-of-State.....	59
Table 2.39: Most Frequent Out-of-State Destinations Reported for Truck Trips Passing Through Washington from Other States or Provinces	60
Table 2.40: Cargo Content for Truck Trips Originating Out-of-State with Eastern Washington Destinations	63
Table 2.41: Cargo Content for Truck Trips Originating Out-of-State with Western Washington Destinations	64
Table 2.42: Cargo Content for Trucks Passing Through Washington En Route to Other States or Provinces.....	65
Table 2.43: Type of Facility at Place of Origin for Truck Trips Originating Outside of Washington.....	66
Table 2.44: Type of Facility at Place of Destination for Truck Trips Originating Outside of Washington.....	67
Table 2.45: States and Provinces with the Most Frequent Connections to Washington Intermodal Facilities.....	67
Table 3.1: Commodity Mix on Major Washington Freight Corridors by Percentage	71
Table 3.2: Comparison of Mean Cargo Tonnage per Truck for Selected Commodities	73
Table 3.3: Multiple Trailer Vehicle Percentage by Selected Commodities	75
Table 3.4: Percentage of Vehicles with 5 or More Axles for Selected Commodities	76

List of Figures

Figure 1.1: Origin and Destination Survey Sites.....	8
Figure 1.2: Framework for Data Management, Analysis and Modeling	10
Figure 2.1: Regional Classification of Washington Counties	14
Figure 2.2: Comparison of Average Daily Truck Trips Originating in Eastern Washington Counties	17
Figure 2.3: Overview of In-State Destinations by County for Truck Trips Originating in Eastern Washington	19
Figure 2.4: Key Intermodal Locations for Truck Trips Originating in Eastern Washington	25
Figure 2.5: Eastern Washington County Groups	26
Figure 2.6: Major Routes for Truck Trips Originating in Okanogan, Chelan and Douglas Counties	28
Figure 2.7: Major Routes for Truck Trips Originating in Ferry, Stevens and Pend Oreille Counties	31
Figure 2.8: Major Routes for Truck Trips Originating in Spokand and Lincoln Counties	33
Figure 2.9: Major Routes for Truck Trips Originating in Whitman, Garfield, Asotin, Columbia and Walla Walla Counties.....	34
Figure 2.10: Major Routes for Truck Trips Originating in Grant, Adams, Franklin and Benton Counties	38
Figure 2.11: Major Routes for Truck Trips Originating in Kittitas, Klickitat and Yakima Counties	40
Figure 2.12: Comparison of Average Daily Truck Trips Originating in Western Washington Counties.....	41
Figure 2.13: Overview of In-State Destinations by County for Truck Trips Originating in Western Washington	43
Figure 2.14: Key Intermodal Locations for Truck Trips Originating in Western Washington.....	47
Figure 2.15: Western Washington County Groups	48
Figure 2.16: Major Routes for Truck Trips Originating in Pierce, Thurston, Lewis, Cowlitz, Clark and Skamania Counties.....	51
Figure 2.17: Major Routes for Truck Trips Originating in Clallam, Jefferson, Mason, Grays Harbor, Pacific and Wahkiakum Counties.....	53
Figure 2.18: Major Routes for Truck Trips Originating in Whatcom, Skagit, Island, San Juan, Snohomish, King and Kitsap Counties.....	55
Figure 2.19: Primary Entry Points for Trucks Crossing into Washington State.....	57
Figure 2.20: Overview of Destinations Within Washington State for Truck Trips Originating Outside of the State.....	60
Figure 2.21: Major Freight Corridors for Trucks Passing Through Washington State to Destinations Outside the State	61
Figure 2.22: Key Intermodal Connections for Truck Trips Originating Outside Washington State	67
Figure 3.1: Key Highway Freight Corridors in Washington State	69

List of Charts

Chart 2.1: Proportion of Total Trucks with Cargo for Major Regions of Origin.....	15
Chart 2.2: Comparison of Average Cargo Tonnage for Major Regions of Origin	15
Chart 2.3: Comparison of Average Value per Ton for Major Regions of Origin.....	16
Chart 2.4: Regional Destinations of Trucks from Out-of-State on Washington Highways	58
Chart 3.1: Mean Cargo Weight of Vehicles on Major Washington Freight Corridors.....	74
Chart 3.2: Multiple Trailer Truck Configurations by Major Highway.....	77
Chart 3.3: Percent of Vehicles with More than 5 Axles on Major Highways	78
Chart 4.1: Comparison of Forecast Annual Growth in Freight Truck Trips	80
Chart 4.2: Comparison of Forecast Annual Growth in Total Freight Tonnage.....	80

Executive Summary

This report presents the findings of an extensive yearlong survey assessment of freight truck movements on highways in the state of Washington. This study follows up on the Eastern Washington Intermodal Transportation Study (EWITS) completed in 1993-1994 and is analogous in scope to EWITS Research Report Number 9 (Nov. 1995). The SFTA study involved almost one hundred individuals who conducted personal interviews with truck drivers at 28 separate survey locations around the state. This state-wide origin and destination survey obtained approximately 24,000 observations, providing the state of Washington and SFTA project researchers an updated, extensive database with which to examine statewide freight movements.

The value of goods being transported on Washington highways was almost \$550 billion (in 1997 dollars) in 2002-2003. Approximately 15.2 million truck trips are made each year, carrying 375 million tons of cargo. In addition, there are 6.4 million empty or backhaul trucks/trailers on state highways each year. Interviews with truck drivers conducted at survey sites reported origins or destinations in over 400 Washington communities. The economic prosperity of these communities and the region is critically dependent upon the efficient movement of freight goods over Washington highways.

The survey data collected are indicative of the integration of the Washington highway system into the regional, national and international roadway networks. Approximately one-third of all trucks moving on Washington highways originated outside of the state. For truck trips originating in Eastern Washington, 39 percent had destinations outside of Washington, and 35 percent of truck trips originating in Western Washington were made to destinations out of state. Freight movements to and from Canada were particularly dependent on the I-5, US 395 and US 97 corridors. Over 4,000 trucks enter Washington from Canada each day, while over 4,800 trucks move north across the border on a daily basis.

Efficient freight movement in Washington is also highly dependent on trade and growth of the state's marine and inland port systems, as well as rail facilities within the state. Over 2,200 truck trips originating within Washington are destined for port facilities, primarily the Port of Seattle and the Port of Tacoma. An additional 650 trucks originating out of state have destinations at Washington ports. Approximately 750 trucks per day have destinations at rail/intermodal terminals in Washington.

The results of this study also point out the varying transportation needs and dependencies of the different regions and sub-regions of Washington. Freight traffic originating in Eastern Washington is primarily commodity based, with grains, lumber and wood, fruits and vegetables, wine and livestock dominating the cargo mix. Many Western Washington freight trip origins are also for commodities, with logs, lumber and paper being some of the most common generators of truck trips within the region. Significantly more trips originating in Western Washington carry manufactured, finished and consumer goods.

Overview

An estimated 21.6 million truck trips occur on state highways in Washington each year, with the value of cargo carried being approximately \$550 billion (1997 dollars). Approximately 11.6 million trips originate in Western Washington, with 2.9 million originating in Eastern Washington and 7.1 million coming from out of state. Almost 70 percent of all truck trips originating in Eastern Washington were loaded, while approximately 65 percent of trips from Western Washington carried cargo. Out of state trip origins had the highest percentage of loaded trucks at almost 80 percent. Average cargo weight per truck was highest in Eastern Washington at just over 20 tons. Cargo weights were lowest in Western Washington with an average of approximately 16.5 tons, while trucks originating out of state carried an average 17.5 tons. Significant differences were found in the estimated cargo values of shipments being carried. Shipments originating in Eastern Washington had the lowest value per ton at approximately \$1,900, with Western Washington shipments and those from out of state having approximate values of \$3,200 and \$3,500 respectively. The disparities in average cargo weight and in value per ton are noted by the observation that truck trips originating in Eastern Washington are more likely to be carrying agricultural and forest products than trips originating in Western Washington or out of state. Shipments originating in Western Washington and out of state are more likely to carry intermediate and finished manufactured goods and consumer products. These items are often lighter and of higher value per ton than the agricultural and forest products which are common trip generators in Eastern Washington.

Disparities are also noted in the different destinations for shipments originating out of state and within Eastern or Western Washington. Truck trips originating in Eastern Washington are divided almost equally between Eastern Washington and Western Washington destinations, with most shipments (39 percent) destined to deliver out of state. Western Washington is in marked contrast to Eastern Washington, with over half of all shipments originating in Western Washington terminating within the region. Only 12 percent of Western Washington shipments have a destination in Eastern Washington, with the remainder shipping out of state. Forty percent of all trucks coming from outside Washington deliver in Western Washington, while almost one-third are passing through Washington with destinations to other states or provinces.

Eastern Washington Truck Movements

Businesses and industries in Spokane, Yakima and Wenatchee account for the largest number of freight truck origins in Eastern Washington, with almost 38 percent of all trips originating in these three communities. On average, over 3,500 trucks depart from these locations on a daily basis. Spokane County alone generates over 20 percent of all truck trips coming from the region. Twenty communities account for more than three-quarters of all freight truck trips originating in Eastern Washington. While Spokane is the major Eastern regional consumption market and industrial production center, cities such as Yakima, Wenatchee, Pasco and Moses Lake are important regional centers for agricultural production, processing and distribution.

Western Washington cities are frequent destinations for truck trips originating in the Eastern region. Almost 1,200 trucks leave Eastern Washington each day for destinations in Seattle and Tacoma. Kent and Vancouver are also frequent destinations for East region shipments. Spokane is the second most frequent destination after Seattle, with almost 570 shipments per day. About one-third of all truck trips originating in Eastern Washington are destined to terminate out of state. Of these, the most frequent state of destination is Oregon with over 1,400 per day. Other major out of state destinations are California, British Columbia and Idaho.

Agricultural and forest products are the largest generators of truck trips in Eastern Washington. Commodity classifications for agricultural products, prepared foodstuffs, feed and fertilizers account for 56 percent of all cargo tons originating in the region. Forest products such as lumber, pulp and newsprint and paperboard account for an additional 17 percent. These same commodities account for 34 percent and 4.5 percent of the total value of cargo, respectively. Goods with the highest value that shipped from Eastern Washington were machinery, mixed freight, motorized vehicles and parts and electron and office equipment. These goods represent approximately 9 percent of the total cargo tonnage generated in Eastern Washington, but almost 38 percent of the total value of cargo shipped. These results point out the inverse relationship between commodity weight and price: the commodities that generate the largest average tonnage per truck trip are also the commodities with the lowest value per ton.

Western Washington Truck Movements

The Puget Sound area is the largest generator of truck trips in Western Washington and in the state. Ports, industries and businesses in the area create over 75 percent of trips originating in Western Washington. Seattle generates over 6,000 truck trips each day, while Tacoma contributes an additional 5,700. Other large trip generating cities are Kent, Everett, Auburn, Bellingham and Olympia. Together the above cities generate over 53 percent of all truck trips originating in Western Washington. Major generating cities outside of the Puget Sound area are Vancouver, Aberdeen and Chehalis, which together account for approximately 4.5 percent of all trips originating in the Western region.

Over half of all truck trips originating in Western Washington are destined to terminate at cities within the region, with Tacoma and Seattle the most frequently cited locations. Portland, Oregon is the third most popular destination after Tacoma and Seattle, with over 2,300 trips estimated per day. Eastern Washington is the least cited destination for trips originating in Western Washington with only 12 percent of the total generated truck trips. Spokane is the primary city receiving such shipments at an average of almost 480 trucks per day. An estimated 31 percent of all trips originating in the West terminate outside the state. Oregon receives over 5,000 trucks per day, with British Columbia and California receiving over 1,900 and 1,700 respectively.

The cargo content of shipments originating in Western Washington is more varied than those from Eastern Washington reflecting the more diversified economy in the Western region. While wood and lumber products represent the major portion of cargo tonnage at approximately two-thirds of the average total tonnage, significant tonnage of mixed freight (consumer goods) and industrial goods are also shipped on a daily basis from locations in Western Washington. By value, the most important items shipping from Western Washington origins are high-value products such as electronics, finished manufactured goods and equipment. Electronic and office equipment accounts for almost 50 percent of the total cargo value in transit from Western regional locations.

Out of State Origin Movements

An estimated 22,700 trucks originating outside of the state travel on Washington highways every day. Of these, 35 percent of the truck trips have reported origins in Oregon. Trucks originating in British Columbia and California represent 16 and 15 percent of the total out of state origins, respectively. Portland, Oregon is the primary generator of out of state truck trips with over 3,250 trucks entering Washington per day. Vancouver, British Columbia is the next largest out of state origin, averaging over 750 trucks per day moving south across the border. Other British Columbia cities in the Vancouver area such as Surrey, Delta and Richmond also generate significant numbers of southbound freight-truck traffic. Hermiston, Oregon also generates a large number of trucks on a daily basis, mostly moving into Eastern Washington. Just over 50 percent of all truck trips originating outside the state are destined to terminate in Western Washington, with Seattle, Tacoma and Kent the most frequent destinations. Spokane is the most frequent destination for trips terminating in Eastern Washington, followed by Yakima and Pasco. Over 7,400 trucks that have origins outside Washington are passing through to other states or Canadian provinces. Portland, Oregon is the most frequent individual destination for such trips with over 800 trucks moving towards the city through Washington each day. The Vancouver region, encompassing Vancouver, Surrey, Delta and other cities, is the largest area destination for out of state truck trips with over 1,900 trucks crossing the border to the north on a daily basis.

Freight trips originating out of state represent the largest share of total cargo value moving on Washington state highways at an estimated \$264 billion per year. Out of state trucks also account for the majority of the total cargo tonnage, with over 210 million tons shipped each year on Washington roadways. Agricultural and food products, forest products and mineral products are the primary commodity cargo content on these shipments. Gasoline and refined aviation fuel is another significant commodity with out of state origins, reflecting movements from Canadian refineries to demand markets in Washington.

Truck Movements on Major Freight Corridors

A primary goal of this origin and destination survey is to provide data for the analysis of freight movements on the state highway transportation network. Analyses of the various freight corridors, their freight traffic volumes, the direction of the freight flows

and the locations of traffic generators or terminal points are critical in determining current and future transport needs in Washington. An important component of these analyses is the commodity cargo content of the trucks on Washington highways. For example, trucks carrying agricultural or forest products are, on average, the most heavily laden transport vehicles on the road, which will have a greater impact on roadways in Eastern Washington and the Olympic Peninsula than in the Puget Sound region. Commodities have been grouped into 41 classifications conforming to the SCTG code for a shipment as identified in the site interviews. This study examines commodity movements along five major transport corridors in Washington: summary results are noted below.

Trucks carrying loads of mixed freight, usually consumer goods, are the most common on Washington highways, comprising over 8 percent of total statewide truck trips. This level is consistent across all of the major corridors, except US 97, reflecting the smaller and more dispersed population in the region served by this highway. Agricultural products such as grains, livestock, animal feeds, fertilizers, prepared and milled foods and other goods make up almost 15 percent of the truck trips in the state, followed by forest products and paper which contributes over 11 percent of the total truck volume.

Results for the I-5, I-82, I-90 and US 395 corridors are remarkably consistent, with only a few commodity classes significantly different for one or more of the highways. For example, US 395 has 6.7 percent of trucks on the road carrying prepared foodstuffs, while I-5 has less than 3.5 percent and I-82 and I-90 have approximately 5 percent each. Another exception category is wood products with most corridors at 6 to 7 percent of total truck trips, and I-82 with just over 4 percent. This can be explained by I-82 serving the Yakima valley and lower Columbia Basin region, which is primarily an unforested, agricultural production region.

While the other highway corridors are consistent in the commodity mix of trucks on the road, US 97 exhibits the greatest variation and concentration in cargo content. Over 25 percent of truck trips moving on US 97 are carrying agricultural products, while the statewide average is 15 percent. Shipments of lumber and wood products are also higher than on other state highways. US 97 also has significantly lower numbers of trucks carrying finished industrial products, machinery and mixed freight.

Cargo Weight, Trailer Type and Axle Count of Freight Trucks

Assessment of the cargo tonnage moving on state highways is crucial in determining the locations of likely infrastructure maintenance and the need for improvements to the existing infrastructure network. Cargo weight is closely correlated with cargo content; agricultural products, fertilizers, forestry products and minerals are some of the heaviest commodities transported on Washington highways. Each of these products has a mean tonnage per truck in excess of 20 tons. The freight corridors also have varying average cargo tonnage, with trucks traveling on US 97 having the greatest average weight at 22 tons per vehicle and I-5 and I-82 having the lowest average weights at 20 tons per vehicle, respectively.

Other determinants of road use and wear can be derived from analysis of commodities being carried in multiple trailer trucks and by larger tractor-trailer rigs. Over one-in-five of the truck trips carrying cereal grains, fertilizers, wood products, stone and coal or petroleum products have truck trips utilizing multiple trailers. These commodities are also more likely to be carried by tractors and trailers with 5 or more axles. As an example, over 98 percent of trips carrying cereal grains are carried in vehicles with 5 or more axles and almost 97 percent of trucks carrying logs and lumber are likewise configured.

Overview

The Strategic Freight Transportation Analysis study (SFTA) follows and builds upon an earlier freight transportation research project known as the Eastern Washington Intermodal Transportation Study (EWITS) that produced a variety of freight related research reports, working papers and databases to facilitate regional and statewide transportation planning efforts. The present study presents the results of an extensive origin and destination survey of truck drivers carrying freight on highways in Washington. Over 24,000 interviews were conducted in 2002 and 2003 providing a comprehensive overview of freight movements in the state. The specific methods and procedures utilized in conducting the driver survey are described in SFTA Report Number 2, *“Freight Truck Origin and Destination Study: Methods, Procedures and Data Dictionary.”* A brief summary of the methods and procedures is provided in Section 1 of this report.

Section 2 details the major truck movements in Washington by geographic region of trip origin, with analysis of the various sub-regions comprising the primary regions (Eastern Washington, Western Washington and Out of State). Section 3 provides an analysis of the major Washington freight corridors and the freight vehicles carrying cargo. This section also extends the analysis to include implications for current and future transportation infrastructure and future commodity flows on Washington roadways. A final section summarizes the survey results and gives an assessment of the overall system efficiency of freight flows within and through the state.

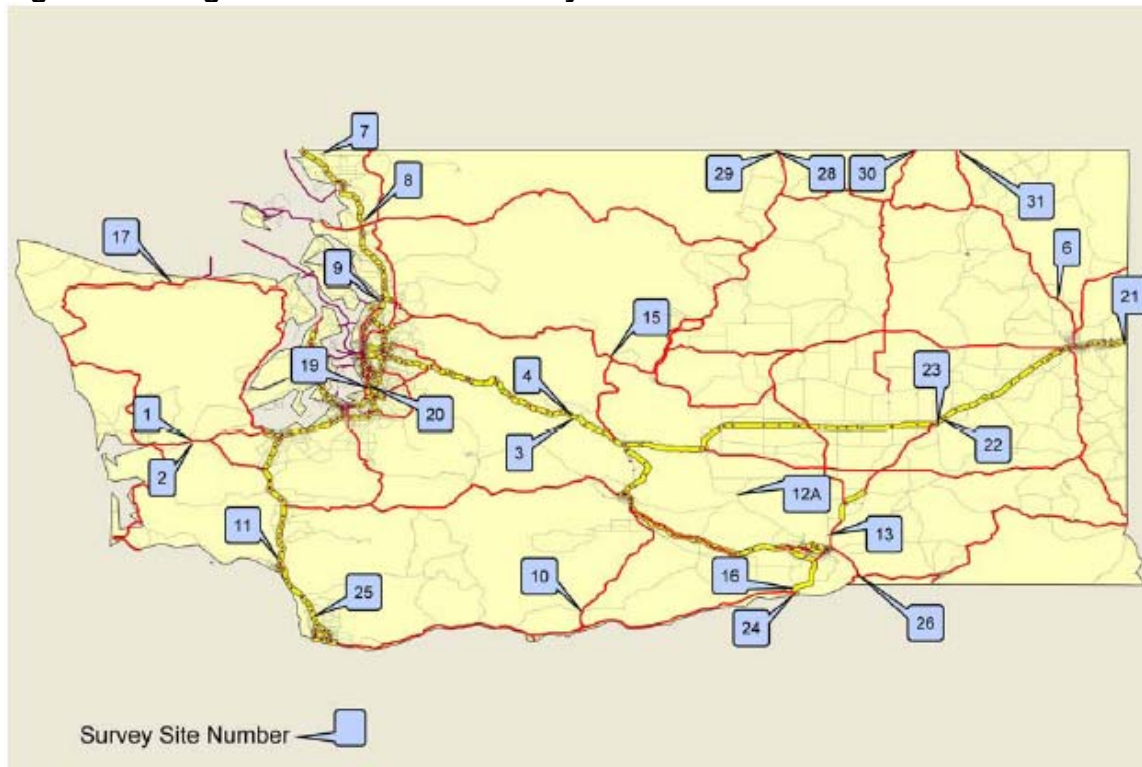
Section 1: Methodology

Data Collection Methods and Issues

The SFTA origin and destination survey was designed to provide a statistically reliable and comprehensive database of freight truck movements on highways in the state of Washington. A varied set of truck trip and shipment characteristics were determined and incorporated into the survey. Examples of such information include the carrier, truck type, unloaded truck weight, payload weight, commodity type, and the origin and destination facility type(s). Detailed information on the highways and routes used by the drivers was also collected as an aid in identifying the major and minor freight corridors in and through Washington.

Twenty-seven interview sites at permanent weigh stations and ports of entry were utilized to implement the driver survey. Of the sites selected, twenty-six matched the survey locations used in the 1993-1994 EWITS study. This matching was done in order to facilitate the consistent comparison and analysis of data in both surveys. Please see Appendix A for a list of the survey sites and locations.

Figure 1.1: Origin and Destination Survey Sites



Data was collected during a four-week period in each season (Spring (April 2002), Summer (July 2002), Fall (October 2002), Winter (January 2003)). This was done in order to allow seasonal traffic flow comparisons to be made. Data collection was made on a Wednesday of each week in order eliminate unusual flow patterns associated with

the beginning and end of the week. Wherever possible, data collection at each site was obtained over a 24-hour period to gain a comprehensive freight movement profile for each location.

Approximately 24,000 driver interviews were collected (roughly 6,000 per season) to complete the origin and destination survey. Additionally, estimates of the number and direction of non-sampled trucks were made during the interview periods. These counts were then used to construct weighted estimates of total truck volumes at each location by season. The results presented in this study are derived from these weighted truck trip estimates.

The driver interviews were conducted by a team of Washington State University personnel assisted by members of local Lions and Kiwanis clubs throughout the state. Survey locations were usually staffed by 4 to 5 individuals, resulting in an average of 90 personnel conducting driver interviews each survey day. Driver participation in the survey was high, with locations reporting 95 to 100 percent response rates. A copy of the survey questionnaire is included as Appendix B of this report.

Data Management, Analysis and Modeling Procedures

The overall framework for data management, analysis and modeling of the SFTA origin and destination data is described in Figure 1.2. This section briefly highlights key procedures used within this data framework. More detailed information can be found in Strategic Freight Transportation Analysis Report Number 2, *“Freight Truck Origin and Destination Study: Methods, Procedures and Data Dictionary.”*

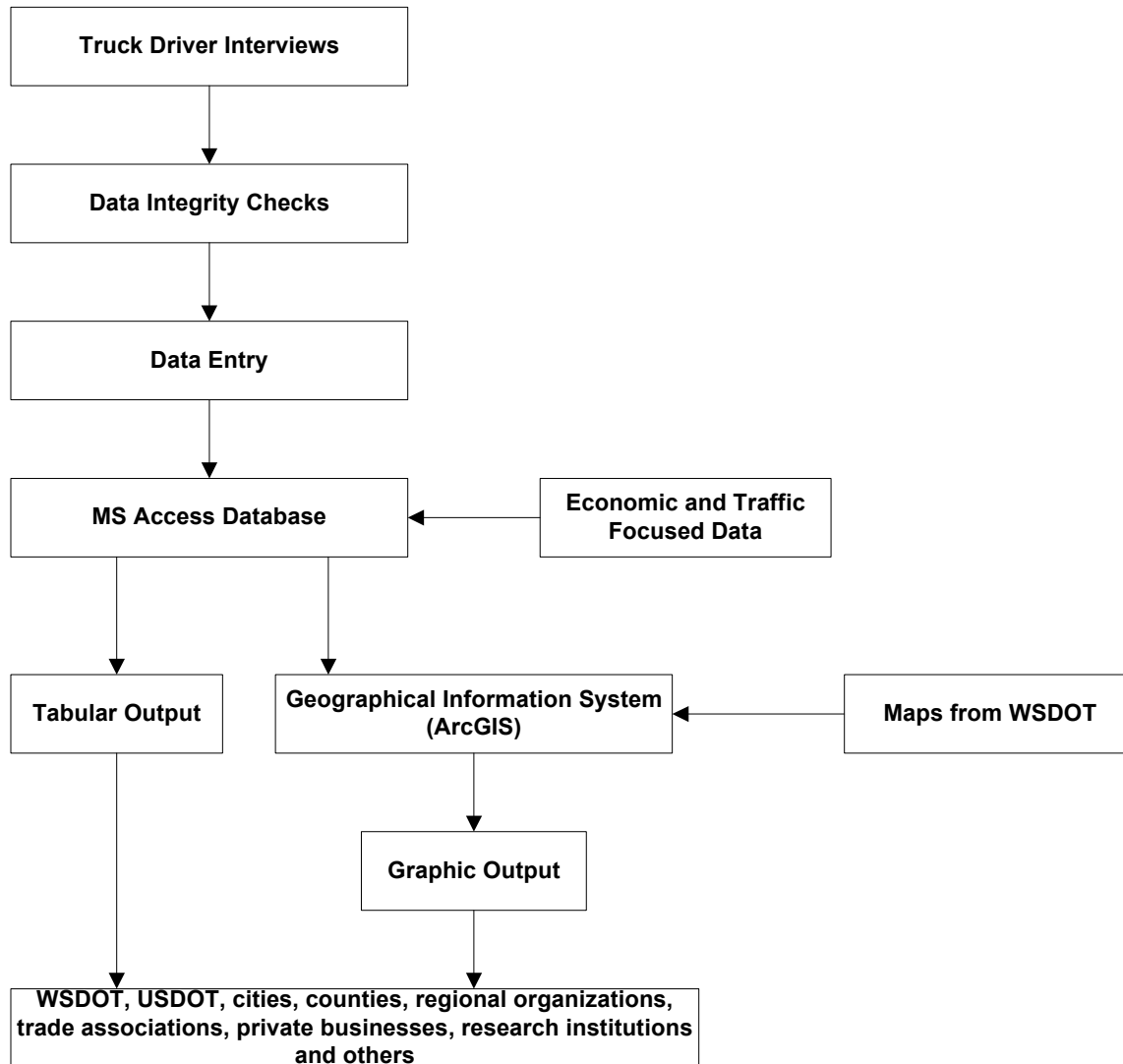
Data Management

It is important to maintain effective management of data during collection, entry into a database and during all subsequent analyses. Following and implementing appropriate management techniques helps ensure that the compiled database accurately reflect the statewide freight movements in Washington.

There are three possible sources of error that can be attributed to on-site data collection issues. Systemic problems arise from poorly worded questions, incorrect interview procedures and/or problems stemming from sub-optimal site selection. Data problems may come from drivers who provide inaccurate information in response to the survey questions. Finally, interview personnel may fill out the survey incorrectly, providing inaccurate data regarding vehicle information or driver responses.

Errors stemming from improper data collection technique were minimized through a constant monitoring of the survey and data entry personnel. On-site monitoring allowed specific problems to be immediately addressed with the interviewer. Problems identified during data entry were addressed during the following survey season.

Figure 1.2: Framework for Data Management, Analysis and Modeling



Source: SFTA Freight Truck Origin and Destination Study

Data entry personnel performed accuracy checks on each questionnaire as it was entered into the database. They checked individual answers for consistency and being logical. Each highlighted route was verified that it corresponded to the origin and destination points provided within the survey. Origin and destination points were checked to make sure that the origin was before the weigh station and the destination was beyond the weigh station. Some drivers on round trip routes would incorrectly provide information about a trip segment that may have occurred earlier in the day and was not actually their current trip segment. Once it was determined that the answers on a survey were logically consistent, the questionnaire would then be entered.

This data review process included several decision rules that were followed to assist data entry persons with making uniform and consistent decisions. For example, for those questionnaires where the sum of the empty and payload weight was significantly

greater than the Washington State legal limit of 105,500 pounds, it was assumed the recorded payload weight was actually the gross weight of the vehicle. Data entry persons revised the answers to reflect the correct information. The revised payload weight was calculated as gross weight minus empty weight.

Data Analysis and Modeling

The data collected in the origin and destination survey has a wide variety of applications and potential users. An overview of these applications and users is listed below in Table 1.1.

The data obtained in the driver interviews was entered into a MS Access database in table format. Additional information from various sources was systematically added to the database in order to provide greater depth of analysis. For example, traffic counts from the WSDOT Traffic Data Office were used to verify and correct the sample weights obtained during the survey period. Also, Geographical Information Systems (GIS) data for place names, cities and other locations was obtained from the WSDOT GeoData Distribution website (<http://www.wsdot.wa.gov/mapsdata/geodatacatalog/default.htm>). The survey data was geo-coded using the ArcInfo program from ESRI.

The use of the MS Access platform also allows for the incorporation of database information from such sources as the US Census Bureau, the USDOT Bureau of Transportation Statistics and other federal, state and local transportation databases. Linkage of these various databases was and is accomplished by the use of the Standard Classification of Transported Goods (SCTG) code. This code was identified using information obtained during the driver interview about the primary commodity content of the cargo being transported. This information is critical to identifying commodity flows and volumes moving on state highways.

Geo-coding of the data allows for the spatial analysis of transportation movements throughout the state. The origin and destinations survey data may then be related to other database information using common geographical properties such as origin and destination cities or highways. This allows the survey data to be linked to other information such as population, zoning, political units or other socio-economic features. The maps used in this report rely upon these relationships and were made using ArcInfo/ArcMap software tools.

Table 1.1: Potential Applications for Freight Truck Origin and Destination Data

Corridor Planning

- Identify highway corridors most critical to key industries
- Pinpoint major freight truck generators for specific corridors
- Document routes most widely utilized for national and international trade
- Provide base data to project freight truck traffic growth and decline for specific corridors
- Provide base data to estimate the economic value of specific commodities shipped on specific corridors
- MPO model validation
- Weigh-station siting

Intermodal Systems Planning

- Delineate essential highway linked to rail, air, deep water and river ports
- Evaluate intermodal systems most critical to key industries and international competitiveness
- Geographic proximity of intermodal facilities relative to origins and destinations of trucks utilizing those facilities
- Provide base data to project changes in highway usage that would result from rail-line abandonment or closing of key river ports

Pavement Management

- Document highway segments with the highest average freight cargo volumes and weights
- Provide base data to project future changes in freight cargo volumes and weights on specific highway segments

Congestion Management and Safety

- Document origins, destinations and routes used by freight trucks traveling through congested urban areas
- Provide base data to evaluate opportunities to reduce freight truck traffic through urban areas during peak commute periods

Survey and Study Development and Methodology

- Provide methodological support for other O-D studies
- Define data needs for questionnaire design in other freight studies
- Development of freight data collection techniques

Source: SFTA Freight Truck Origin and Destination Study

Section 2: Freight Truck Movements on Washington Highways

Overview

The efficient movement of goods within and through Washington is vital to the continued economic vitality of the state and the region. It is estimated that 21.6 million long-haul¹ truck trips move on state highways each year (see Table 2.1 below) carrying approximately \$549 billion worth of cargo. With trade being central to economic growth and labor income in the state², the operation and maintenance of the transportation infrastructure in the state is of critical importance.

Table 2.1: Region of Origin, Tonnage and Economic Value of Cargo Transported Each Year on Washington Highways³

Region of Trip Origin	Number of Empty Trucks	Number of Trucks with Cargo	Total Cargo Weight (Million Tons)	Total Cargo Value (Million Dollars)
Eastern WA	918,822	1,996,489	40.6	50,004
Western WA	4,116,279	7,502,108	123.6	234,850
Out of State	1,403,889	5,687,852	210.4	264,081
All Trucks	6,438,990	15,186,449	374.6	548,935

Source: SFTA Freight Truck Origin and Destination Study

Almost 375 million tons of cargo is transported on freight trucks in the state of Washington each year. Most of the cargo weight is attributed to trucks traveling from out of state origins. Approximately 80 percent of out of state freight vehicles are carrying cargo, while 65 to 70 percent of trucks originating in state have loads. (Chart 2.1) This is due to the fact that empty backhauls are not economical over the longer distances typical of interstate or international freight hauls.

Cargo tonnage is the largest for shipments originating in Eastern Washington, averaging slightly over 20 tons per truck (Chart 2.2). However, the value of the cargo shipping from locations in the Eastern region was the lowest, averaging less than \$2,000 per ton (Chart 2.3). Shipments from Western Washington had the lowest average tonnage, at approximately 16 tons per truckload, but an average cargo value of over \$3,000 per ton hauled. Trucks coming from origins out of state had the second highest average cargo weights at approximately 18 tons per truck trip and the highest average cargo value at \$3,500 per ton. This reflects the relation between cargo value and modal choice over long distances.

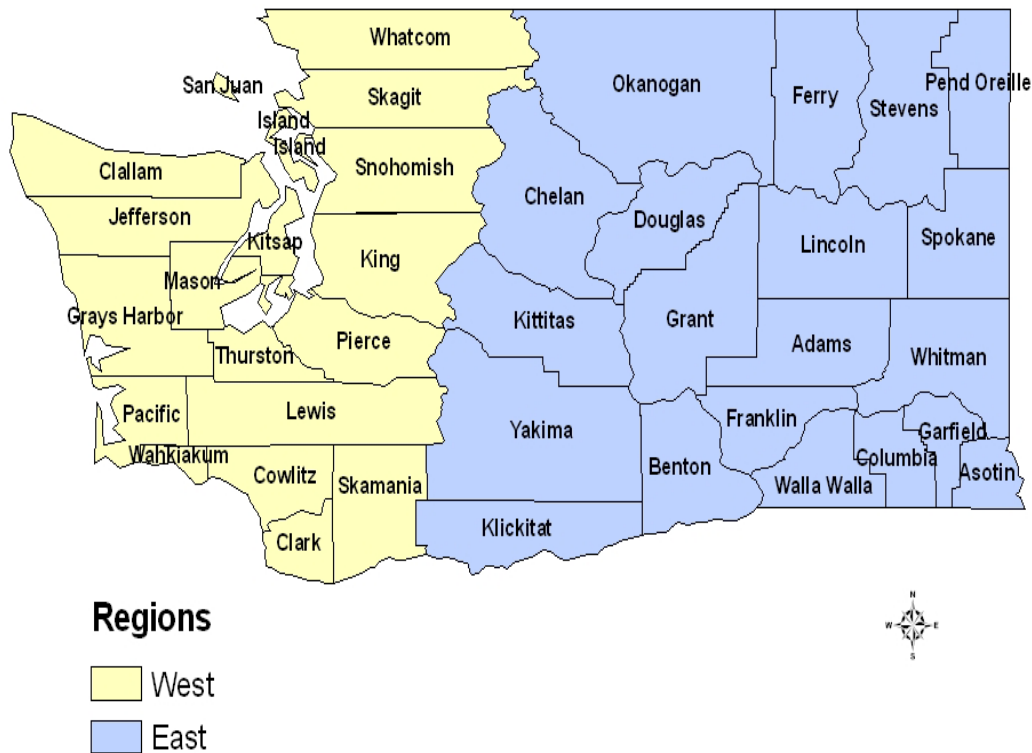
¹ The SFTA origin and destination survey concentrated primarily on long-haul freight traffic movements on the state transportation network. Trucks that were using only municipal or county roadways or only making local deliveries are not considered in the data analysis.

² Conway, Jr., Richard S. "Foreign Exports and the Washington State Economy." Washington, 1997, p.x.

³ The survey data captured daily freight movements and most information will be presented as daily volumes. Annual volumes were calculated using weighted daily averages and multiplying by 312.

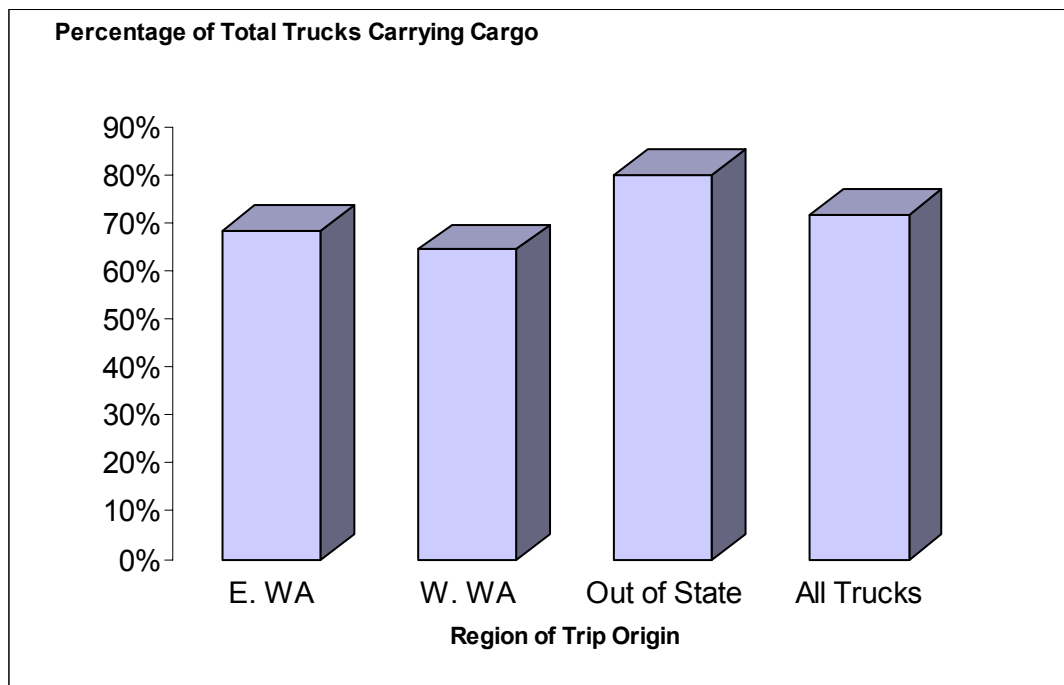
Long-haul over-the-road truck trips are more economical if the cargo value of the shipment is higher, such as consumer and electronic goods, or lightweight, high-value manufacturing or industrial goods.

Figure 2.1: Regional Classification of Washington Counties



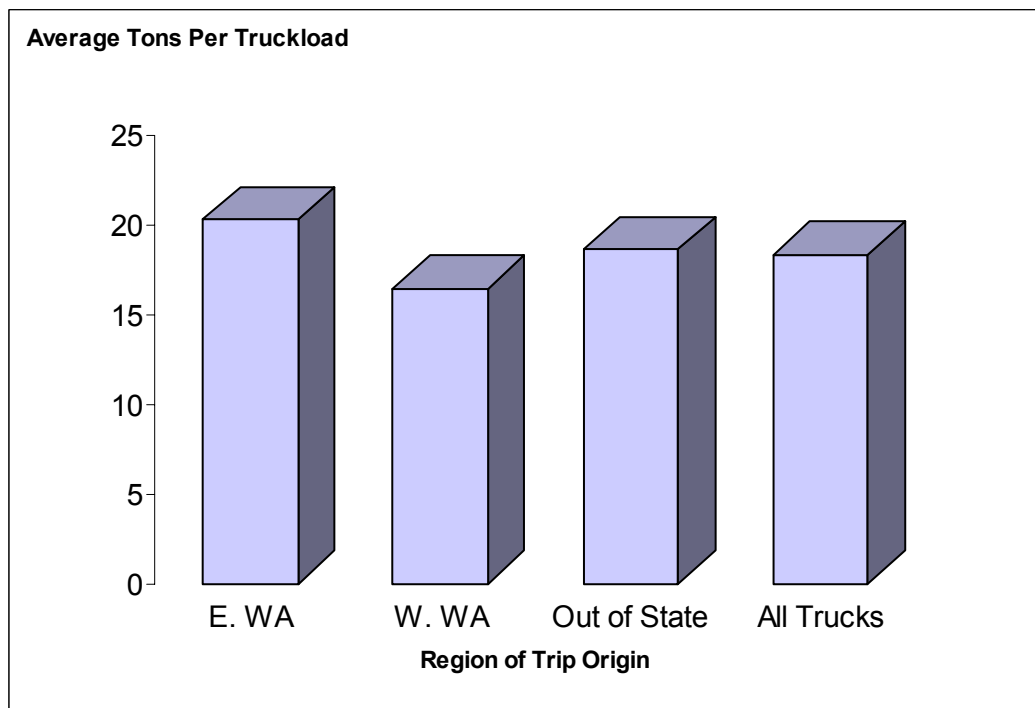
Source: SFTA Freight Truck Origin and Destination Study

Chart 2.1: Proportion of Total Trucks with Cargo for Major Regions of Origin



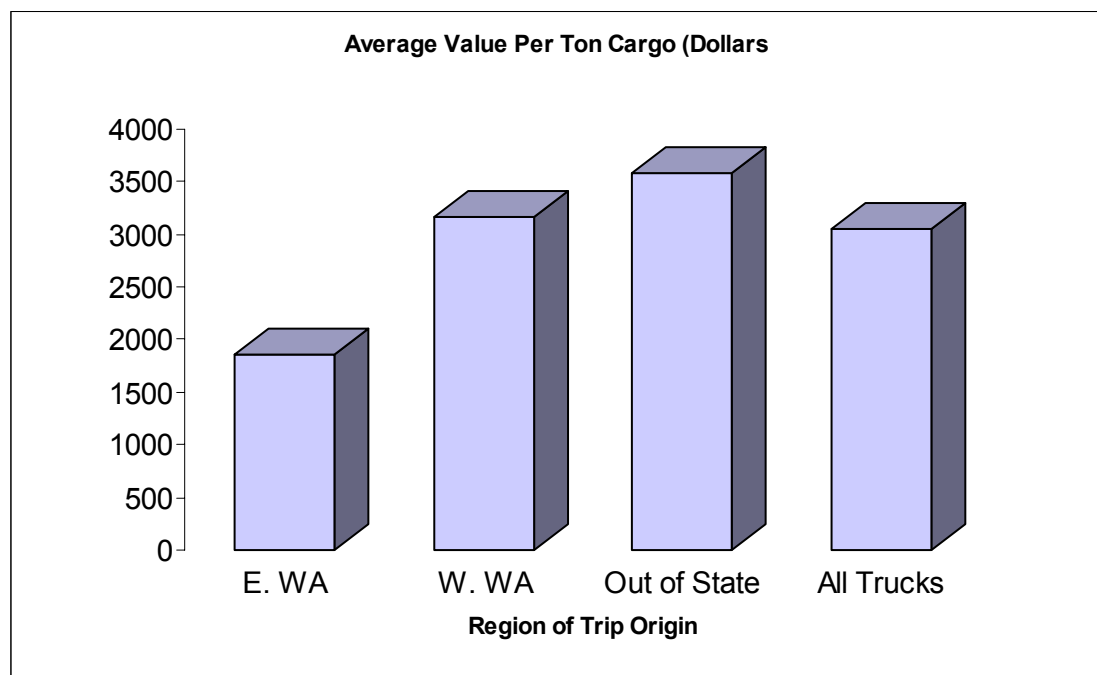
Source: SFTA Freight Truck Origin and Destination Study

Chart 2.2: Comparison of Average Cargo Tonnage for Major Regions of Origin



Source: SFTA Freight Truck Origin and Destination Study

Chart 2.3: Comparison of Average Value per Ton for Major Regions of Origin



Source: SFTA Freight Truck Origin and Destination Study

There are also substantial differences in the destinations of truck trips originating from the three regional categories. Truck trips coming from the Eastern region of the state are most likely to have terminal points outside of Washington, with an almost equal number traveling to Western Washington or staying within the region (Table 2.2). In contrast, the majority of trips originating in the west remain in-region, with an additional 35 percent traveling out of state. Only 12 percent of all truck trips originating in Western Washington have an intended destination in Eastern Washington. The destination split for truck trips coming from out of state origins is more balanced, with 40 percent terminating in Western Washington and approximately 31 percent passing through to destinations in other states or provinces.

Table 2.2: Region of Trip Destination for Major Origin Regions

Region of Trip Origin	Eastern WA Destinations	Western WA Destinations	Out of State Destinations	All Destinations
Eastern WA	29%	32%	39%	100%
Western WA	12%	53%	35%	100%
Out of State	29%	40%	31%	100%

Source: SFTA Freight Truck Origin and Destination Study

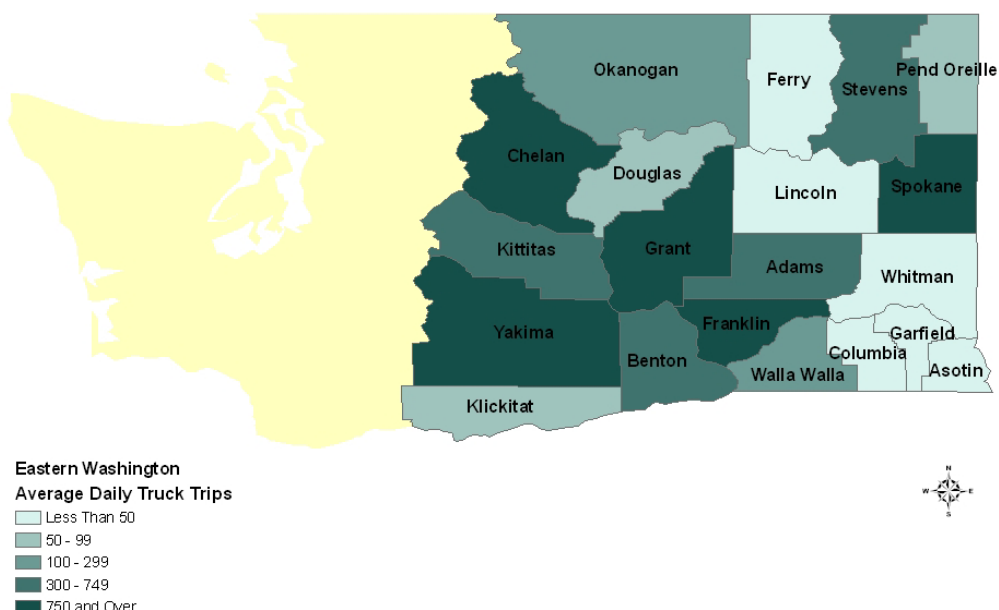
The remainder of this section will focus more clearly on the regional and sub-regional characteristics of freight truck movements on Washington highways. These characteristics will include more detailed information regarding the types of facilities at the origins and destinations, as well as a detailed breakdown of the commodity cargo coming from each region.

Characteristic Profile of Truck Trips Originating in Eastern Washington

A brief overview of the trip generation statistics by county is presented in Figure 2.2. Businesses and industries in Spokane, Yakima, Grant and Chelan counties are the largest trip generators in the eastern region. On an average day, over 1,000 truck trips originate in these counties. Spokane County alone contributes approximately 1,900 truck trips to the freight traffic moving on state highways. Several other counties, such as Franklin, Benton and Kittitas generate an average of over 500 truck trips each day.

Counties that are predominantly agriculturally oriented and/or have a small population base do not generate large numbers of long-haul freight truck traffic. As the origin and destination survey focused on the long-haul movements of freight within the state, local and regional truck traffic moving grain and vegetable harvests from farms to elevators or storehouses and then on to rail or barge terminals may not be fully reflected in the results of this study. Detailed examinations of freight movement of agricultural products are available in other SFTA publications or are forthcoming.⁴

Figure 2.2: Comparison of Average Daily Truck Trips Originating in Eastern Washington Counties



⁴ The transportation market for fresh fruits and vegetables is detailed in “*Value of Modal Competition for Transportation of Washington Fresh Fruits and Vegetables*,” SFTA Report Number 3. Grain transportation is examined in SFTA Report Number 5, “*Dynamics of Wheat and Barley Shipments on Haul Roads to and from Grain Warehouses in Washington State*.” Reports regarding forest products, hay and livestock are forthcoming.

The city of Spokane is the most frequent origin for truck trips originating in the eastern region of Washington. Approximately 1,800 truck trips are generated each day from Spokane businesses and industry, representing almost one-fifth of the entire volume of truck trips originating in Eastern Washington per day. Yakima and Wenatchee are also major trip originators, with over 800 truck trips beginning daily, on average, in those cities (Table 2.3). Other major origin cities in Eastern Washington are Pasco, Moses Lake, Ellensburg, Othello and Kennewick. These cities are the regional centers for the processing and distribution of agricultural commodities produced throughout the counties of the east.

As noted in Table 2.2 above, the destinations for truck trips originating in Eastern Washington are most likely to ship out of state, with roughly equal numbers of trucks terminating in either the eastern part of the state, or in the west. Truck trips terminating out of state were most frequently destined for Oregon. Seattle and Spokane were the two most frequent in-state destinations, followed by Tacoma in the west, and Pasco and Yakima in the east (Table 2.4). For trucks hauling loads out of state, Portland, Oregon and Hermiston, Oregon were the most frequent destinations, with approximately 300 truck trips moving to each city per day. It should be noted that future hauls to Hermiston might decrease due to the recent closure of a major potato processing plant in that city.

Table 2.3: Most Frequent Eastern Washington Origins for Truck Trips on State Highways

City of Trip Origin	Avg Daily Truck Trips	% of Total Trip Origins	Cumulative %
Spokane	1786	19.1%	19.1%
Yakima	883	9.4%	28.6%
Wenatchee	846	9.1%	37.6%
Pasco	552	5.9%	43.5%
Moses Lake	428	4.6%	48.1%
Ellensburg	389	4.2%	52.3%
Othello	371	4.0%	56.2%
Kennewick	227	2.4%	58.7%
Quincy	186	2.0%	60.7%
Colville	163	1.7%	62.4%
Connell	149	1.6%	64.0%
Wallula	142	1.5%	65.5%
Mattawa	137	1.5%	67.0%
Richland	136	1.5%	68.5%
Sunnyside	135	1.4%	69.9%
Prosser	115	1.2%	71.1%
Royal City	111	1.2%	72.3%
Warden	110	1.2%	73.5%
Kettle Falls	105	1.1%	74.6%
Selah	101	1.1%	75.7%
All Other E. WA Cities	2271	24.3%	100%

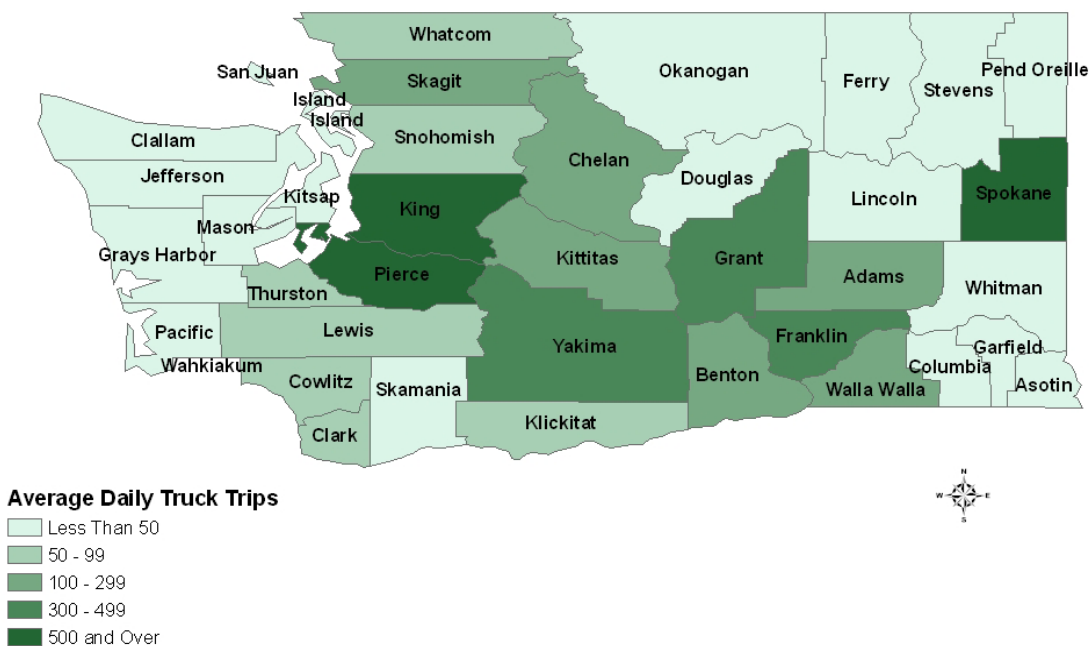
Source: SFTA Freight Truck Origin and Destination Study

Table 2.4: Cities Reported Most Frequently as Destinations for Truck Trips Originating in Eastern Washington

Destination City	Avg Number of Daily Truck Trips
Seattle	667
Spokane	569
Tacoma	503
Pasco	441
Portland	307
Hermiston	283
Yakima	260
Kent	199
Walla Walla	153
Vancouver	135
Leavenworth	133
Mattawa	124
Kennewick	122
Boardman	114
Moses Lake	108
Ellensburg	103

Source: SFTA Freight Truck Origin and Destination Study

Figure 2.3: Overview of In-State Destinations by County for Truck Trips Originating in Eastern Washington



Source: SFTA Freight Truck Origin and Destination Study

For truck trips originating in Eastern Washington, King County is the most frequent destination (Figure 2.3). Large numbers of truck trips also are destined for Pierce County in the west. Almost all of the truck trips moving from the eastern region to the

west are intended to terminate at locations in King or Pierce. Truck trips staying with the east most often are destined for Spokane County, which averages over 600 terminating truck trips per day. Yakima, Franklin and Grant counties receive over 350 trucks each day from other Eastern Washington locations.

Table 2.5: Most Frequent Out-of-State Destinations for Truck Trips Originating in Eastern Washington

Destination State/Province	Avg Number of Daily Truck Trips
Oregon	1431
California	431
British Columbia	387
Idaho	314
Texas	99
Utah	84
Montana	65
Other Western States/Provinces	374
States/Provinces East of the Mississippi	423

Source: SFTA Freight Truck Origin and Destination Study

Approximately two truck trips in five originating in Eastern Washington are carrying freight to destinations outside the state. Over 1,400 trucks have loads delivering in the state of Oregon per day, and over 400 trucks haul freight to California. British Columbia and Idaho are also frequent destinations, with each receiving over 300 trucks from Eastern Washington per day (Table 2.5).

Table 2.6: Commodity Content for Truck Trips Originating in Eastern Washington

Commodity description	Avg Daily Tons	% Total Tons	Avg Daily Value	% Total Value
Live animals and live fish	5,431	1.04%	5,661,602	0.87%
Cereal grains	4,553	0.87%	874,235	0.13%
Other agricultural products	148,765	28.53%	108,515,307	16.68%
Animal feed and products of animal origin (NEC)	44,295	8.50%	9,807,046	1.51%
Meat, fish, seafood, and their preparations	8,277	1.59%	19,753,025	3.04%
Milled grain products, preparations, and bakery products	21,662	4.15%	15,626,385	2.40%
Other prepared foodstuffs and fats and oils	50,838	9.75%	57,965,038	8.91%
Alcoholic beverages	1,913	0.37%	5,366,218	0.82%
Tobacco products	2	0.00%	23,189	0.00%
Monumental or building stone	3,918	0.75%	705,039	0.11%
Natural sands	3,241	0.62%	62,403	0.01%
Gravel and crushed stone	1,084	0.21%	7,180	0.00%
Nonmetallic minerals (NEC)	2,151	0.41%	188,448	0.03%
Metallic ores and concentrates	1,419	0.27%	244,549	0.04%
Gasoline and aviation turbine fuel	5,631	1.08%	1,336,975	0.21%
Fuel oils	1,291	0.25%	252,725	0.04%
Coal and petroleum products (NEC)	1,409	0.27%	300,526	0.05%
Basic chemicals	4,050	0.78%	2,346,141	0.36%
Pharmaceutical products	378	0.07%	8,581,077	1.32%
Fertilizers	7,141	1.37%	1,172,532	0.18%
Chemical products and preparations (NEC)	1,332	0.26%	3,167,714	0.49%
Plastics and rubber	3,864	0.74%	9,701,352	1.49%
Logs and other wood in the rough	14,677	2.81%	1,650,807	0.25%
Wood products	40,510	7.77%	12,754,937	1.96%
Pulp, newsprint, paper, and paperboard	19,719	3.78%	13,890,501	2.14%
Paper or paperboard articles	7,478	1.43%	7,800,348	1.20%
Printed products	3,451	0.66%	8,129,109	1.25%
Textiles, leather, and articles of textiles or leather	1,568	0.30%	10,144,332	1.56%
Nonmetallic mineral products	12,196	2.34%	2,407,549	0.37%
Base metal in primary or semifinished forms and in finished basic shapes	5,984	1.15%	9,487,139	1.46%
Articles of base metal	2,722	0.52%	14,317,880	2.20%
Machinery	7,321	1.40%	66,336,052	10.20%
Electronic, other electrical equipment, components and office equipment	2,685	0.51%	60,730,346	9.34%
Motorized and other vehicles (including parts)	7,726	1.48%	57,897,459	8.90%
Transportation equipment (NEC)	2,055	0.39%	19,551,828	3.01%
Precision instruments and apparatus	212	0.04%	11,371,401	1.75%
Furniture, mattresses & mattress supports, lamps, lighting fittings, & illuminated signs	301	0.06%	1,340,346	0.21%
Miscellaneous manufactured products	6,577	1.26%	17,692,795	2.72%
Waste and scrap	8,602	1.65%	2,225,764	0.34%
Mixed freight	28,978	5.56%	60,549,624	9.31%
Commodity unknown	26,007	4.99%	20,565,536	3.16%
	521,417	100.00%	650,502,458	100.00%

Source: SFTA Freight Truck Origin and Destination Study and Bureau of Transportation Statistics

Cargo Value and Tonnage of Freight Shipped from Eastern Washington

Table 2.6 highlights the value and variety of commodities shipped as cargo on truck trips from Eastern Washington. The cargo content is dominated by agricultural products, whether grains, fresh fruits and vegetables, or processed foods and oils. Wood products also make up a significant portion of the goods being hauled from eastern region origins. Agricultural and forest goods, both raw and processed, represent over 60 percent of the average daily tonnage originating in Eastern Washington locations. However, these same goods represent only 35 percent of the average daily value of cargo being generated in the east. Machinery, motor vehicles, electronic and office equipment and industrial goods such as plastics and rubber account for over 35 percent of the average daily total value of cargo, but only 5.5 percent of the average daily total cargo tonnage. In general, truck trips originating in counties dominated by agricultural or logging economic base have shipments that are among the heaviest, but also least-valued, shipments in the region.

Additional detail of tonnage and value by county is provided in Table 2.7. Freight trips originating in Columbia County have the highest average value per truckload of eastern region origins at almost \$84,000. The commodity most frequently cited during the driver interviews for Columbia County was fish, however the large value of the shipments was primarily due to movements of high-value farming equipment through the county. The heaviest truckloads originate in Pend Oreille and Ferry counties, representing the large number of trucks carrying of high-weight goods such as logs, wood chips, raw lumber and pulp. The value of trucks originating in Pend Oreille County is considerably higher (averaging approximately \$36,000 per truck trip) than those coming from Ferry County (averaging just over \$12,500 per trip) due to the larger number of trucks carrying cargo classified as processed paper or newsprint.

Klickitat County has some of the smallest and lowest valued loads originating in Eastern Washington. While this is certainly related to the relatively low population of the county, geography likely plays a greater role; Klickitat County has the longest span of Columbia River frontage of all Washington counties. As a result, many of the major commodities produced in Klickitat County such as logs and fresh vegetables move short distances to the river and then to ports downstream.

Table 2.7: Comparison of Average Volume and Value of Cargo Shipped from Eastern Washington Counties

Origin County	Avg. Tons Per Truck	E. WA Rank	Avg. Value Per Truck	E. WA Rank	Major Commodities
Adams	21.1	3	30,641	9	Wheat, potatoes, apples
Asotin	16.5	15	14,855	15	Peas, lumber, paper
Benton	17.2	11	32,398	8	Corn, peas, fertilizer, potatoes
Chelan	14.5	19	29,613	10	Wood chips, logs, apples
Columbia	17	13	83,925	1	Fish
Douglas	17.8	10	34,375	6	Concrete, construction equipment, fruit
Ferry	22	2	12,555	18	Wood chips, lumber
Franklin	17.9	9	38,845	4	Potatoes, hay, farm equipment
Garfield	N/A	20	N/A	20	N/A
Grant	19.25	6	25,727	12	Fertilizer, hay, frozen vegetables
Kittitas	18	8	34,281	7	Hay, fertilizer, potatoes, miscellaneous
Klickitat	14.5	18	7,959	19	Logs/lumber, produce, equipment
Lincoln	20.25	5	14,475	16	Grains, livestock
Okanogan	20.8	4	25,333	13	Logs/lumber, apples, fertilizer
Pend Oreille	24.75	1	35,934	5	Logs/lumber, newsprint/paper
Spokane	16.75	14	39,282	3	Fuel/gasoline, peas, grains, miscellaneous
Stevens	17.2	12	49,725	2	Logs/lumber, livestock, sand/gravel/stone
Walla Walla	18.25	7	21,583	14	Wheat, processed meat, fruits and vegetables
Whitman	14.7	17	12,600	17	Wheat, barley, hay
Yakima	16.4	16	27,326	11	Wine, fertilizer, hay, fruits and vegetables

Note: There was no survey data for shipments originating in Garfield County.

Source: SFTA Freight Truck Origin and Destination Study

Type of Facility at Place of Origin and Destination

In order to enhance our understanding of the facilities generating truck trips in the state and the destinations receiving such shipments, freight truck drivers were asked to describe the type of facility where they picked up the load and the type of facility at the intended destination. Summary results for facility type origins are found in Table 2.8 and results for facility type destinations are found in Table 2.9.

Table 2.8: Type of Facility at Place of Origin for Truck Trips Originating in Eastern Washington

Type of Facility	Avg. Daily Number of Trips	% of All Trips
Unknown/Other	1,324	14.17%
Truck Terminal	1,304	13.96%
Rail Terminal	68	0.73%
Marine Terminal	25	0.27%
Air Terminal	16	0.17%
Factory	1,450	15.52%
Warehouse/Distribution Center	3,585	38.36%
Farm	1,103	11.81%
Point of Sale/Consumption	468	5.01%

Source: SFTA Freight Truck Origin and Destination Study

Table 2.9: Type of Facility at Place of Destination for Truck Trips Originating in Eastern Washington

Type of Facility	Avg. Daily Number of Trips	% of All Trips
Unknown/Other	1,451	15.53%
Truck Terminal	1,079	11.55%
Rail Terminal	125	1.34%
Marine Terminal	563	6.02%
Air Terminal	44	0.47%
Factory	1,165	12.47%
Warehouse/Distribution Center	3,371	36.08%
Farm	605	6.47%
Point of Sale/Consumption	939	10.05%

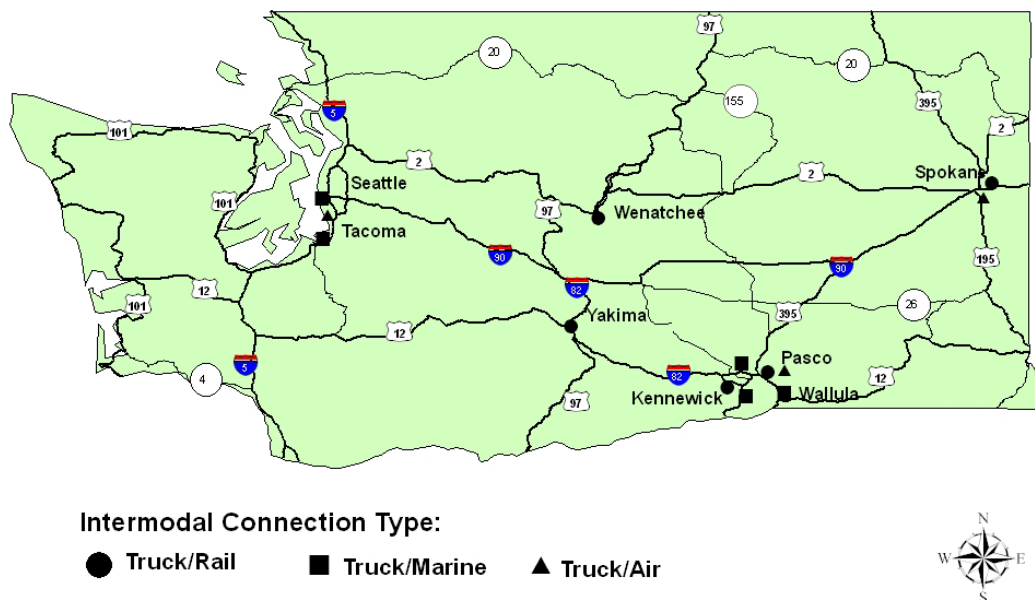
Source: SFTA Freight Truck Origin and Destination Study

In Eastern Washington, over half of all freight trip origins are at warehouses and distribution centers or factories. An additional 14 percent originate at freight truck terminals and 12 percent come directly from farms. Of note, 14 percent of the truck drivers could not identify the origin facility type, or the facility was listed as “other.” This may reflect the practice of driver/tractor switching, where long-haul trailers are dropped at roadside locations by one driver-and-rig and picked up by another driver-and-rig for final delivery. There is very little intermodal trip origination from non-truck to truck. Origins at rail, marine and air terminals represent slightly over 1 percent of all freight truck origins in Eastern Washington.

Freight truck connections to other transport modes are more common as points of destination. Almost 8 percent of freight truck trips originating in Eastern Washington have an intended destination of a rail, marine or air terminal. The most frequently cited locations for truck-to-rail destinations were Spokane, Yakima and Pasco. Truck-to-air terminal destinations were cited in Spokane, SeaTac, Moses Lake and the Tri-Cities. Trucks delivering or transferring loads at marine terminals most often shipped to the

Ports of Seattle and Tacoma, as well as to several locations at or near the confluence of the Snake and Columbia Rivers (Figure 2.4). Shipments of Eastern Washington cereal grains to the Columbia Snake marine terminals are not fully encompassed in the results of this study, as most of the truck trips making the deliveries or transfers are short-hauls. As well, shipments of grains to barge terminals near Lewiston, Idaho are not reflected in the survey results for the same reason. This is also the case with most truck deliveries of grains to the special rail terminal at Ritzville in Adams County.⁵

Figure 2.4: Key Intermodal Locations for Truck Trips Originating in Eastern Washington

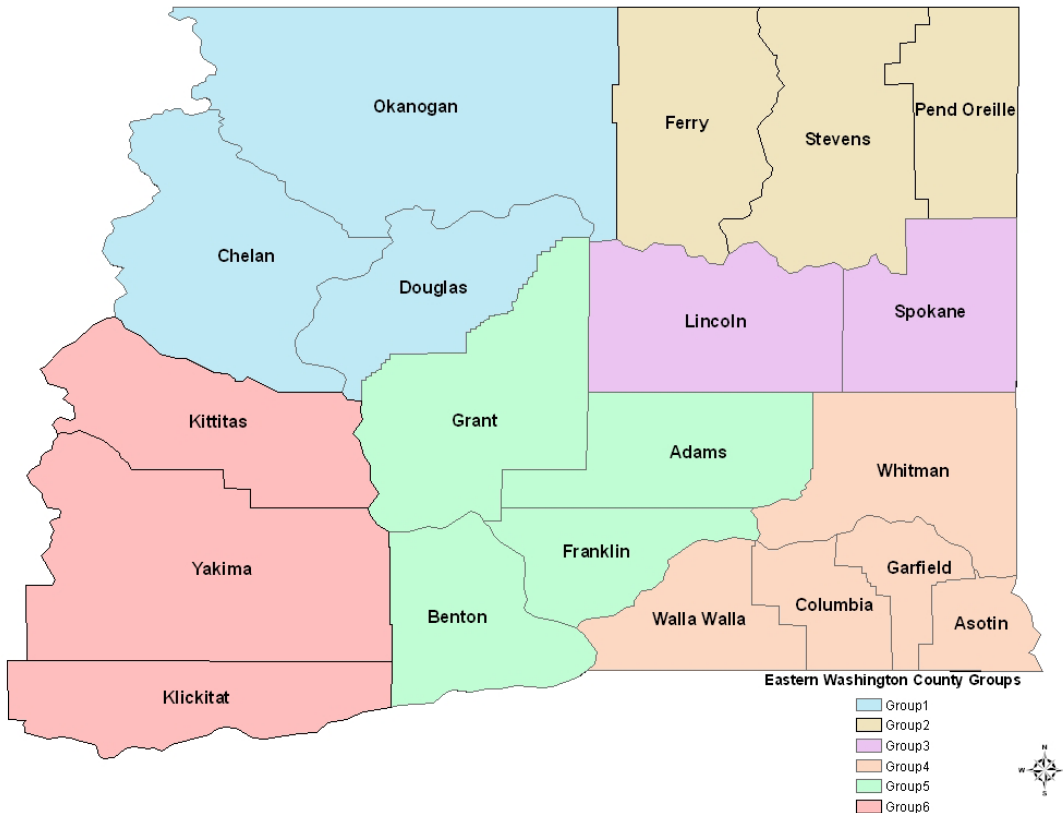


Source: SFTA Freight Truck Origin and Destination Study

⁵ Clark, Michael L., Eric L. Jessup and Kenneth L Casavant. "Dynamics of Wheat and Barley Shipments on Haul Roads to and from Grain Warehouses in Washington State." SFTA Research Report Number 5, September 2003.

Analysis of Origins and Destinations in Eastern Washington Subregions

Figure 2.5: Eastern Washington County Groups



Source: SFTA Freight Truck Origin and Destination Study

Major Highway Corridors in Eastern Washington

This section organizes the Eastern Washington region into 6 subregional groups. The county subregions are defined according to similarities in commodity types originating in the subregion and by shared highway corridors for each grouping. The major highway corridors for the eastern region of Washington are listed in Table 2.10.

Subregion 1: Truck Trips Originating in Okanogan, Chelan and Douglas Counties

Freight truck traffic in the Okanogan, Chelan and Douglas County subregion is clustered around the fruit and logging industries. Wenatchee is a focal point for truck trip originations due to it being a regional center for fruit packing and distribution. On average, 846 trucks per day have origins in Wenatchee (Table 2.11). Logging activities are more dispersed throughout the subregion, but also contribute significant numbers of trucks onto state highways.

Table 2.10: Major Highway Corridors Defining Traffic Flows Within Eastern Washington Subregions

Subregion	Counties	Major Corridors	
		East/West	North/South
Group 1	Okanogan, Chelan, Douglas	US2	US97, SR17
Group 2	Ferry, Stevens, Pend Oreille	US2	US395, SR20
Group 3	Spokane, Lincoln	I90, US2	US395, US195
Group 4	Whitman, Garfield, Asotin, Columbia, Walla Walla	US12, SR26	US195
Group 5	Grant, Adams, Franklin, Benton	I90, US2	I82, US395, SR17
Group 6	Kittitas, Yakima, Klickitat	US 97	US97, I82

Source: SFTA Freight Truck Origin and Destination Study

The intended destinations for truck trips originating in this three-county area are distributed in roughly equal proportions between Eastern Washington, Western Washington and out of state (Table 2.12). Most of the trucks traveling to Western Washington are heading towards the Puget Sound region for local consumption or for export through the ports of Seattle and Tacoma. For trucks hauling goods out of state, British Columbia is the primary destination with over 100 truck trips originating in the subregion on an average day

Table 2.11: Most Frequent City Origins for Truck Trips Originating in Okanogan Chelan and Douglas Counties

City of Origin	Avg. Daily Truck Trips
Wenatchee	846
Chelan	94
Cashmere	75
Oroville	53
Omak	49
Brewster	41

Source: SFTA Freight Truck Origin and Destination Study

Trips destinations in Eastern Washington are also clustered around the fruit packing and processing industries. Two of the top three cited destination cities for the subregion are Leavenworth and Peshastin; both are fruit producing areas in close proximity to Wenatchee. Another major destination is Yakima, which is a primary center for processing and distribution of fruits and vegetables.

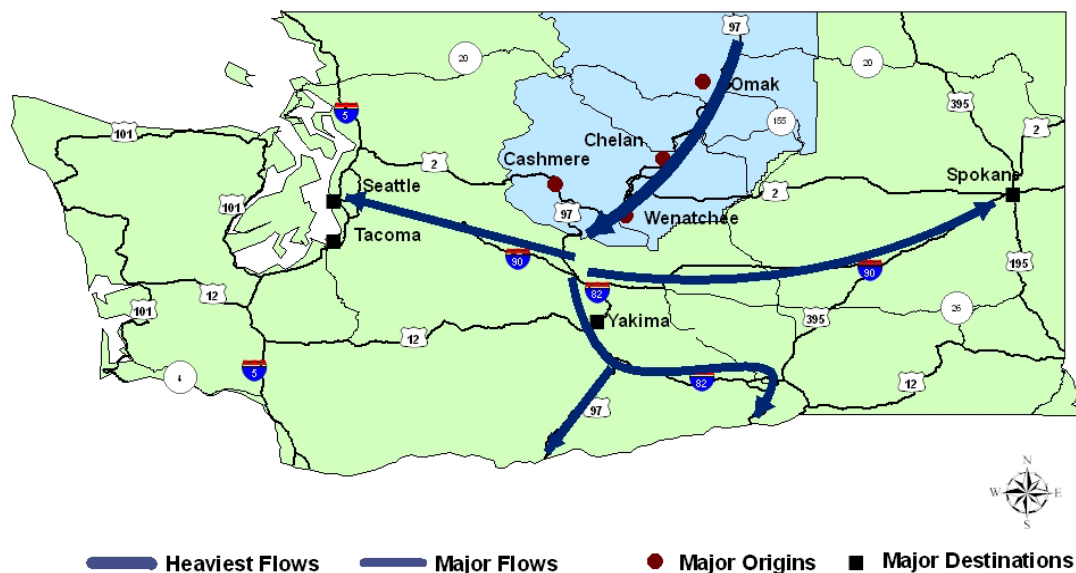
Freight trucks originating in this subregion use several highway corridors to move goods to market. US 97 and US 2 are the primary freight arteries for cargo movement within the area. Shipments moving out of the subregion will most likely connect with I-90 for cargo moving east or west, or I-82 for freight moving south (Figure 2.6).

Table 2.12: Most Frequent Destinations for Truck Trips Originating in Okanogan, Chelan and Douglas Counties

Destination	Avg. Daily Number of Trucks	Percentage of Total Trucks from Subregion
Eastern Washington	433	31.7%
Leavenworth	112	8.2%
Yakima	53	3.9%
Peshastin	41	3%
Other E. WA Cities	227	16.6%
Western Washington	498	36.4%
Seattle	152	11.1%
Tacoma	115	8.4%
Kent	37	2.7%
Other W. WA Cities	194	14.2%
Out of State	437	31.9%
British Columbia	109	7.7%
California	74	5.4%
Oregon	42	3.1%
Texas	34	2.5%
Other States/Provinces	160	11.7%

Source: SFTA Freight Truck Origin and Destination Study

Figure 2.6: Major Routes for Truck Trips Originating in Okanogan, Chelan and Douglas Counties



Source: SFTA Freight Truck Origin and Destination Study

Subregion 2: Truck Trips Originating in Ferry, Stevens and Pend Oreille Counties

The heavily forested regions of the Colville and Kaniksu National Forests of northeastern Washington are the ultimate sources of origin for many of the freight trips generated in Ferry, Stevens and Pend Oreille counties. Logs, lumber, wood chips and pulp, along with paper products are the major commodities produced and shipped in the subregion. As a result, locales such as Colville, Kettle Falls and Usk, in addition to Arden, Chewelah and Valley, were the most oft-cited origins for truck trips for all three counties. Approximately 500 trucks per day are engaged in hauling goods from these towns (Table 2.13).⁶

Table 2.13: Most Frequent City Origins for Truck Trips Originating in Ferry, Stevens and Pend Oreille Counties

City of Origin	Avg. Daily Truck Trips
Colville	163
Kettle Falls	105
Usk	75
Arden	55
Chewelah	51
Valley	42

Source: SFTA Freight Truck Origin and Destination Study

Of the trucks shipping from the Ferry, Stevens Pend Oreille subregion, Spokane is the most popular destination; over 37 percent of all truck trips originating in the area terminate in Spokane. Very little freight Traffic ships to Western Washington destinations, with approximately one-quarter of these shipments destined for Seattle. Almost 40 percent of all shipments coming from the subregion move out of state, with Idaho the most likely site of the terminal location (Table 2.14).

⁶ A SFTA Research Report regarding the specific transportation characteristics of the Washington forest products industry is expected in 2005.

Table 2.14: Most Frequent Destinations for Truck Trips Originating in Ferry, Stevens and Pend Oreille Counties

Destination	Avg. Daily Number of Trucks	Percentage of Total Trucks from Subregion
Eastern Washington	297	50.7%
Spokane	219	37.4%
Lewiston	34	5.8%
Wallula	23	3.9%
Other E. WA Cities	21	3.6%
Western Washington	57	9.7%
Seattle	14	2.4%
Kent	7	1.2%
Longview	5	0.85%
Other W. WA Cities	31	5.3%
Out of State	232	39.6%
Idaho	80	13.7%
California	52	8.9%
Oregon	50	8.5%
British Columbia	25	4.3%
Other States/Provinces	25	4.3%

Freight trucks hauling cargo from Ferry, Stevens or Pend Oreille counties most often use US 395 to Spokane. Smaller volumes are shipped southward on US 2, as well. From Spokane, these shipments utilize I-90 for those shipments moving west or directly east and I-82 for shipments moving south and west to Oregon and California. Idaho is the most popular out of state destination for truck trips originating in the area, and the city of Lewiston is the most cited destination within Idaho for such trips. Thus, significant numbers of truck trips from northeastern Washington travel to destinations in Lewiston on US 195 out of Spokane (Figure 2.7).

Figure 2.7: Major Routes for Truck Trips Originating in Ferry, Stevens and Pend Oreille Counties



Source: SFTA Freight Truck Origin and Destination Study

Subregion 3: Truck Trips Originating in Spokane and Lincoln Counties

As expected, the city of Spokane is the primary generator of truck trips in Spokane and Lincoln counties. Over 90 percent of the truck trips originating on a daily basis from the two-county area begin in Spokane (Table 2.15). Spokane's status as the commercial and industrial leader in Eastern Washington is reflected in the diversity of cargo originating in the city. More consumer goods, electronic and office products, machinery and electronic equipment are shipped from Spokane than from any other eastern regional city.

Table 2.15: Most Frequent City Origins for Truck Trips Originating in Spokane and Lincoln Counties

City of Origin	Avg. Daily Truck Trips
Spokane	1,786
Cheney	37
Deer Park	20
Mead	18
Mica	14
Sprague	9

Source: SFTA Freight Truck Origin and Destination Study

Slightly more than 40 percent of all the truck trips generated in the Spokane and Lincoln County subregion are destined to terminate in other east regional locales. Of these, Spokane, Pasco and Yakima are the most frequent destinations (Table 2.16). About one-quarter of all shipments originating in the subregion move to destinations in Western Washington, with approximately half of these truckloads destined for the port

cities of Seattle and Tacoma. One-third of the subregions freight truck originations travel outside the state. Oregon is the most cited out-of-state destination accounting for 18.5 percent of the total truck trips originating from subregion businesses.

Truck trips originating in Spokane and Lincoln counties utilize I-90 and US 395 extensively. I-90 is used for trucks delivering to other Eastern Washington locations and for trucks traveling to cities west of the Cascade Range. Shipments destined to move south to Oregon and California use I-90 and US 395 to access I-82 in the Tri-Cities area. North of Spokane, US 395 is also used for movements into Ferry, Stevens and Pend Oreille counties, as well as British Columbia. Significant numbers of trucks travel east on I-90 into Idaho and then to other points North, East and South, while a smaller number of trucks use US 195 south out of Spokane for destinations in the Palouse area and Lewiston, Idaho. Additionally, US 2 is used for a small number of trucks hauling loads to cities and towns in Douglas, Chelan and Okanogan counties (Figure 2.8).

Table 2.16: Most Frequent Destinations for Truck Trips Originating in Spokane and Lincoln Counties

Destination	Avg. Daily Number of Trucks	Percentage of Total Trucks from Subregion
Eastern Washington	803	41.6%
Spokane	145	7.5%
Pasco	126	6.5%
Yakima	85	4.4%
Other E. WA Cities	447	23.1%
Western Washington	491	25.4%
Seattle	138	7.1%
Tacoma	55	2.8%
Kent	49	2.5%
Other W. WA Cities	249	12.9%
Out of State	637	32.9%
Oregon	358	18.5%
California	84	4.4%
Idaho	68	3.5%
British Columbia	51	2.6%
Other States/Provinces	76	3.9%

Source: SFTA Freight Truck Origin and Destination Study

Subregion 4: Truck Trips Originating in Asotin, Columbia, Garfield, Walla Walla and Whitman Counties

Wallula and Walla Walla are the two most frequently cited points of origination for long-haul trucks in Subregion 4 (Table 2.17). Approximately 140 trucks per day originate in Wallula, which has a major beef packing plant, as well as a paper and pulp mill in the immediate vicinity. Walla Walla has a burgeoning wine and grape industry that contributes to the approximately 70 trucks originating from that locale.

33

Table 2.17: Most Frequent City Origins for Truck Trips Originating in Asotin, Columbia, Garfield, Walla Walla and Whitman Counties

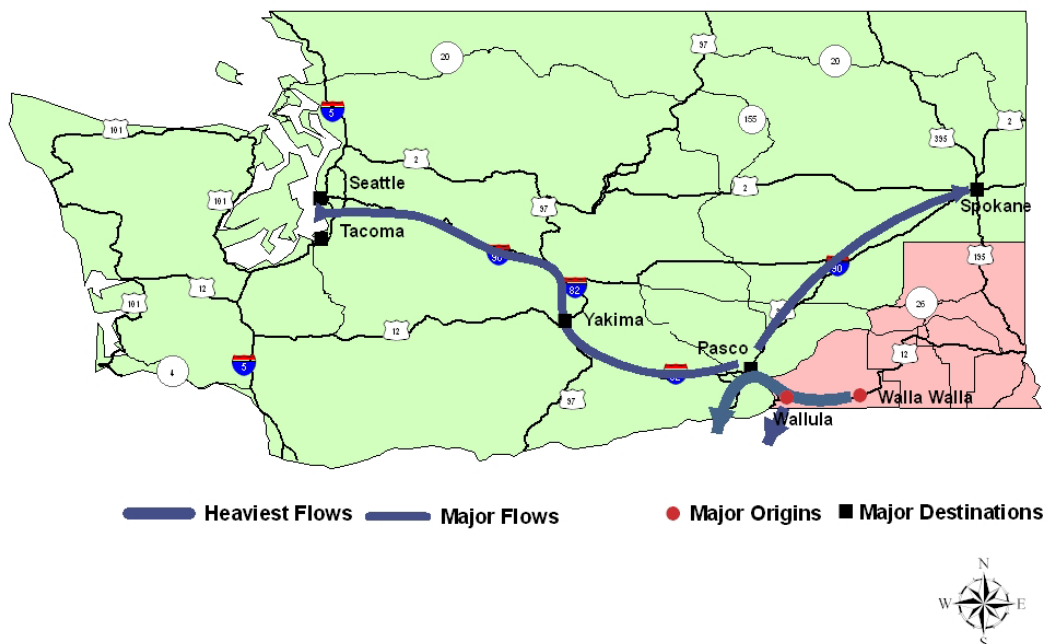
City of Origin	Avg. Daily Truck Trips
Walla Walla	142
Walla Walla	70
Burbank	42
Lamont	10
St. John	7
Clarkston	7

Source: SFTA Freight Truck Origin and Destination Study

Approximately 300 truck trips are generated daily from the counties making up the southeastern area of Washington. Of these, more than one-half are destined for out of state delivery (Table 2.19). In fact, during the driver surveys, Oregon was the most cited destination of any for truck trips originating in the subregion. This is not surprising given that the border communities of Wallula and Walla Walla are the primary generators of truck trips in the five-county region.

Most of the trucks carrying loads in the subregion travel on county roads such as SR 26 or SR 127 and smaller roadways like US 12. Shipments from Wallula and Walla Walla rely on US 12 to move goods to the Tri-Cities or into Oregon to meet up with I-82 (Figure 2.9).

Figure 2.9: Major Routes for Truck Trips Originating in Whitman, Garfield, Asotin, Columbia and Walla Walla Counties



Source: SFTA Freight Truck Origin and Destination Study

Table 2.18: Most Frequent Destinations for Truck Trips Originating in Asotin, Columbia, Garfield, Walla Walla and Whitman Counties

Destination	Avg. Daily Number of Trucks	Percentage of Total Trucks from Subregion
Eastern Washington	82	26.7%
Walla Walla	17	5.5%
Ritzville	16	5.2%
Spokane	10	3.3%
Other E. WA Cities	39	12.7%
Western Washington	68	22.1%
Seattle	32	10.4%
Tacoma	15	4.9%
Mount Vernon	4	1.3%
Other W. WA Cities	17	5.5%
Out of State	157	51.1%
Oregon	96	31.3%
California	20	6.5%
Idaho	18	5.9%
British Columbia	8	2.6%
Other States/Provinces	15	4.9%

Source: SFTA Freight Truck Origin and Destination Study

Subregion 5: Truck Trips Originating in Grant, Adams, Franklin and Benton Counties

Grant, Adams, Franklin and Benton counties make up the heart of the Columbia Basin and are, collectively, a large generator of truck trips in Washington. Fruits and potatoes are two of the major commodity goods being hauled, in addition to hay, grain and vegetable crops. Within the subregion, farms and businesses in the cities of Pasco, Moses Lake, Othello and Kennewick each place over 200 trucks daily onto state highways (Table 2.19). Additional truck trips are generated from locales such as Quincy and Connell. These cities are major agricultural processing and distribution centers for potatoes, apples, onions and hay.⁸ Moses Lake and the Tri-Cities communities are also major retail and consumer goods distribution hubs in the area.

⁸ Casavant, Kenneth L. and Eric L. Jessup. "Value of Modal Competition for Transportation of Washington Fresh Fruits and Vegetables." SFTA Research Report Number 3 (December 2002), and forthcoming research to be published on Washington hay and livestock shipments.

Table 2.19: Most Frequent City Origins for Truck Trips Originating in Grant, Adams, Franklin and Benton Counties

City of Origin	Avg. Daily Truck Trips
Pasco	552
Moses Lake	428
Othello	371
Kennewick	227
Quincy	186
Connell	149
Mattawa	137
Richland	136
Prosser	115
Royal City	111

Source: SFTA Freight Truck Origin and Destination Study

Traffic patterns in Subregion 5 are roughly similar to those of Subregion 4: most of the truck trips generated in the area are destined to deliver to out of state locations, with lower levels shipping to Western Washington. For those trucks hauling goods to the west, the Puget Sound area is the most probable terminal site. Approximately 35 percent of the trips originating in the subregion are destined for other Eastern Washington locations, with Pasco, Spokane and Walla Walla being the most frequent destinations (Table 2.20). Again, like Subregion 4, Oregon is the most likely end-point for trucks traveling out of state, accounting for almost 19 percent of the total number of truck trips from the four-county area.

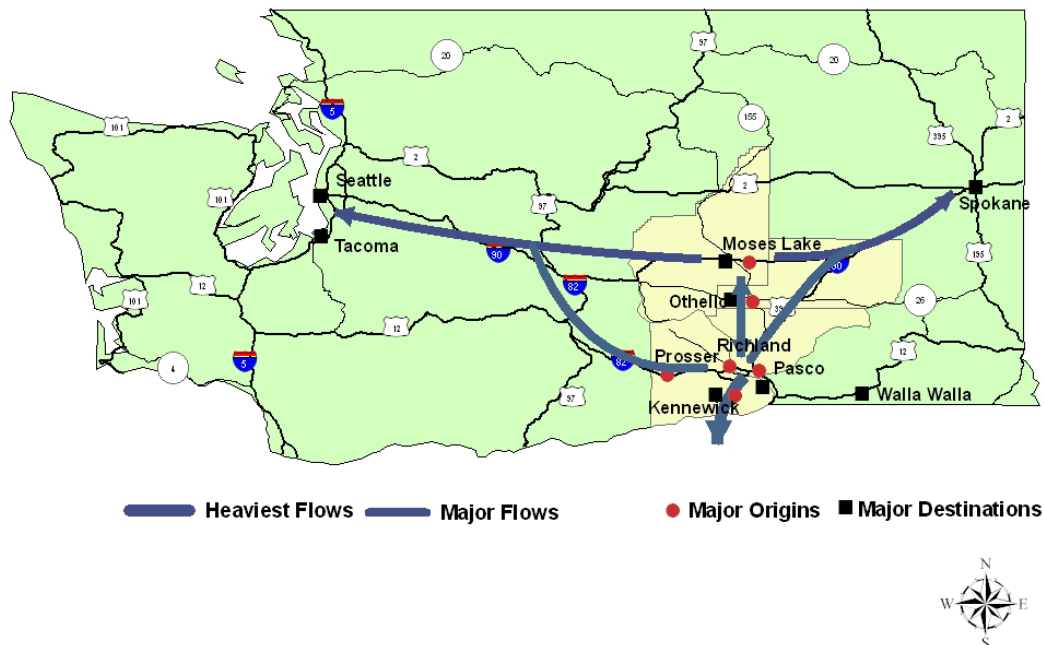
I-82 is the primary freight artery for goods originating in Grant, Adams, Franklin and Benton counties. I-90 is also a significant factor for the movement of goods to the Puget Sound area, or to points east through Spokane (Figure 2.10). Within the subregion, US 395, SR 17 and US 2 are all frequently utilized for distribution to, and collection from, the farming and production communities within the Columbia Basin.

Table 2.20: Most Frequent Destinations for Truck Trips Originating in Grant, Adams, Franklin and Benton Counties

Destination	Avg. Daily Number of Trucks	Percentage of Total Trucks from Subregion
Eastern Washington	1062	35.1%
Pasco	280	9.2%
Spokane	131	4.3%
Walla Walla	88	2.9%
Yakima	62	2.0%
Kennewick	53	1.8%
Quincy	34	1.1%
Other E. WA Cities	414	13.7%
Western Washington	649	21.4%
Tacoma	154	5.1%
Seattle	147	4.9%
Kent	71	2.3%
Other W. WA Cities	277	9.2%
Out of State	1315	43.5%
Oregon	563	18.6%
Idaho	117	3.9%
California	114	3.8%
British Columbia	104	3.4%
Other States/Provinces	417	13.8%

Source: SFTA Freight Truck Origin and Destination Study

Figure 2.10: Major Routes for Truck Trips Originating in Grant, Adams, Franklin and Benton Counties



Source: SFTA Freight Truck Origin and Destination Study

Subregion 6: Truck Trips Originating in Kittitas, Yakima and Klickitat Counties

The counties comprising Subregion 6 are major producers of agricultural goods such as fruits, vegetables, hay and wine. The counties are also major distribution centers for agricultural inputs such as seed, fertilizers and pesticides, as well as agricultural equipment and machinery. The city of Yakima is the primary traffic generator in the subregion with almost 900 freight trips per day. Ellensburg, Sunnyside and Selah are other major trip origins in the area (Table 2.21).

Kittitas, Klickitat and Yakima counties are geographically located on the western extent of the Eastern Washington region. As such, the shipments originating from the subregion are more likely to have destinations in Western Washington than any of the other eastern subregions. Approximately 35 percent of all long-haul trips from Subregion 6 have destinations in the west, with most going to Seattle or Tacoma (Table 2.22). Like the most of the other subregions of Eastern Washington, the largest part of the truck trips generated by the farms and businesses in the three-county area are hauling loads to out of state destinations, with Oregon again the most probable terminating point. Fewer trips are designated for intra-regional movement, as only one-in-four freight hauls travel to other Eastern Washington destinations, which is the lowest level of any of the eastern subregions.

Table 2.21: Most Frequent City Origins for Truck Trips Originating in Kittitas, Yakima and Klickitat Counties

City of Origin	Avg. Daily Truck Trips
Yakima	883
Ellensburg	389
Sunnyside	135
Selah	101
Toppenish	77
Cle Elum	59
Grandview	59
Wapato	50
Union Gap	41
Goldendale	38

Source: SFTA Freight Truck Origin and Destination Study

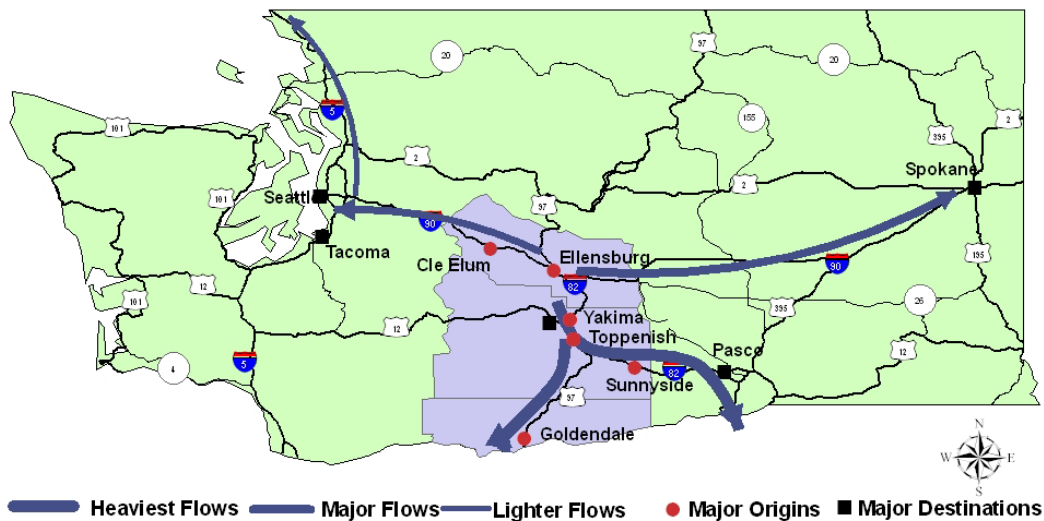
Table 2.22: Most Frequent Destinations for Truck Trips Originating in Kittitas, Yakima and Klickitat Counties

Destination	Avg. Daily Number of Trucks	Percentage of Total Trucks from Subregion
Eastern Washington	524	25.0%
Mattawa	105	5.0%
Yakima	60	2.9%
Ellensburg	58	2.8%
Spokane	44	2.1%
Other E. WA Cities	257	12.2%
Western Washington	745	35.5%
Seattle	184	8.8%
Tacoma	162	7.7%
Mount Vernon	34	1.6%
Other W. WA Cities	365	17.4%
Out of State	829	39.5%
Oregon	323	15.4%
British Columbia	91	4.3%
California	87	4.1%
Texas	32	1.5%
Florida	30	1.4%
Idaho	26	1.2%
Other States/Provinces	242	11.5%

Source: SFTA Freight Truck Origin and Destination Study

Most of the freight moving in and out of Kittitas, Klickitat and Yakima counties travels along US 97 and I-82. Shipments moving west will then use I-90 to reach the Puget Sound area, while destinations in Eastern Washington also use I-90. Southbound shipments consolidate on US 97 and I-82 and continue on I-82 to Oregon and points beyond (Figure 2.11).

Figure 2.11: Major Routes for Truck Trips Originating in Kittitas, Klickitat and Yakima Counties



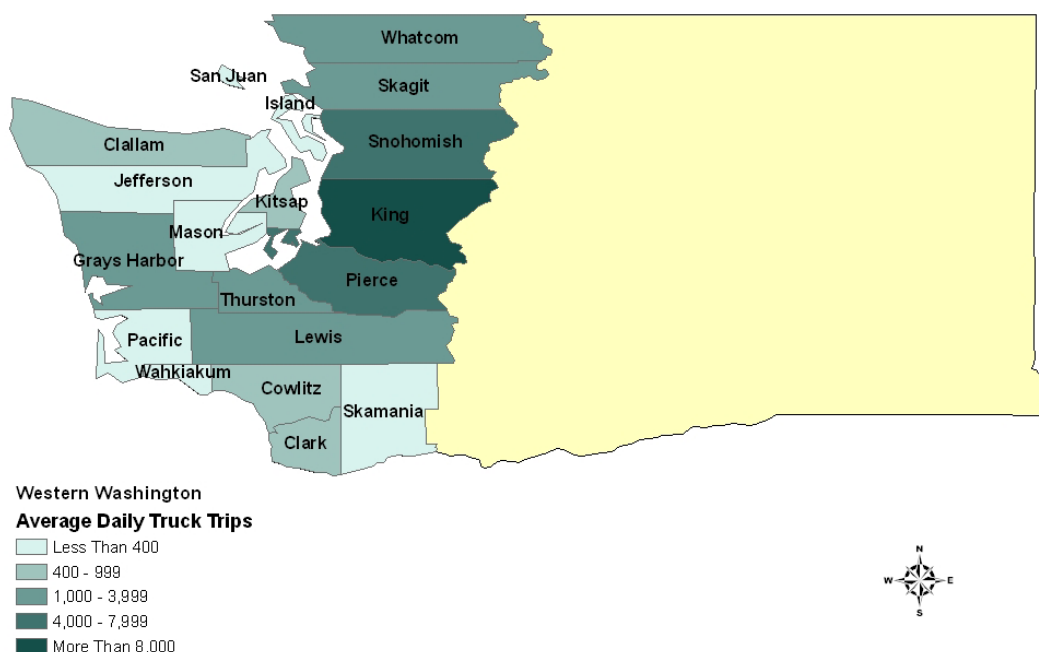
Source: SFTA Freight Truck Origin and Destination Study

Characteristic Profile of Truck Trips Originating in Western Washington

The region of Western Washington is the dominant trip-generating region of the state. The breakdown of average daily truck trips by county is presented in Figure 2.12. Within this region, King, Pierce and Snohomish counties are the largest contributors of freight trips. King County alone produces an average of over 11,000 daily truck trips, while Pierce produces approximately 6,000 trips per day (Table 2.23). Businesses and industries in Snohomish County generate over 3,000 freight trucks hauling goods each day. Altogether, communities in Western Washington produce approximately 47,000 truck trips each day.

The cities of Seattle and Tacoma produce the majority of these trips, accounting for almost one-third of the total trip origination in Western Washington. With large-scale, deep-water ports located in both cities, as well as their associated logistics hubs and distribution centers, they are the primary generators of freight traffic in the western region. Over 6,000 trucks depart Seattle daily for other destinations, joined by over 5,770 trucks from Tacoma.

Figure 2.12: Comparison of Average Daily Truck Trips Originating in Western Washington Counties



Source: SFTA Freight Truck Origin and Destination Study

Other Puget Sound communities that contribute large numbers of freight hauls to state highways are Kent, Everett, Auburn, Bellingham and Olympia. Cities such as Vancouver, Aberdeen and Chehalis are major trip generators from Western Washington that are outside the Puget Sound area. Twenty cities account for almost 73 percent of the total freight originations in the western region.

The cities of Seattle and Tacoma are also the primary destinations for truck trips originating in the west. Portland, Oregon and Kent are also major terminal points for trucks hauling freight from Western Washington. A majority of the truck trips generated in the region come from and are destined to deliver within the Puget Sound area, especially King, Pierce and Snohomish counties (Table 2.24). Figure 2.13 provides a breakdown of the major destinations for shipments originating in Western Washington by county.

Over 10,000 trucks ship from Western Washington to out of state destinations on a daily basis (Table 2.25). This represents 35 percent of the total number of truck trips generated each day in the western region. Of these truck trips, most are destined for locations in Oregon, British Columbia and California. As mentioned above, Portland, Oregon was the most frequently cited out of state city destination for truck trips originating in the region according to the results of the driver survey.

Table 2.23: Most Frequent Western Washington Origins of Trucks Traveling on State Highways

City of Trip Origin	Average Daily Truck Trips	% of Total W.WA Trip Origins	Cumulative %
Seattle	6,084	16.3%	16.3%
Tacoma	5,742	15.4%	31.8%
Kent	2,965	8.0%	39.7%
Everett	2,294	6.2%	45.9%
Auburn	1,155	3.1%	49.0%
Bellingham	976	2.6%	51.6%
Olympia	750	2.0%	53.6%
Vancouver	714	1.9%	55.5%
Arlington	704	1.9%	57.4%
Aberdeen	689	1.8%	59.3%
Marysville	651	1.7%	61.0%
Fife	567	1.5%	62.6%
Chehalis	544	1.5%	64.0%
Sumner	526	1.4%	65.4%
Bellevue	503	1.4%	66.8%
Mount Vernon	493	1.3%	68.1%
Renton	443	1.2%	69.3%
Tukwila	419	1.1%	70.4%
Tumwater	407	1.1%	71.5%
Woodinville	394	1.1%	72.6%
Other W. WA Cities	10,214	27.4%	100%

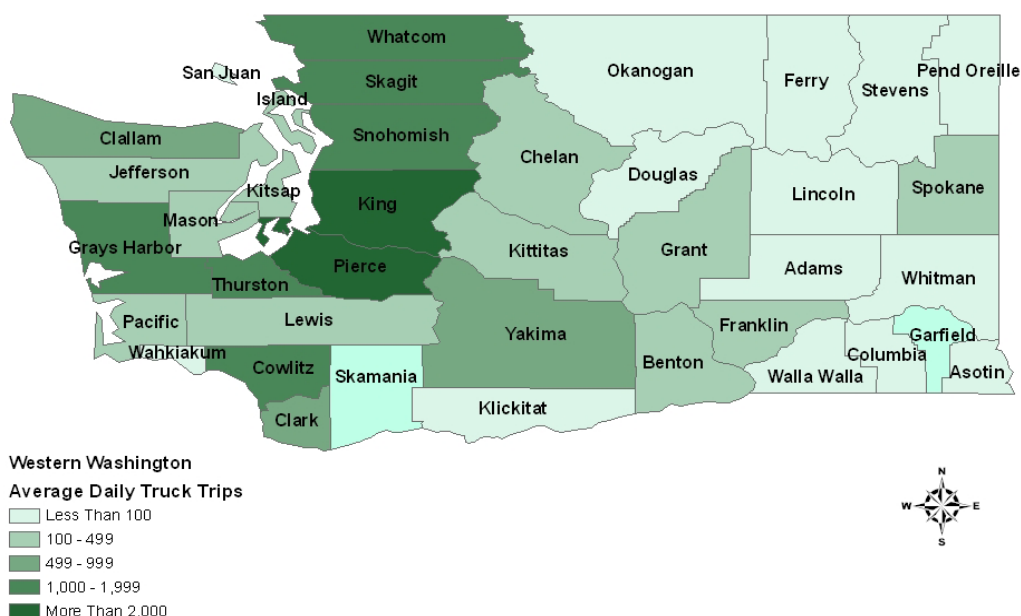
Source: SFTA Freight Truck Origin and Destination Study

Table 2.24: Most Frequent City Destinations for Truck Trips Originating in Western Washington

Destination City	Avg. Daily Truck Trips
Tacoma	3,963
Seattle	2,944
Portland, Oregon	2,363
Kent	1,709
Port Angeles	828
Aberdeen	797
Longview	762
Bellingham	747
Auburn	672
Mount Vernon	638
Olympia	559
Yakima	559
Fife	549
Spokane	479
Vancouver	467
Vancouver, British Columbia	428

Source: SFTA Freight Truck Origin and Destination Study

Figure 2.13: Overview of In-State Destinations by County for Truck Trips Originating in Western Washington



Source: SFTA Freight Truck Origin and Destination Study

Table 2.25: Most Frequent Out-of-State Destinations for Truck Trips Originating in Western Washington

Destination State/Province	Avg Number of Daily Truck Trips
Oregon	5,064
British Columbia	1,907
California	1,735
Idaho	449
Utah	206
Montana	159
Texas	153
Nevada	127
Other Western States/Provinces	462
States/Provinces East of the Mississippi	657

Source: SFTA Freight Truck Origin and Destination Study

The commodity mix of goods hauled from origins in Western Washington is more diversified than that of Eastern Washington. Logs, lumber and wood products comprise the largest component of the cargo weight transported on Washington highways from the western region at approximately 30 percent of the total cargo weight, followed by mixed or unknown freight at 20 percent. However, the forestry products account for only 6.4 percent of the total value of cargo shipped from the region. The unknown and mixed freight, mostly consisting of consumer goods, accounts for about 13 percent of the total cargo value per day (Table 2.26).

Table 2.26: Commodity Content for Truck Trips Originating in Western Washington

Commodity description	Avg Daily Tons	% of Total Tons	Avg Daily Value	% of Total Value
Live animals and live fish	7,029	0.50%	7,326,622	0.24%
Cereal grains	730	0.05%	140,093	0.00%
Other agricultural products	42,455	3.02%	37,045,148	1.23%
Animal feed and products of animal origin (NEC)	10,951	0.78%	4,818,628	0.16%
Meat, fish, seafood, and their preparations	34,772	2.48%	89,393,374	2.96%
Milled grain products, preparations, and bakery products	17,474	1.25%	23,861,412	0.79%
Other prepared foodstuffs and fats and oils	65,416	4.66%	88,015,432	2.92%
Alcoholic beverages	18,118	1.29%	63,787,704	2.11%
Monumental or building stone	14,787	1.05%	2,450,683	0.08%
Natural sands	11,058	0.79%	212,912	0.01%
Gravel and crushed stone	15,708	1.12%	103,829	0.00%
Nonmetallic minerals (NEC)	3,061	0.22%	212,256	0.01%
Metallic ores and concentrates	293	0.02%	119,272	0.00%
Gasoline and aviation turbine fuel	40,579	2.89%	9,466,763	0.31%
Fuel oils	4,217	0.30%	825,579	0.03%
Coal and petroleum products (NEC)	7,279	0.52%	2,234,897	0.07%
Basic chemicals	33,047	2.35%	16,277,874	0.54%
Pharmaceutical products	260	0.02%	5,906,286	0.20%
Fertilizers	3,669	0.26%	561,402	0.02%
Chemical products and preparations (NEC)	11,681	0.83%	24,818,388	0.82%
Plastics and rubber	17,917	1.28%	43,874,416	1.45%
Logs and other wood in the rough	128,120	9.13%	14,353,175	0.48%
Wood products	196,938	14.03%	69,917,930	2.32%
Pulp, newsprint, paper, and paperboard	71,379	5.09%	58,554,328	1.94%
Paper or paperboard articles	31,423	2.24%	48,808,236	1.62%
Printed products	20,099	1.43%	73,714,374	2.44%
Textiles, leather, and articles of textiles or leather	10,214	0.73%	102,772,104	3.41%
Nonmetallic mineral products	59,682	4.25%	29,663,735	0.98%
Base metal in primary or semifinished forms and in finished basic shapes	29,557	2.11%	34,679,939	1.15%
Articles of base metal	15,102	1.08%	57,509,365	1.91%
Machinery	32,081	2.29%	288,485,831	9.56%
Electronic, other electrical equipment, components and office equipment	20,005	1.43%	594,708,484	19.71%
Motorized and other vehicles (including parts)	40,112	2.86%	289,036,316	9.58%
Transportation equipment (NEC)	4,677	0.33%	327,026,430	10.84%
Precision instruments and apparatus	388	0.03%	17,856,497	0.59%
Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	10,668	0.76%	47,708,074	1.58%
Miscellaneous manufactured products	51,085	3.64%	147,456,380	4.89%
Waste and scrap	43,345	3.09%	7,938,304	0.26%
Mixed freight	127,018	9.05%	265,409,323	8.80%
Commodity unknown	151,099	10.77%	119,486,571	3.96%
	1,403,491	100.00%	3,016,538,367	100.00%

Source: SFTA Freight Truck Origin and Destination Study and Bureau of Transportation Statistics

The most dramatic contrast between weight and value in the region is with electronic and office equipment. This commodity segment, which includes personal computers, copiers, telecom equipment and computer software, represents only 1.42 percent of the total weight shipping each day from Western Washington, but 19.75 percent of the total value of cargo shipping each day.

Table 2.27 provides a county-by-county comparison of the average tonnage and average value per truck trip originating in Western Washington. Those counties such as Pacific, Skamania and Mason that are producing and shipping forestry products have some of the highest average tonnages but also, some of the lowest average cargo values. In contrast, Pierce and King Counties rank 12th and 13th in average daily cargo weight, but 2nd and 1st, respectively in average daily cargo value.

Table 2.27: Comparison of Average Volume and Value of Cargo Shipped from Western Washington Counties

Origin County	Avg. Tons Per Truck	W. WA Rank	Avg. Value Per Truck	W. WA Rank	Major Commodities
Clallam	7.8	15	14,232	12	Logs, lumber, paper
Clark	12.2	7	36,071	3	Logs, lumber, paper
Cowlitz	14.6	6	18,178	10	Logs, animal feed
Grays Harbor	14.8	5	19,025	9	Logs, lumber, paper
Island	7.1	16	23,155	8	Milk, pipe
Jefferson	9.9	11	10,169	15	Logs, lumber, paper
King	9.1	13	45,054	1	Food products, steel, logs, automobiles
Kitsap	5.8	17	12,664	13	Logs, lumber
Lewis	15.6	4	14,680	11	Logs, lumber, pulp
Mason	16.5	3	12,608	14	Logs, lumber, fuel
Pacific	19.0	2	9,549	16	Logs, lumber
Pierce	9.8	12	44,225	2	Food products, household goods, logs
San Juan	N/A	18	N/A	18	
Skagit	11.7	9	25,948	7	Lumber, potatoes, fuel
Skamania	31.6	1	3,999	17	Logs, wood products
Snohomish	8.9	14	34,684	4	Logs, lumber, asphalt
Thurston	11.7	8	31,176	5	Logs, wood products
Wahkiakum	N/A	19	N/A	19	
Whatcom	11.3	10	29,775	6	Lumber, paper, aluminum, cement

Note: There was no survey data for shipments originating in San Juan and Wahkiakum Counties.
Source: SFTA Freight Truck Origin and Destination Study

Type of Facility at Place of Origin and Destination

Driver survey data regarding the types of facilities at the origin and destination points for Western Washington is presented in Tables 2.28 and 2.29. Almost 60 percent of the daily freight volume generated in the west region begins at a factory or warehouse/distribution center; as destination points, factories and distribution centers attract approximately 56 percent of all freight trips terminating in the region. Underscoring the different economic bases between Eastern and Western Washington,

the importance of agriculture as a trip originator or destination in the western region is significantly less than that of the eastern region.

On the other hand, there are more freight trips involved in intermodal transportation (defined as freight origins at marine, rail or air terminals) of products in Western Washington than in the eastern region. Approximately 9 percent of the average daily freight trip traffic in the west originates at an intermodal facility; most of this traffic comes from the deep-water marine ports of the Puget Sound region and their attendant intermodal rail facilities. These results reinforce the important role of the ports, and their accompanying industrial infrastructure, in generating and attracting freight movements throughout Western Washington and the Pacific Northwest.

Table 2.28: Type of Facility at Place of Origin for Truck Trips Originating in Western Washington

Type of Facility	Avg. Daily Number of Trips	% of All Trips
Unknown/Other	6,092	18.21%
Truck Terminal	4,945	14.78%
Rail Terminal	591	1.77%
Marine Terminal	2,267	6.78%
Air Terminal	207	0.62%
Factory	7,315	21.86%
Warehouse/Distribution Center	12,517	37.41%
Farm	781	2.33%
Point of Sale/Consumption	2,518	7.53%

Source: SFTA Freight Truck Origin and Destination Study

Table 2.29: Type of Facility at Place of Destination for Truck Trips Originating in Western Washington

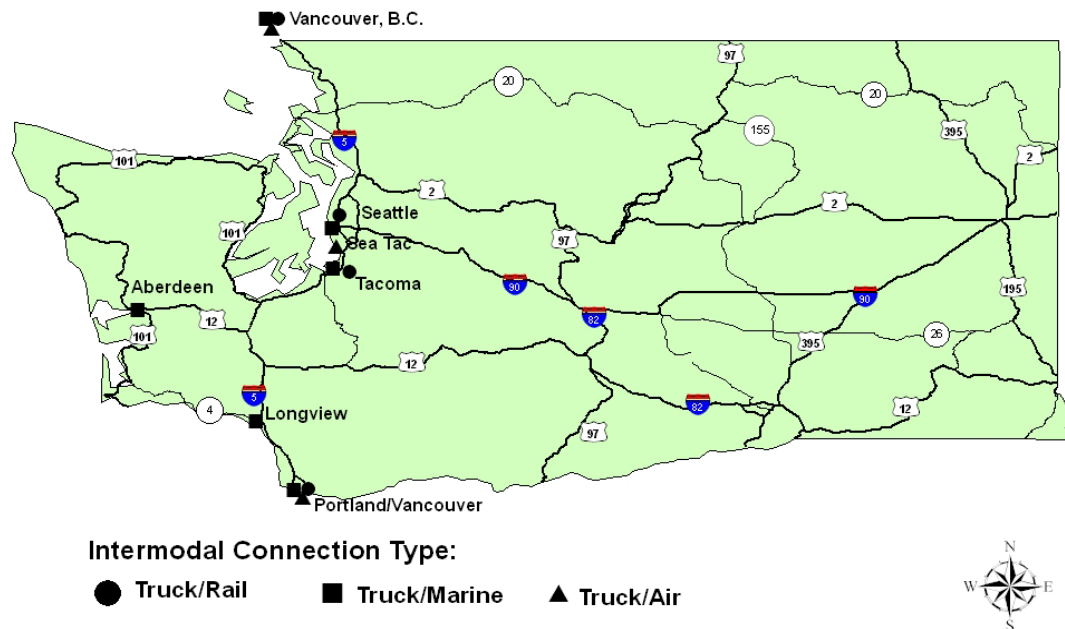
Type of Facility	Avg. Daily Number of Trips	% of All Trips
Unknown/Other	7,285	23.2%
Truck Terminal	4,847	15.4%
Rail Terminal	449	1.4%
Marine Terminal	1,655	5.27%
Air Terminal	103	0.33%
Factory	5,833	18.58%
Warehouse/Distribution Center	11,655	37.12%
Farm	832	2.65%
Point of Sale/Consumption	4,574	14.57%

Source: SFTA Freight Truck Origin and Destination Study

Figure 2.14 illustrates the various major intermodal origination and destination points in Western Washington. As noted above, the deep-water marine ports of the Puget Sound are significant contributors and attractors of long-haul freight traffic. The ports of Seattle and Tacoma were the most frequently cited port origins and destinations, followed by the port of Portland, Oregon, the ports of Aberdeen and Longview, Washington and the port of Vancouver, British Columbia. The ports of Kalama, Port Townsend and Port

Angeles were also cited, but freight volumes were much lower in these locations. The intermodal rail facilities associated with the ports of Seattle and Tacoma are also significant origin and terminal points in Western Washington.

Figure 2.14: Key Intermodal Locations for Truck Trips Originating in Western Washington



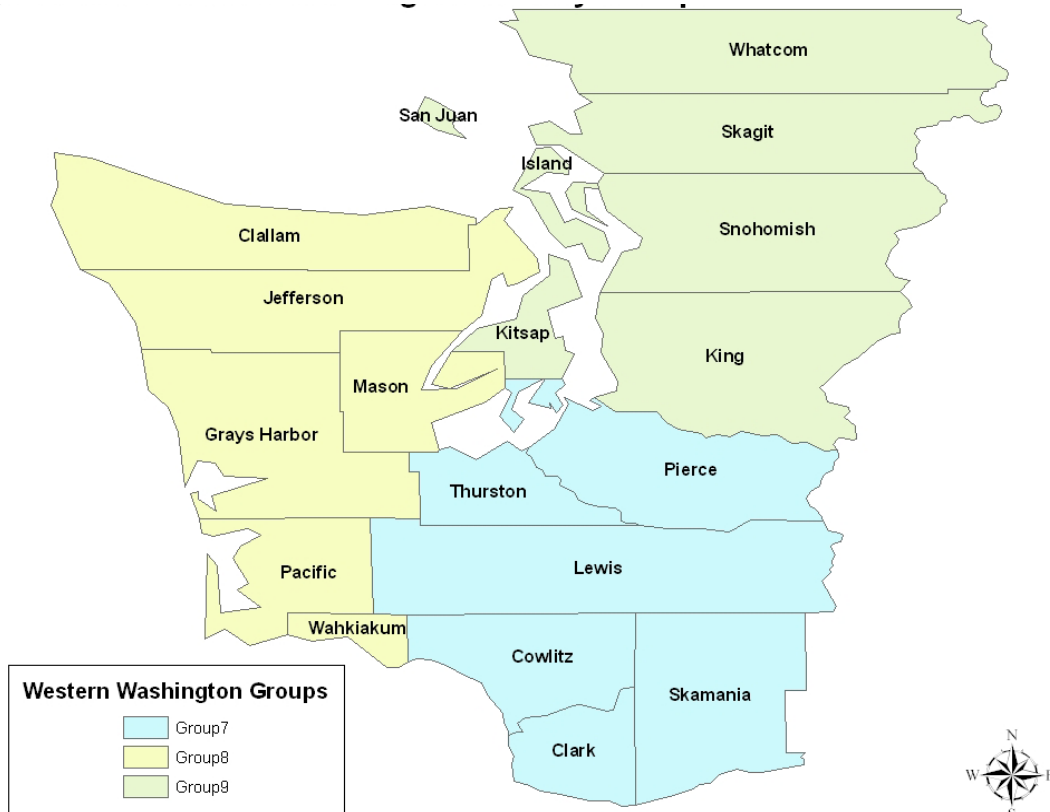
Source: SFTA Freight Truck Origin and Destination Study

Analysis of Origins and Destinations in Western Washington Subregions

This section reviews highway route utilization in the three subregions of Western Washington. The three subregions are geographically grouped in order to highlight the local movements and variations between the areas.

The I-5 corridor is the primary means of conveyance for freight traffic in the western region. Most of the other roadways in the west feed traffic into the I-5 corridor. East-west freight flows are generally along I-90 out of the Puget Sound area, or by the Columbia River and/or highways that run parallel to this major freight-carrying river system. Figure 2.15 illustrates the three subregional county groupings that make up Western Washington.

Figure 2.15: Western Washington County Groups



Source: SFTA Freight Truck Origin and Destination Study

Subregion 7: Truck Trips Originating in Pierce, Thurston, Lewis, Cowlitz, Clark and Skamania Counties

On a daily basis, the businesses, industries and commercial activities of the communities representing Pierce, Thurston, Lewis Cowlitz, Clark and Skamania Counties generate approximately 12,000 freight truck trips. Of this number, almost half of these shipments originate in the city of Tacoma (Table 2.30). Olympia and Vancouver each contribute over 700 trucks per day, while Fife, Chehalis and Sumner each account for over 500 trucks every day.

Table 2.30: Origins for Truck Trips Originating in Pierce, Thurston, Lewis, Cowlitz, Clark and Skamania Counties

City of Origin	Avg. Daily Truck Trips
Tacoma	5,742
Olympia	750
Vancouver	714
Fife	567
Chehalis	544
Sumner	526
Tumwater	407
Puyallup	363
Longview	319
Centralia	189

Source: SFTA Freight Truck Origin and Destination Study

Almost two-thirds of the freight truck trips from Subregion 7 origins have destinations within the western region. Seattle is the most likely terminal point with over 1,400 truck trips destined for locations within the city. Kent also is a significant attractor of truck trips, with over 1,000 trips terminating within the city on a daily basis. Other major destinations within Western Washington are given in Table 2.31.

Less than 9 percent of all the freight trucks traveling from the subregion have terminating points in Eastern Washington. There is also little eastbound pass-through traffic that is generated from locations within the 6 county region; destinations in Idaho represent less than 2 percent of the total freight traffic originating in the area, while other eastern states or provinces comprise less than 5 percent of the total.

Most interstate traffic originating in Pierce, Thurston, Lewis, Cowlitz, Clark and Skamania Counties travels to Oregon, particularly the port city of Portland. British Columbia receives approximately 5 percent of the shipments originating in the subregion, and California receives about half this number. One conclusion that can be derived from these numbers is that long-haul truck traffic originating in these counties does not travel great distances and is geographically concentrated along the Pacific Coast. Freight designated for movement inland and over the Cascades will generally move by other transport modes such as rail or barge up the Columbia River system.

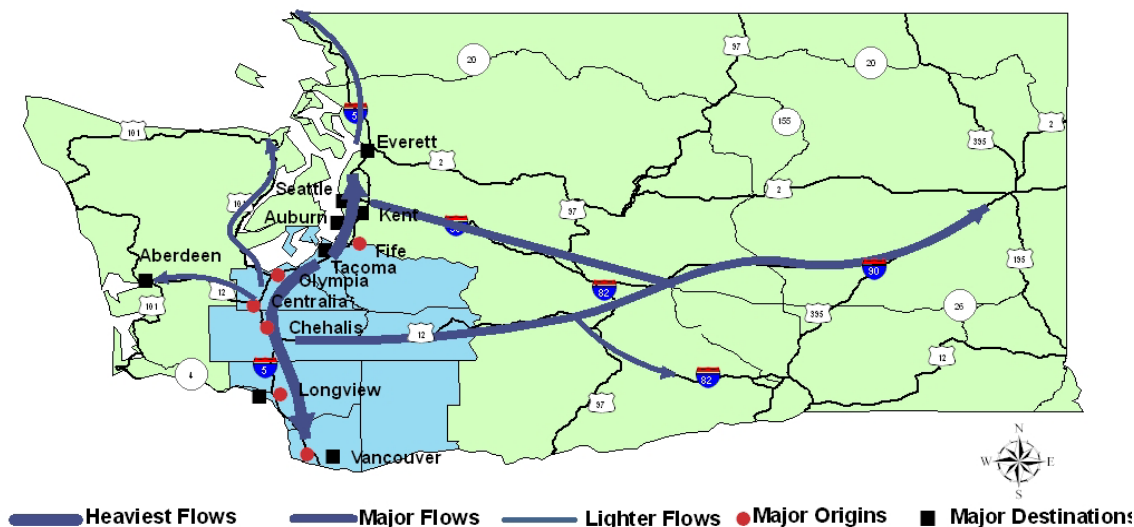
Table 2.31: Most Frequent Destinations for Truck Trips Originating in Pierce, Thurston, Lewis, Cowlitz, Clark and Skamania Counties

Destination	Avg. Daily Number of Trucks	Percentage of Total Trucks from Subregion
Western Washington	7,730	64.0%
Seattle	1,452	12.0%
Kent	1,043	8.6%
Longview	521	4.3%
Auburn	427	3.5%
Aberdeen	367	3.0%
Everett	267	2.2%
Tacoma	231	1.9%
Bellingham	212	1.8%
Other W. WA Cities	3,210	26.6%
Eastern Washington	1,052	8.7%
Yakima	191	1.6%
Spokane	162	1.3%
Other E. WA Cities	699	5.8%
Out of State	3,292	27.3%
Oregon	1,545	12.8%
British Columbia	618	5.1%
California	310	2.6%
Idaho	216	1.8%
Other States/Provinces	603	5.0%

Source: SFTA Freight Truck Origin and Destination Study

Freight traffic movements from Subregion 7 are centered along the I-5 corridor (Figure 2.16), into the Puget Sound area and south towards Portland, Oregon. Eastbound shipments usually follow I-90 to the north or I-82 in the south. Other state highways within the subregion are generally used as feeders into one of these major highway networks, or to coastal and Olympic Peninsula destinations.

Figure 2.16: Major Routes for Truck Trips Originating in Pierce, Thurston, Lewis, Cowlitz, Clark and Skamania Counties



Source: SFTA Freight Truck Origin and Destination Study

Subregion 8: Truck Trips Originating in Clallam, Jefferson, Mason, Grays Harbor, Pacific and Wahkiakum Counties

Each day, on average, almost 2,900 freight truck trips originate in the communities comprising Clallam, Jefferson, Mason, Grays Harbor, Pacific and Wahkiakum Counties. The port of Aberdeen and the nearby city of Hoquiam generate the largest volume of freight traffic within the subregion. Sequim and Port Townsend are also significant contributors to freight volumes within the area (Table 2.32). Most of the freight traffic involves the flow of goods and materials supporting the forest and paper products industries that are central to the economy of the subregion.

Almost all of the freight traffic movements originating in Subregion 8 are designated for destinations within Western Washington (Table 2.33). Port Angeles and Aberdeen are the most frequent terminal points for shipments originating within the subregion, due to the number of wood and paper processing plants concentrated in these two cities and port facilities that specialize in the handling of forest and paper products. Outside of the coastal and Olympic Peninsula area, Seattle is the most common destination for trips originating in Subregion 8.

Freight traffic moving to destinations in Eastern Washington from the 7-county region is negligible; on average, just over 40 trucks per day leave the area for destinations in the east region of the state. Out of state movements of freight comprise fewer than 19 percent of the total volumes generated in the subregion.

As in Subregion 7, most of the freight traffic in Clallam, Jefferson, Mason, Grays Harbor, Pacific and Wahkiakum Counties is oriented towards the I-5 corridor. For movements

within the subregion and to I-5, US 101 and US 12 are the primary routes used by long-haul freight trucks (see Figure 2.17).

Table 2.32: Most Frequent City Origins for Truck Trips Originating in Clallam, Jefferson, Mason, Grays Harbor, Pacific and Wahkiakum Counties

City of Origin	Avg. Daily Truck Trips
Aberdeen	689
Hoquiam	284
Sequim	235
Elma	202
Port Townsend	198
Shelton	191
Port Angeles	181
Cosmopolis	130
Montesano	104
Raymond	69

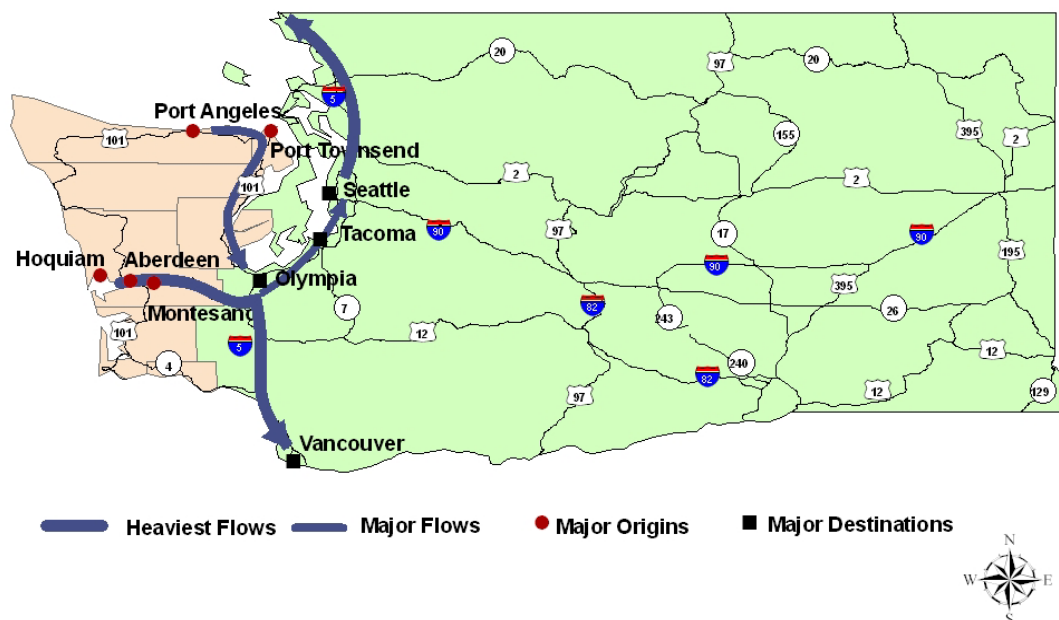
Source: SFTA Freight Truck Origin and Destination Study

Table 2.33: Most Frequent Destinations for Truck Trips Originating in Clallam, Jefferson, Mason, Grays Harbor, Pacific and Wahkiakum Counties

Destination	Avg. Daily Number of Trucks	Percentage of Total Trucks from Subregion
Western Washington	2,306	79.8%
Port Angeles	456	15.8%
Aberdeen	242	8.4%
Seattle	192	6.6%
Tacoma	155	5.4%
Shelton	129	4.5%
Elma	117	4.0%
Olympia	112	3.9%
Other W. WA Cities	903	31.2%
Eastern Washington	43	1.5%
Out of State	542	18.7%
Oregon	229	7.9%
British Columbia	119	4.1%
California	93	3.2%
Other States/Provinces	101	3.5%

Source: SFTA Freight Truck Origin and Destination Study

Figure 2.17: Major Routes for Truck Trips Originating in Clallam, Jefferson, Mason, Grays Harbor, Pacific and Wahkiakum Counties



Source: SFTA Freight Truck origin and Destination Study

Subregion 9: Truck Trips Originating in Whatcom, Skagit, Island, Snohomish, King and Kitsap Counties

On average, over 22,000 truck trips originate in Whatcom, Skagit, Island, Snohomish, King and Kitsap Counties every day. King County generates most of this traffic, with Seattle alone producing over 6,000 freight trips per day (Table 2.34). King County communities surrounding Seattle proper additionally contribute over 6,000 truck trips on a daily basis. Northern Puget Sound locales such as Everett, Bellingham, Marysville and Mount Vernon also generate significant freight truck volumes.

As is the case with the other Western Washington subregions, most of the freight traffic originating in Subregion 9 is destined for locations within the western region. However, the amount of freight designated for delivery to out of state destinations is significantly higher at 33.5 percent. This reflects the broader industrial economic base of the subregion, as well as the central role of Seattle in the distribution of goods to other states through its major deepwater port facilities. Almost half of all shipments moving products out of state are destined for Oregon; significant numbers of truck also move south to California and north to terminating points in British Columbia.

Table 2.34: Most Frequent City Origins for Truck Trips Originating in Whatcom, Skagit, Island, Snohomish, King and Kitsap Counties

City of Origin	Avg. Daily Truck Trips
Seattle	6,084
Kent	2,965
Everett	2,294
Auburn	1,155
Bellingham	976
Arlington	704
Marysville	651
Bellevue	503
Mount Vernon	493
Renton	443

Source: SFTA Freight Truck Origin and Destination Study

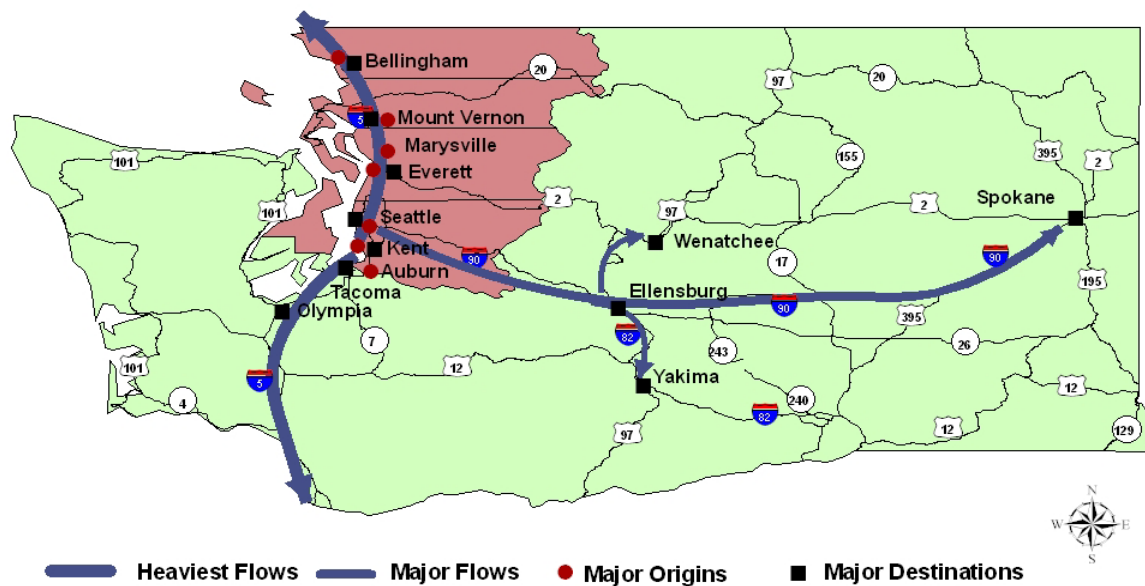
Western Washington freight traffic revolves around the I-5 corridor, and the counties of Whatcom, Skagit, Island, Snohomish, King and Kitsap are at the heart of this vital transportation corridor. Freight movements south to Oregon and California and north to British Columbia travel along the I-5 corridor (See Figure 2.18). Several smaller state highways are utilized for regional distribution, while I-90, I-82 and US 97 serve as connectors to Southern and Eastern Washington and beyond.

Table 2.35: Most Frequent Destinations for Truck Trips Originating in Whatcom, Skagit, Island, Snohomish, King and Kitsap Counties

Destination	Avg. Daily Number of Trucks	Percentage of Total Trucks from Subregion
Western Washington	13,059	58.7%
Tacoma	3,577	16.1%
Seattle	1,301	5.9%
Kent	628	2.8%
Bellingham	524	2.4%
Fife	513	2.3%
Mount Vernon	456	2.1%
Olympia	387	1.7%
Other W. WA Cities	5,673	25.5%
Eastern Washington	1,729	7.8%
Yakima	352	1.6%
Spokane	311	1.4%
Ellensburg	180	0.8%
Other E. WA Cities	886	4.0%
Out of State	7,449	33.5%
Oregon	3,289	14.8%
California	1,333	6.0%
British Columbia	1,175	5.3%
Other States/Provinces	1,652	7.4%

Source: SFTA Freight Truck Origin and Destination Study

Figure 2.18: Major Routes for Truck Trips Originating in Whatcom, Skagit, Island, San Juan, Snohomish, King and Kitsap Counties



Source: SFTA Freight Truck Origin and Destination Study

Characteristic Profile of Truck Trips Originating Outside of Washington

Most Frequent Origins

On average, over 22,700 trucks enter the state of Washington from origins outside of the state, from states on the East Coast, various Canadian provinces and some from Mexico. During the interview portion of this study, drivers indicated origins from 47 different states, including Alaska, the District of Columbia, 8 Canadian provinces and Mexico. Over one-third of all trucks entering Washington originate in the state of Oregon (Table 2.36). British Columbia and California are also major trip generators, with each contributing over 3,000 trucks per day to freight traffic in Washington.

Portland, Oregon is the most frequent city of origin for trucks coming from out of state. Daily, more than 3,200 truck trips enter Washington having originated in Portland. The Vancouver, British Columbia metropolitan region also produces large numbers of truck trips entering Washington from the north. Approximately 2,400 trucks cross the border from these Canadian locations each day. Hermiston, Oregon is also a major origination point for trucks coming from out of state, particularly in Eastern Washington. As noted previously in the section on Eastern Washington freight patterns, much of this traffic was associated with potato processing. Due to the closure of major processing plant in Hermiston, the continuation of these levels of trip generation is questionable.

Table 2.36: Major Out-of-State Trip Origins for Trucks Traveling on Washington Highways

Origin State/Province	Avg Daily Truck Trips	% of Total Out-of-State Trip Origins
Oregon	8,023	35%
British Columbia	3,728	16%
California	3,427	15%
Idaho	1,481	7%
Montana	797	4%
Alberta	381	3%
Utah	370	2%
Wisconsin	275	1%
Minnesota	257	1%
Other Western States	1,662	8%
Eastern States	1,683	8%
Total Out of State	22,726	100%

Source: SFTA Freight Truck Origin and Destination Study

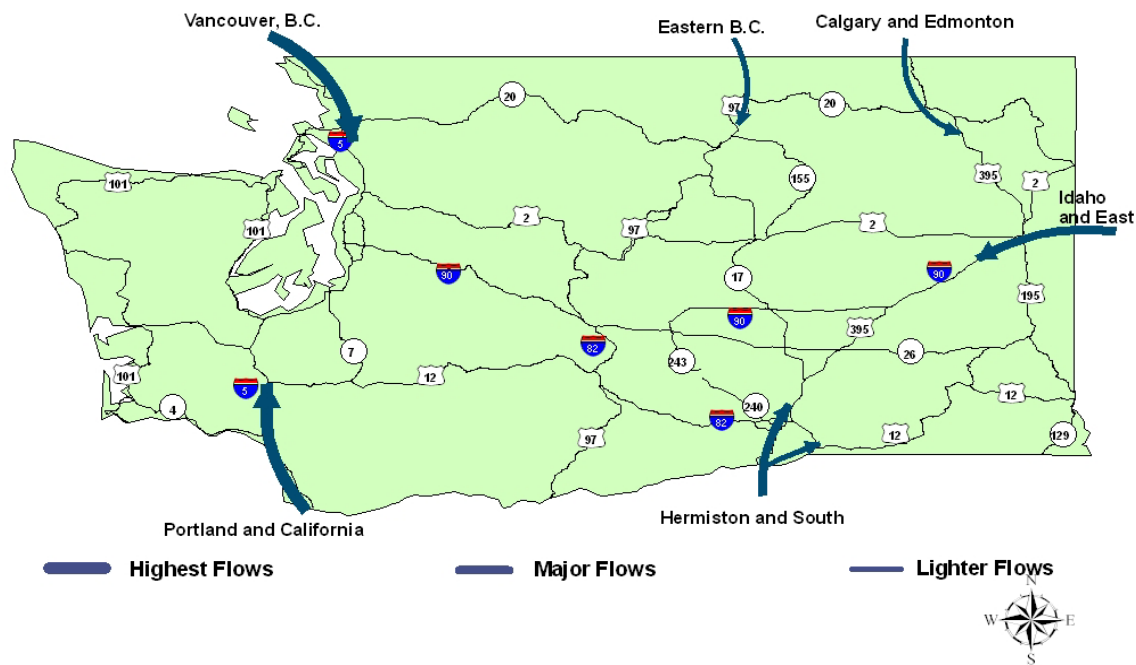
The major entry points for freight trips originating outside of Washington are illustrated in Figure 2.19.

Table 2.37: Major City Origins for Truck Trips Originating Outside Washington

Origin City, State/Province	Avg. Daily Truck Trips
Portland, Oregon	3,274
Vancouver, British Columbia	761
Hermiston, Oregon	540
Surrey, British Columbia	500
Delta, British Columbia	433
Los Angeles, California	333
Richmond, British Columbia	303
Coeur d'Alene, Idaho	261
Salem, Oregon	246
Abbotsford, British Columbia	246
Eugene, Oregon	236
Post Falls, Idaho	234
Albany, Oregon	195
Missoula, Montana	188
Langley, British Columbia	169

Source: SFTA Freight Truck Origin and Destination Study

Figure 2.19: Primary Entry Points for Trucks Crossing into Washington State

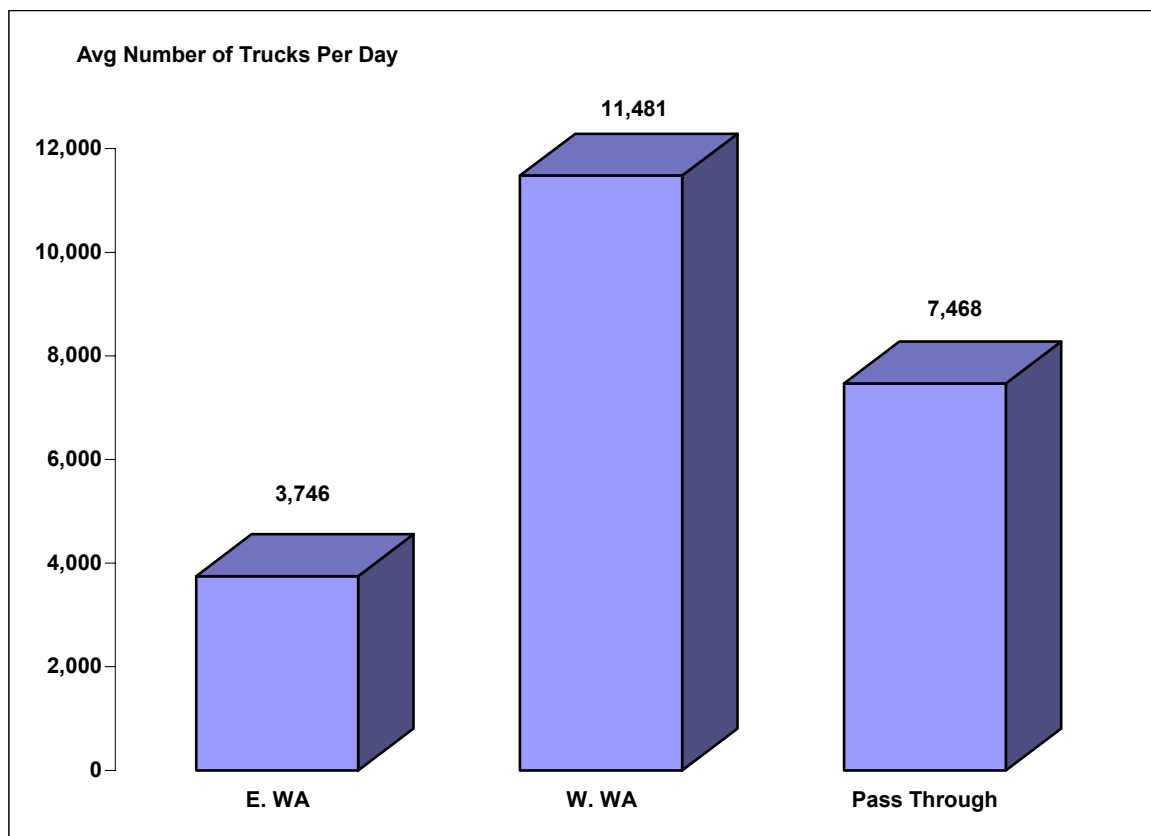


Source: SFTA Freight Truck Origin and Destination Study

Most Frequent Destinations

Chart 2.4 provides the regional breakdown of these out of state freight flows in Washington State. Over half of the shipments with out of state origins are destined to deliver within the Western Washington region, while only 16 percent terminate in Eastern Washington. A significant number of the out of state trucks are "pass-through;" these are trucks coming from out of state origins that have ultimate delivery destinations that are also out of state. Much of this traffic is comprised of international flows between businesses in Canada, especially British Columbia, and U.S. firms located in Oregon and California.

Chart 2.4: Regional Destinations of Trucks from Out-of-State on Washington Highways



Source: SFTA Freight Truck Origin and Destination Study

Freight truck trips originating outside of Washington have widely dispersed destinations within the various regions and cities of the state. Seattle, Tacoma, Spokane and Kent are the most likely destinations, with each receiving more than 1,000 trucks from out of state each day (Table 2.38).

Spokane is the primary destination for out-of-state freight shipping to Eastern Washington. Cities such as Yakima, Pasco and Kennewick were also cited as frequent terminal points within the eastern region. Freight moving into Eastern Washington usually enters the state from the south via I-82 near the Tri-Cities, or from the east along I-90 from Idaho into Spokane. Figure 2.20 provides an illustration of the average daily volumes of freight trips from outside of the state received by each Washington county.

Table 2.38: Washington Cities Reported Most Frequently as Destinations for Truck Trips Originating Out-of-State

Destination City	Avg. Number of Daily Truck Trips
Seattle	2,527
Tacoma	1,439
Spokane	1,282
Kent	1,247
Yakima	398
Sumner	368
Pasco	357
Longview	340
Bellingham	335
Everett	308
Bellevue	287
Fife	259
Renton	205
Olympia	185
Mount Vernon	172
Puyallup	172
Kennewick	168
Tukwila	167
Vancouver	159
Aberdeen	152

Source: SFTA Freight Truck Origin and Destination Study

Freight passing through Washington is usually destined for locations in Oregon or British Columbia. Trips terminating in Portland were cited most frequently in the driver interviews, followed by Vancouver, British Columbia. Both of these cities receive over 800 trucks per day that have traveled through the state of Washington (Table 2.39). Cities comprising the metropolitan area of Vancouver, British Columbia also attract large numbers of freight trips from out of state origins. Northbound volumes are significantly larger than any other geographical location, representing over one-third of the total pass-through freight truck trips.

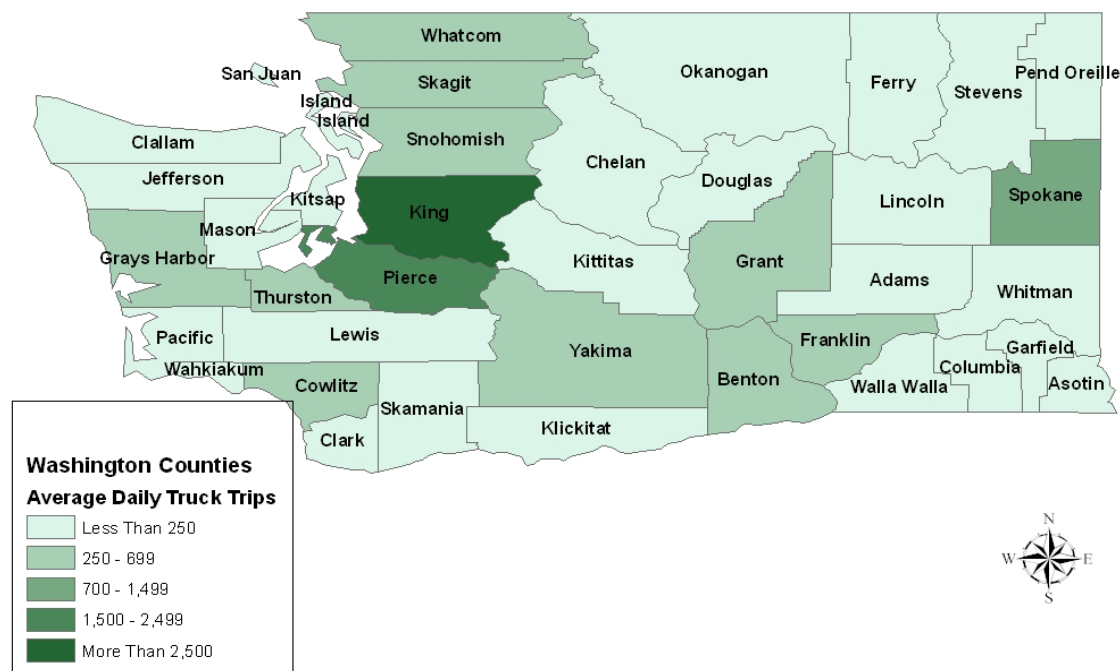
In Western Washington, most out-of-state trucks enter the state via the I-5 corridor; shipments from British Columbia typically cross the border at Blaine, while shipments from the south usually cross the Columbia River from Portland, Oregon to Vancouver. Figure 2.21 shows the typical routes utilized by freight trucks originating outside of Washington and a comparison of the average volumes of the freight flows on these routes.

Table 2.39: Most Frequent Out-of-State Destinations Reported for Truck Trips Passing Through Washington from Other States or Provinces

Destination City	Avg. Number of Daily Truck Trips
Portland, Oregon	836
Vancouver, British Columbia	809
Surrey, British Columbia	342
Delta, British Columbia	270
Richmond, British Columbia	219
Abbotsford, British Columbia	144
Burnaby, British Columbia	137
Langley, British Columbia	125
Los Angeles, California	110
Hermiston, Oregon	95

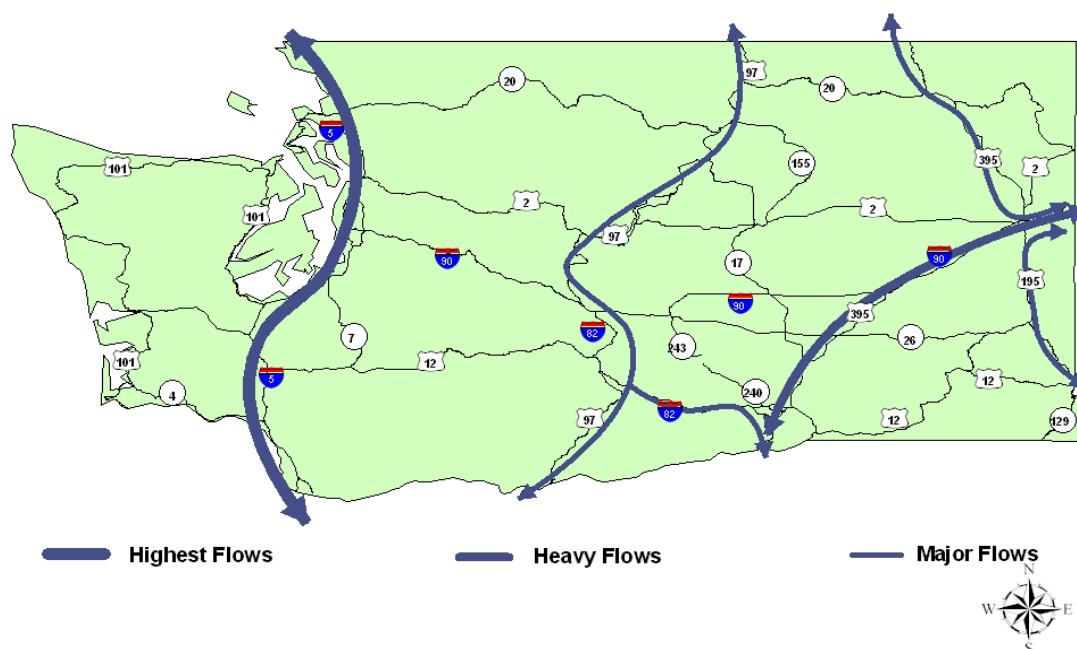
Source: SFTA Freight Truck Origin and Destination Study

Figure 2.20: Overview of Destinations Within Washington State for Truck Trips Originating Outside of the State



Source: SFTA Freight Truck Origin and Destination Study

Figure 2.21: Major Freight Corridors for Trucks Passing Through Washington State to Destinations Outside the State



Source: SFTA Freight Truck Origin and Destination Study

Cargo Value and Tonnage of Freight Shipped from Origins Outside Washington State

Tables 2.40 - 2.42 on pages 63 - 65 provide detailed information on the commodity content and cargo value of freight traveling on Washington highways that originates outside the state. Trucks delivering to Eastern Washington carry more products classified as agricultural goods or inputs as a percentage of total freight than trucks delivering in Western Washington. However, there is a higher percentage of trucks carrying timber and forest products to locations in the western region (approximately 16 percent) than to the east (about 11.6 percent). There are more deliveries of industrial and mechanical goods from out of state origins to destinations in Western Washington, while more raw materials and commodity goods are delivered to Eastern Washington.

Freight that is passing through the state is highly concentrated. Most of the cargo weight being transported through the state is from timber and forestry products traveling south from British Columbia to processing sites in Oregon, or it is the movement of seasonal fresh fruits and vegetables moving to and from distribution points in Canada, Oregon, California and other states. This freight traffic is generally of low-to-moderate value, traveling over relatively short inter-state distances within the Pacific Northwest.

The economic value of cargo of shipments from out of state, expressed in dollar terms, is significantly higher to destinations in Western Washington. This is due to the larger market for consumer goods (mixed freight), office and electronic equipment, technical

instruments and machinery. On an average day, cargo valued at approximately \$525 million is delivered to destinations in Western Washington from outside the state; Eastern Washington receives about \$112 million each day. The value of cargo traveling through state is also highly concentrated. High-value goods such as machinery, electronic and office equipment, transportation equipment, motor vehicles and manufactured goods comprise almost half of the value of all goods shipping through the state.

Table 2.40: Cargo Content for Truck Trips Originating Out-of-State with Eastern Washington Destinations

Commodity description	Avg Daily Tons	% of Total Tons	Avg Daily Value	% of Total Value
Live animals and live fish	961	1.20%	1,002,122	0.89%
Cereal grains	643	0.80%	123,457	0.11%
Other agricultural products	6,575	8.21%	5,339,196	4.75%
Animal feed and products of animal origin (NEC)	969	1.21%	283,099	0.25%
Meat, fish, seafood, and their preparations	470	0.59%	1,192,182	1.06%
Milled grain products, preparations, and bakery products	1,395	1.74%	1,625,888	1.45%
Other prepared foodstuffs and fats and oils	4,705	5.87%	5,532,153	4.92%
Alcoholic beverages	787	0.98%	3,092,884	2.75%
Tobacco products	4	0.01%	51,575	0.05%
Monumental or building stone	93	0.12%	18,342	0.02%
Natural sands	318	0.40%	6,127	0.01%
Gravel and crushed stone	260	0.32%	1,675	0.00%
Nonmetallic minerals (NEC)	634	0.79%	57,991	0.05%
Metallic ores and concentrates	336	0.42%	138,936	0.12%
Gasoline and aviation turbine fuel	562	0.70%	126,685	0.11%
Fuel oils	70	0.09%	13,702	0.01%
Coal and petroleum products (NEC)	252	0.31%	77,318	0.07%
Basic chemicals	335	0.42%	212,025	0.19%
Fertilizers	1,152	1.44%	181,218	0.16%
Chemical products and preparations (NEC)	216	0.27%	428,643	0.38%
Plastics and rubber	657	0.82%	1,681,207	1.50%
Logs and other wood in the rough	490	0.61%	55,085	0.05%
Wood products	7,269	9.07%	2,000,051	1.78%
Pulp, newsprint, paper, and paperboard	1,360	1.70%	1,079,167	0.96%
Paper or paperboard articles	210	0.26%	203,965	0.18%
Printed products	362	0.45%	1,237,859	1.10%
Textiles, leather, and articles of textiles or leather	462	0.58%	3,214,783	2.86%
Nonmetallic mineral products	1,086	1.36%	213,122	0.19%
Base metal in primary or semifinished forms and in finished basic shapes	1,269	1.58%	1,765,827	1.57%
Articles of base metal	405	0.51%	1,445,895	1.29%
Machinery	1,072	1.34%	10,582,522	9.42%
Electronic and other electrical equipment and components and office equipment	470	0.59%	9,593,757	8.54%
Motorized and other vehicles (including parts)	1,108	1.38%	8,131,635	7.24%
Transportation equipment (NEC)	83	0.10%	4,390,200	3.91%
Precision instruments and apparatus	59	0.07%	2,928,053	2.61%
Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	371	0.46%	1,654,772	1.47%
Miscellaneous manufactured products	1,340	1.67%	3,904,113	3.47%
Waste and scrap	949	1.18%	193,372	0.17%
Mixed freight	5,128	6.40%	10,714,099	9.54%
Commodity unknown	3,821	4.77%	3,021,217	2.69%
Commodity unknown	31,420	39.21%	24,845,971	22.11%
	80,129	100.00%	112,361,891	100.00%

Source: SFTA Freight Truck Origin and Destination Study and Bureau of Transportation Statistics

Table 2.41: Cargo Content for Truck Trips Originating Out-of-State with Western Washington Destinations

Commodity description	Avg Daily Tons	% of Total Tons	Avg Daily Value	% of Total Value
Live animals and live fish	471	0.28%	490,781	0.09%
Cereal grains	47	0.03%	8,940	0.00%
Other agricultural products	8,743	5.24%	7,067,205	1.35%
Animal feed and products of animal origin (NEC)	2,990	1.79%	1,233,412	0.24%
Meat, fish, seafood, and their preparations	7,798	4.68%	19,410,276	3.70%
Milled grain products, preparations, and bakery products	4,889	2.93%	8,201,861	1.56%
Other prepared foodstuffs and fats and oils	10,772	6.46%	14,413,526	2.75%
Alcoholic beverages	3,709	2.22%	13,901,443	2.65%
Tobacco products	180	0.11%	2,384,303	0.45%
Monumental or building stone	500	0.30%	81,782	0.02%
Natural sands	533	0.32%	10,056	0.00%
Gravel and crushed stone	203	0.12%	1,342	0.00%
Nonmetallic minerals (NEC)	1,044	0.63%	91,970	0.02%
Metallic ores and concentrates	463	0.28%	161,707	0.03%
Gasoline and aviation turbine fuel	158	0.09%	36,091	0.01%
Fuel oils	425	0.25%	83,170	0.02%
Coal and petroleum products (NEC)	873	0.52%	472,100	0.09%
Basic chemicals	2,517	1.51%	1,373,692	0.26%
Pharmaceutical products	397	0.24%	9,009,682	1.72%
Fertilizers	602	0.36%	93,651	0.02%
Chemical products and preparations (NEC)	3,841	2.30%	7,577,898	1.44%
Plastics and rubber	3,402	2.04%	8,919,887	1.70%
Logs and other wood in the rough	2,783	1.67%	312,981	0.06%
Wood products	14,741	8.84%	5,921,379	1.13%
Pulp, newsprint, paper, and paperboard	7,190	4.31%	5,882,554	1.12%
Paper or paperboard articles	2,465	1.48%	2,935,666	0.56%
Printed products	2,369	1.42%	7,932,952	1.51%
Textiles, leather, and articles of textiles or leather	2,757	1.65%	26,957,793	5.14%
Nonmetallic mineral products	8,511	5.10%	3,587,142	0.68%
Base metal in primary or semifinished forms and in finished basic shapes	3,010	1.80%	4,067,761	0.78%
Articles of base metal	3,258	1.95%	8,584,788	1.64%
Machinery	3,714	2.23%	36,120,996	6.88%
Electronic, other electrical equipment, components and office equipment	4,746	2.85%	148,457,652	28.29%
Motorized and other vehicles (including parts)	3,591	2.15%	25,351,329	4.83%
Transportation equipment (NEC)	659	0.39%	53,845,798	10.26%
Precision instruments and apparatus	7	0.00%	218,378	0.04%
Furniture, mattresses & mattress supports, lamps, lighting fittings, & illuminated signs	3,358	2.01%	15,019,537	2.86%
Miscellaneous manufactured products	6,242	3.74%	23,676,114	4.51%
Waste and scrap	3,676	2.20%	1,423,190	0.27%
Mixed freight	21,913	13.14%	45,788,221	8.73%
Commodity unknown	17,249	10.34%	13,640,128	2.60%
	166,795	100.00%	524,749,133	100.00%

Source: SFTA Freight Truck Origin and Destination Study and Bureau of Transportation Statistics

Table 2.42: Cargo Content for Trucks Passing Through Washington En Route to Other States or Provinces

Commodity description	Avg Daily Tons	% of Total Tons	Avg Daily Value	% of Total Value
Live animals and live fish	624	0.53%	650,599	0.28%
Cereal grains	215	0.18%	41,337	0.02%
Other agricultural products	16,971	14.53%	12,687,833	5.39%
Animal feed and products of animal origin (NEC)	974	0.83%	370,717	0.16%
Meat, fish, seafood, and their preparations	1,781	1.52%	4,266,451	1.81%
Milled grain products, preparations, and bakery products	2,221	1.90%	2,775,180	1.18%
Other prepared foodstuffs and fats and oils	6,020	5.15%	7,747,948	3.29%
Alcoholic beverages	2,197	1.88%	6,841,692	2.91%
Monumental or building stone	149	0.13%	24,860	0.01%
Natural sands	495	0.42%	9,523	0.00%
Gravel and crushed stone	195	0.17%	1,292	0.00%
Nonmetallic minerals (NEC)	533	0.46%	48,696	0.02%
Metallic ores and concentrates	91	0.08%	24,330	0.01%
Gasoline and aviation turbine fuel	216	0.18%	51,297	0.02%
Fuel oils	923	0.79%	180,719	0.08%
Coal and petroleum products (NEC)	341	0.29%	164,284	0.07%
Basic chemicals	1,468	1.26%	807,148	0.34%
Pharmaceutical products	0	0.00%	0	0.00%
Fertilizers	1,585	1.36%	256,996	0.11%
Chemical products and preparations (NEC)	2,872	2.46%	5,270,273	2.24%
Plastics and rubber	2,772	2.37%	7,730,363	3.28%
Logs and other wood in the rough	781	0.67%	85,060	0.04%
Wood products	19,793	16.94%	8,064,486	3.43%
Pulp, newsprint, paper, and paperboard	6,261	5.36%	4,692,923	1.99%
Paper or paperboard articles	1,956	1.67%	2,194,757	0.93%
Printed products	1,574	1.35%	5,053,965	2.15%
Textiles, leather, and articles of textiles or leather	1,159	0.99%	11,118,573	4.72%
Nonmetallic mineral products	4,540	3.89%	3,242,021	1.38%
Base metal in primary or semifinished forms and in finished basic shapes	3,222	2.76%	3,500,362	1.49%
Articles of base metal	1,592	1.36%	4,288,409	1.82%
Machinery	2,769	2.37%	22,630,224	9.61%
Electronic and other electrical equipment and components and office equipment	1,513	1.30%	41,854,111	17.78%
Motorized and other vehicles (including parts)	3,224	2.76%	22,276,144	9.46%
Transportation equipment (NEC)	363	0.31%	7,984,839	3.39%
Precision instruments and apparatus	11	0.01%	818,225	0.35%
Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	1,336	1.14%	5,983,128	2.54%
Miscellaneous manufactured products	4,439	3.80%	17,326,112	7.36%
Waste and scrap	1,706	1.46%	278,467	0.12%
Mixed freight	7,579	6.49%	15,836,832	6.73%
Commodity unknown	10,350	8.86%	8,184,626	3.48%
	116,815	100.00%	235,364,800	100.00%

Source: SFTA Freight Truck Origin and Destination Study and Bureau of Transportation Statistics

Type of Facility at Place of Origin and Destination

Facility types at origin and destination points for freight shipments coming from outside of Washington are detailed in Tables 2.43 and 2.44. Over 60 percent of freight trucks traveling across the state line began at factories or warehouses. A significant number of trucks began at truck terminals or were classified as unknown. Less than 3 percent of all freight trucks began their trips at intermodal facilities (rail, marine or air terminals) outside of the state.

Table 2.43: Type of Facility at Place of Origin for Truck Trips Originating Outside of Washington

Type of Facility	Avg. Daily Number of Trips	% of All Trips
Unknown/Other	2,967	13.1%
Truck Terminal	3,692	16.3%
Rail Terminal	289	1.3%
Marine Terminal	268	1.2%
Air Terminal	101	0.4%
Factory	5,763	25.4%
Warehouse/Distribution Center	8,125	35.8%
Farm	808	3.6%
Point of Sale/Consumption	687	2.9%

Source: SFTA Freight Truck Origin and Destination Study

Factories and distribution centers were also the most frequently cited destinations for trucks traveling from out of state. As expected, deliveries to points of sale or consumption are also numerous, accounting for almost 12 percent of the total terminal points. Intermodal freight destinations are slightly more popular as destinations than origins, but only comprise 3.5 percent of the total freight coming from outside Washington. Most intermodal freight traffic is from British Columbia or Oregon, where the distances to Washington intermodal facilities are the shortest (Table 2.45). Key intermodal connections for shipments originating out of state are noted in Figure 2.22.

Table 2.44: Type of Facility at Place of Destination for Truck Trips Originating Outside of Washington

Type of Facility	Avg. Daily Number of Trips	% of All Trips
Unknown/Other	3,761	16.5%
Truck Terminal	2,333	10.3%
Rail Terminal	174	0.8%
Marine Terminal	659	2.9%
Air Terminal	134	0.6%
Factory	3,025	13.3%
Warehouse/Distribution Center	9,443	41.6%
Farm	517	2.3%
Point of Sale/Consumption	2,655	11.7%

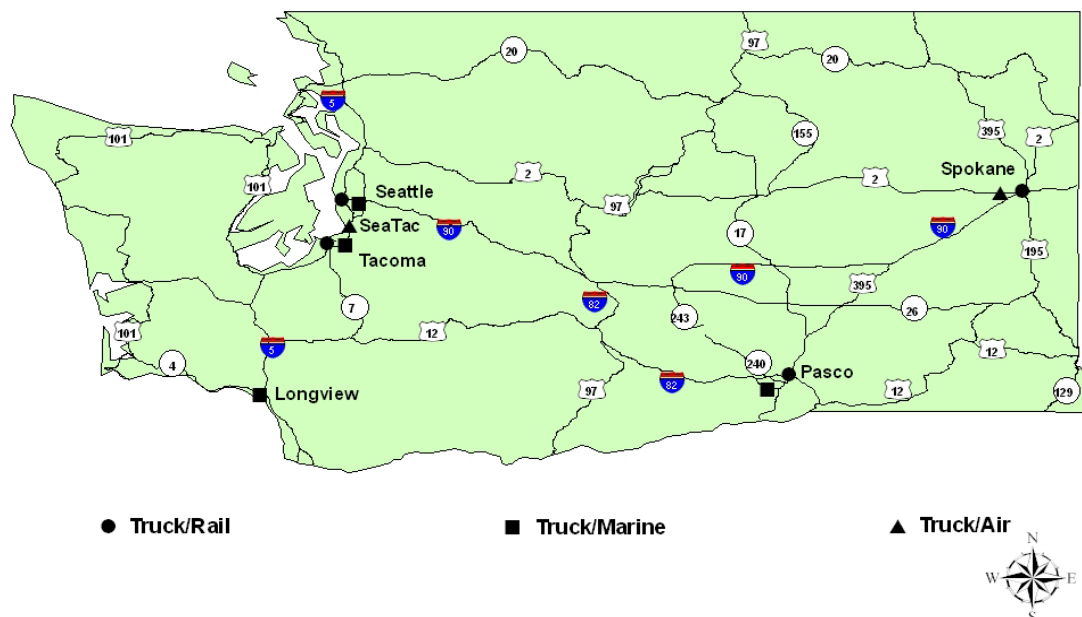
Source: SFTA Freight Truck Origin and Destination Study

Table 2.45: States and Provinces with the Most Frequent Connections to Washington Intermodal Facilities⁹

State of Origin	Avg. Daily Trips
British Columbia	363
Oregon	221
California	58
Idaho	40

Source: SFTA Freight Truck Origin and Destination Study

Figure 2.22: Key Intermodal Connections for Truck Trips Originating Outside Washington State



Source: SFTA Freight Truck Origin and Destination Study

⁹ Intermodal facilities are defined as destinations to rail, marine or air terminals

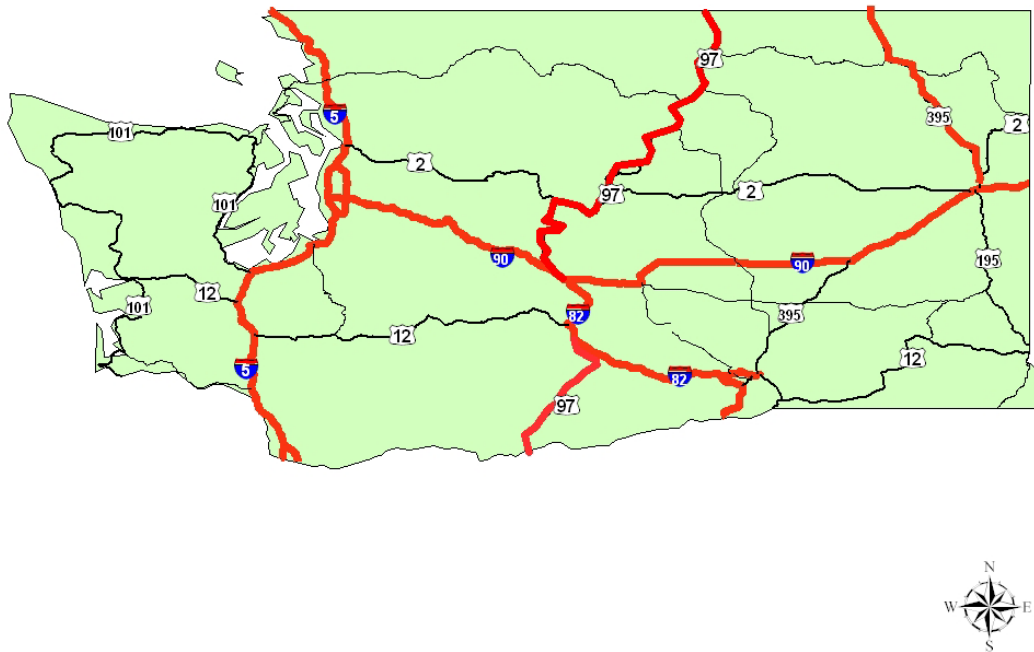
Section 3: Analysis of Commodity Content on Major Washington Freight Corridors

This report provides a comprehensive and systematic analysis of statewide commodity flows on Washington state highways. Such analysis provides a basis for understanding current freight transportation needs within the state, and for evaluating future public expenditures on transportation infrastructure. Knowledge of the seasonality of commodity flows, the mean weights and configurations of vehicles transporting various commodities on state highways, and the movements between and within the state regions is crucial in determining the time and place of such expenditures. Identification of the commodities being shipped in and through the state allows forecasts of future freight volumes to be made according to projections of output growth for these goods. The attachment of financial values to the movement of these commodity classes underscores the significant importance of efficient freight transportation to the economy of Washington.

This section provides analysis of commodity flows along five major freight corridors in Washington State (I-5, I-82, I-90, US 97 and US 395). Each of these corridors is a primary component of the intra-state freight transportation network. Moreover, major entry points for goods traveling from outside of Washington are located on these highways. Information regarding other important roadways within the state has been documented in Section 2 of this report. Specific applications of the Strategic Freight Transportation Analysis database in understanding local and regional freight movements have been done in conjunction with this origin and destination study. Examples of these studies and use of the database will be made public in a future publication.¹⁰ The five freight corridors analyzed in this study are noted in Figure 3.1.

¹⁰ The report will be available on-line at <http://www.sfta.wsu.edu>. The tentative title is "Applications and Analysis Using the Freight Origin and Destination Survey Database."

Figure 3.1: Key Highway Freight Corridors in Washington State



Source: SFTA Freight Truck Origin and Destination Study

Comparative Analysis of Cargo Content on Washington State Highways

The commodity mix on major freight corridors by percentage is detailed in Table 3.1 below. As can be expected, substantial differences do exist between the cargo mixes found on each major highway. However, significant similarities also can be found, perhaps indicating increasing diversity and dispersion in the economic base of Washington, and the importance of Washington's freight transportation network to the efficient flow of diverse products internationally, nationally, throughout the Pacific Northwest and locally within Washington State. The highlights for each major corridor are noted below.

Interstate 5

Interstate 5 is the workhorse of Washington's freight transportation system. This highway passes through the primary concentration of population and industry within Washington state, is in very close proximity to the two largest deep-water marine ports in the state (and two of the largest on the US Pacific coast), and is the primary roadway for goods flowing south from Canada, or north from Oregon and California into the state. I-5 is also a major corridor utilized by the communities involved in the timber and forest products industries on the Olympic Peninsula.

Due to the large population centers situated along Interstate 5, mixed freight and truckloads classified as unknown (assumed to be primarily mixed consumer commodities) comprise the largest percentage of freight trucks on the highway. As noted above, timber and forest products are a major component of I-5 freight traffic,

accounting for almost 20 percent of the truck volume on the highway. Industrial inputs and finished goods are also large generators of freight truck traffic along the I-5 corridor.

Interstate 82

Interstate 82 is the primary transportation route for the agricultural industry in south-central Washington State. Almost one-third of the freight trucks on Interstate 82 carry agricultural products, either in raw or processed form. I-82 carries raw fruits and vegetables from regional farms in Washington and Oregon to processors and wholesalers in both states. This interstate movement of agricultural commodities is the leading generator of freight traffic all along this corridor. Additional freight traffic is generated by the distribution of consumer products to the communities of south-central Washington and by the transportation of machinery and equipment utilized in agricultural production and processing.

Interstate 90

Interstate 90 is the second most important freight corridor in Washington and covers the greatest geographical extent. The highway serves to integrate the agricultural producers of Eastern Washington with the manufacturing and port facilities in the west. Approximately 28 percent of the freight traffic on the I-90 corridor is comprised of agricultural products. An additional 19 percent of the truck traffic is carrying industrial inputs and finished goods along I-90. Most of this traffic moves from the east to the west and the ports in Seattle and Tacoma, but the Spokane area also attracts large numbers of such freight flows.

US 97

This freight corridor is a major north-south route for agricultural producers east of the Cascades. One-quarter of all freight trucks on US 97 are carrying agricultural products, more than any other freight corridor in Washington State. US 97 is the primary freight corridor for apples and other fruits produced in the state. Large numbers of forest products moving south from British Columbia and from northern Washington also move along US 97. Such shipments represent approximately 14 percent of all trucks on the highway. As a result of the small and widely dispersed population in the regions served by US 97, mixed and unknown freight (assumed to be mostly consumer commodities) comprise a smaller percentage of total freight volume than on any other major freight corridor.

US 395 North of Spokane

The portion of US 395 north of Spokane is the shortest major freight corridor analyzed in this study, with the lowest freight truck volumes. However, this highway provides a vital link for movements of timber and forestry products from Canada, the Idaho Panhandle and northeastern Washington. The highway also carries other basic materials such as base metals, sands, gravel and stone from these same regions. A more specific analysis of the directional movements of freight along US 395 is forthcoming and will be part of the SFTA Research Report series.

Table 3.1: Commodity Mix on Major Washington Freight Corridors by Percentage

Commodity description	Statewide	I5	I82	I90	US97	US 395
Live animals and live fish	0.57%	0.47%	1.17%	0.68%	0.97%	1.07%
Cereal grains	0.17%	0.02%	0.19%	0.32%	0.26%	0.78%
Other agricultural products	8.52%	5.97%	16.64%	10.83%	28.61%	15.17%
Animal feed and products of animal origin (NEC)	1.75%	1.63%	1.93%	3.56%	1.90%	1.85%
Meat, fish, seafood, and their preparations	2.65%	2.74%	3.43%	3.37%	0.52%	2.00%
Milled grain products, preparations, and bakery products	2.03%	1.65%	2.15%	2.90%	1.11%	3.53%
Other prepared foodstuffs and fats and oils	5.87%	5.26%	7.20%	6.81%	5.66%	8.65%
Alcoholic beverages	1.26%	1.38%	1.36%	1.04%	1.15%	0.98%
Tobacco products	0.02%	0.00%	0.04%	0.06%	0.00%	0.04%
Monumental or building stone	0.44%	0.39%	0.14%	0.30%	0.37%	0.40%
Natural sands	0.41%	0.37%	0.25%	0.39%	0.13%	0.47%
Gravel and crushed stone	0.42%	0.46%	0.29%	0.19%	0.27%	0.19%
Nonmetallic minerals (NEC)	0.40%	0.38%	0.70%	0.42%	0.54%	0.51%
Metallic ores and concentrates	0.15%	0.15%	0.25%	0.21%	0.23%	0.09%
Gasoline and aviation turbine fuel	1.03%	0.97%	0.74%	0.78%	1.13%	0.28%
Fuel oils	0.30%	0.33%	0.00%	0.27%	0.18%	0.35%
Coal and petroleum products (NEC)	0.36%	0.32%	0.09%	0.36%	0.21%	0.35%
Basic chemicals	1.64%	1.85%	1.56%	1.37%	0.49%	1.10%
Pharmaceutical products	0.12%	0.14%	0.08%	0.10%	0.00%	0.15%
Fertilizers	0.52%	0.25%	0.56%	0.73%	0.49%	1.42%
Chemical products and preparations (NEC)	1.07%	1.19%	1.09%	0.91%	0.58%	0.75%
Plastics and rubber	2.14%	2.25%	2.62%	2.14%	1.97%	2.27%
Logs and other wood in the rough	3.06%	2.72%	0.68%	0.54%	2.25%	0.60%
Wood products	9.84%	10.31%	5.85%	8.01%	11.31%	9.39%
Pulp, newsprint, paper, and paperboard	3.87%	4.27%	1.92%	2.99%	0.89%	3.86%
Paper or paperboard articles	2.07%	2.49%	1.61%	1.49%	1.24%	1.28%
Printed products	1.39%	1.59%	1.41%	1.44%	0.24%	0.95%
Textiles, leather, and articles of textiles or leather	1.39%	1.48%	1.84%	1.49%	0.96%	1.36%
Nonmetallic mineral products	3.45%	3.71%	2.57%	3.14%	3.85%	2.53%
Base metal in primary or semifinished forms and in finished basic shapes	2.12%	2.26%	2.23%	2.25%	2.11%	1.86%
Articles of base metal	1.97%	2.10%	1.26%	1.63%	1.34%	1.65%
Machinery	2.90%	3.06%	2.70%	3.15%	2.07%	2.28%
Electronic and other electrical equipment and components and office equipment	2.15%	2.31%	2.90%	2.32%	1.33%	1.94%
Motorized and other vehicles (including parts)	3.44%	3.42%	3.60%	4.39%	3.02%	3.46%
Transportation equipment (NEC)	0.55%	0.58%	0.97%	0.94%	0.35%	0.60%
Precision instruments and apparatus	0.11%	0.13%	0.16%	0.09%	0.00%	0.15%
Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	1.79%	1.86%	1.55%	2.02%	0.94%	1.37%
Miscellaneous manufactured products	4.32%	4.65%	4.80%	4.59%	4.25%	4.06%
Waste and scrap	2.16%	2.24%	0.69%	1.38%	1.82%	1.35%
Mixed freight	11.94%	12.16%	14.26%	12.91%	7.00%	13.23%
Commodity unknown	9.64%	10.48%	6.54%	7.48%	8.24%	5.70%

Source: SFTA Freight Truck Origin and Destination Study

Mean Cargo Tonnage by Commodity

Information and analysis of the total freight cargo tonnage moving along state highways is important when assessing current and future infrastructure needs and investment priorities. For example, roadways that have frequent movement of heavy vehicles will experience faster-than-normal deterioration than highways that have infrequent truck movements or lighter average payload weights. Highways that have frequent truck movements and heavier average payload weights may require more frequent repairs or special infrastructure to support such traffic. Cargo content is a primary component of the expectations of average cargo payload weights.

During the roadside interviews conducted for this study, drivers were asked to provide information regarding the commodity they were carrying and the average payload weight on their vehicle. Using this information and the weighting factors described in Strategic Freight Transportation Analysis Report Number 2, *“Freight Truck Origin and Destination Study: Methods, Procedures and Data Dictionary,”* a profile of mean cargo weights by commodity classification was constructed. The results are presented in Table 3.2.

Freight trucks carrying agricultural and forest products have the highest mean cargo tonnage on Washington highways. Stone, sand, petroleum and coal also have high average tonnage per truckload. High-value goods such as precision instruments, electronic and office equipment, pharmaceuticals and consumer goods have some of the lowest mean cargo tonnage on freight trucks.

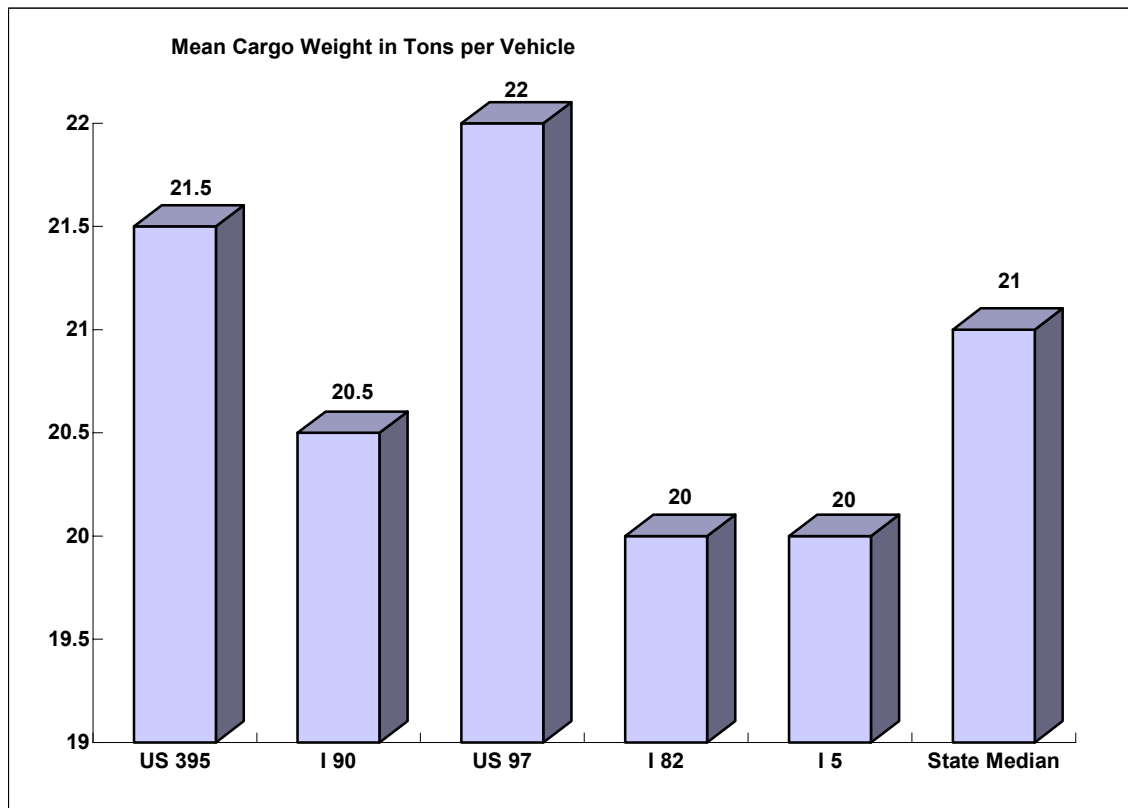
Freight corridors that have large numbers of heavy trucks moving along their highways are more likely to experience roadway surface and subsurface deterioration. Since heavier average payload weights are associated with agriculture, timber and other basic commodities, highways serving as major freight corridors for producers and processors of these goods do have higher mean payloads than other major freight corridors. Chart 3.1 presents the mean cargo weights for freight trucks traveling on the five major freight corridors in Washington State. US 395 and US 97 have the highest mean cargo weights, reflecting the large numbers of trucks carrying agricultural and timber products on those roadways. The lowest mean cargo weights are found on I-5 and I-82, where high-value, low-weight goods such as consumer commodities, electronics and processed agricultural products are more common payloads.

Table 3.2: Comparison of Mean Cargo Tonnage per Truck for Selected Commodities

Commodity description	Mean Tonnage
Cereal grains	30.1
Logs and other wood in the rough	29.2
Gasoline and aviation turbine fuel	28.2
Fertilizers	27.4
Monumental or building stone	25.4
Natural sands	25.4
Animal feed and products of animal origin (NEC)	25.3
Wood products	24.2
Gravel and crushed stone	24.1
Coal and petroleum products (NEC)	23.5
Pulp, newsprint, paper, and paperboard	23.5
Nonmetallic minerals (NEC)	23.4
Live animals and live fish	22.9
Other agricultural products	22.3
Milled grain products, preparations, and bakery products	21.4
Metallic ores and concentrates	21.4
Nonmetallic mineral products	21.2
Alcoholic beverages	21.0
Other prepared foodstuffs and fats and oils	21.0
Chemical products and preparations (NEC)	20.1
Waste and scrap	20.0
Fuel oils	20.0
Meat, fish, seafood, and their preparations	18.6
Base metal in primary or semifinished forms and in finished basic shapes	18.4
Tobacco products	18.3
Commodity unknown	18.2
Basic chemicals	18.2
Paper or paperboard articles	17.5
Printed products	17.2
Mixed freight	15.1
Miscellaneous manufactured products	14.2
Machinery	14.0
Plastics and rubber	13.8
Motorized and other vehicles (including parts)	13.3
Textiles, leather, and articles of textiles or leather	13.3
Pharmaceutical products	13.2
Electronic and other electrical equipment and components and office equipment	12.7
Articles of base metal	12.2
Transportation equipment (NEC)	12.1
Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	10.7
Precision instruments and apparatus	9.0

Source: SFTA Freight Truck Origin and Destination Study

Chart 3.1: Mean Cargo Weight of Vehicles on Major Washington Freight Corridors



Source: SFTA Freight Truck Origin and Destination Study

Analysis and Implications of Multiple Trailer Configurations on Key Freight Corridors in Washington State

Freight vehicles with multiple trailers or other long-length configurations pose a special problem for highway planning and maintenance scheduling. Multiple trailer configurations are usually associated with heavier cargoes, which implies higher road wear on those freight corridors that experience larger volumes of such traffic than normal. These truck configurations also present a safety concern on two-lane highways and in congested urban traffic in the state's major population centers.

Information regarding these truck configurations and the commodity cargoes associated with them is presented in Table 3.3 and Table 3.4. Freight trucks carrying agricultural and forestry products have the highest percentage of multiple-trailer and large-length configurations. Almost 42 percent of all freight trucks carrying cereal grains have multiple trailers, with almost all of the trucks carrying cereals having configurations of 5 or more axles. While only 7 percent of trucks carrying logs and wood in the rough use multiple trailers, over 73 percent have configurations of 5 or more axles, usually carrying newly felled timbers and logs of pole length to and from lumber mills around the state. Trucks carrying finished goods and consumer products typically utilize multiple trailers less than 10 percent of the time.

Table 3.3: Multiple Trailer Vehicle Percentage by Selected Commodities

Commodity description	% of Vehicles with Multiple Trailers
Live animals and live fish	8.36%
Cereal grains	41.77%
Other agricultural products	5.90%
Animal feed and products of animal origin (NEC)	23.28%
Meat, fish, seafood, and their preparations	1.63%
Milled grain products, preparations, and bakery products	12.35%
Other prepared foodstuffs and fats and oils	6.46%
Alcoholic beverages	0.98%
Monumental or building stone	24.14%
Natural sands	12.28%
Gravel and crushed stone	4.02%
Nonmetallic minerals (NEC)	18.72%
Metallic ores and concentrates	6.72%
Gasoline and aviation turbine fuel	10.72%
Fuel oils	18.53%
Coal and petroleum products (NEC)	22.11%
Basic chemicals	7.92%
Pharmaceutical products	9.01%
Fertilizers	37.01%
Chemical products and preparations (NEC)	16.43%
Plastics and rubber	9.16%
Logs and other wood in the rough	7.08%
Wood products	24.50%
Pulp, newsprint, paper, and paperboard	3.71%
Paper or paperboard articles	11.11%
Printed products	6.28%
Textiles, leather, and articles of textiles or leather	3.86%
Nonmetallic mineral products	20.54%
Base metal in primary or semifinished forms and in finished basic shapes	8.23%
Articles of base metal	1.70%
Machinery	2.17%
Electronic, other electrical equipment, components and office equipment	4.56%
Motorized and other vehicles (including parts)	2.70%
Transportation equipment (NEC)	4.26%
Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	2.64%
Miscellaneous manufactured products	6.76%
Waste and scrap	6.44%
Mixed freight	9.74%
Commodity unknown	9.72%

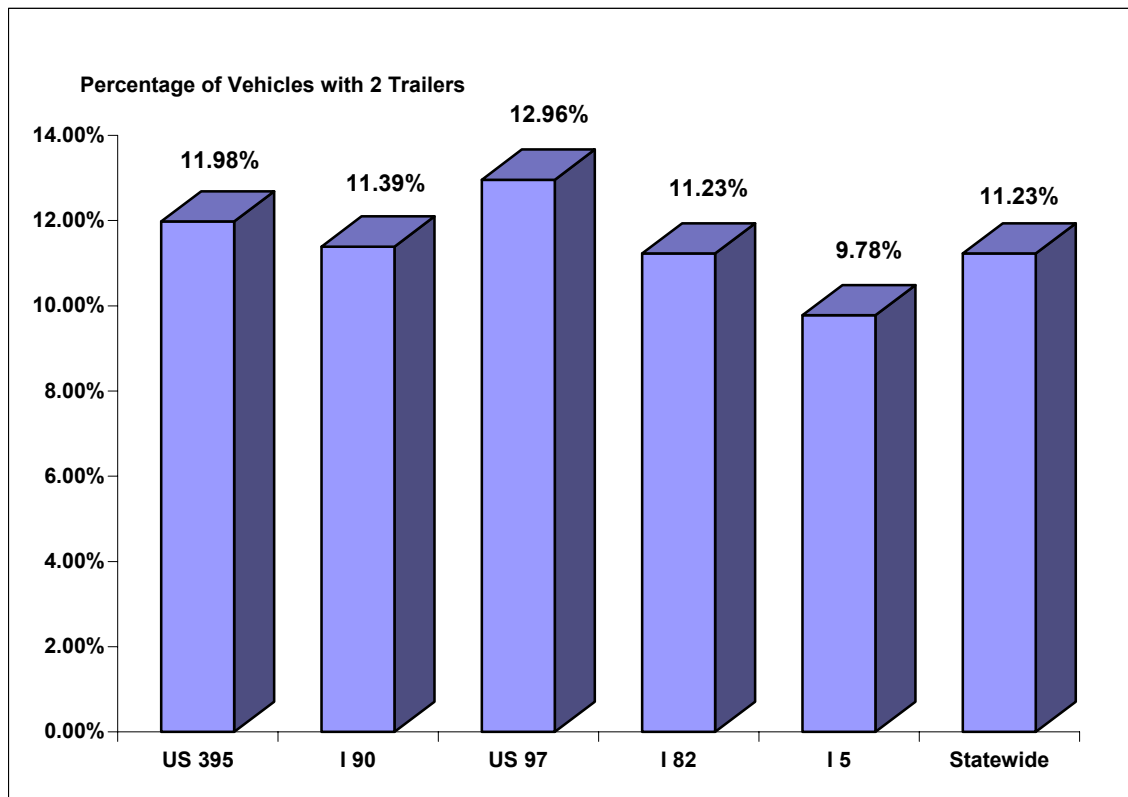
Source: SFTA Freight Truck Origin and Destination Study

Table 3.4: Percentage of Vehicles with 5 or More Axles for Selected Commodities

Commodity description	% of Vehicles with 5 or More Axles
Cereal grains	88.5%
Gravel and crushed stone	82.1%
Coal and petroleum products (NEC)	79.7%
Logs and other wood in the rough	73.3%
Basic chemicals	73.1%
Fertilizers	72.5%
Chemical products and preparations (NEC)	71.6%
Monumental or building stone	71.6%
Fuel oils	70.9%
Pharmaceutical products	69.3%
Nonmetallic mineral products	67.7%
Meat, fish, seafood, and their preparations	65.3%
Milled grain products, preparations, and bakery products	62.9%
Machinery	62.8%
Gasoline and aviation turbine fuel	62.8%
Tobacco products	62.6%
Other agricultural products	62.6%
Transportation equipment (NEC)	62.3%
Textiles, leather, and articles of textiles or leather	62.2%
Base metal in primary or semifinished forms and in finished basic shapes	60.2%
Commodity unknown	59.2%
Wood products	58.0%
Other prepared foodstuffs and fats and oils	57.3%
Alcoholic beverages	57.3%
Metallic ores and concentrates	56.6%
Miscellaneous manufactured products	55.7%
Electronic and other electrical equipment and components and office equipment	54.9%
Pulp, newsprint, paper, and paperboard	53.6%
Mixed freight	53.6%
Articles of base metal	52.1%
Printed products	51.6%
Motorized and other vehicles (including parts)	51.2%
Live animals and live fish	50.4%
Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	48.9%
Plastics and rubber	48.5%
Paper or paperboard articles	47.0%
Natural sands	43.7%
Animal feed and products of animal origin (NEC)	43.1%
Waste and scrap	40.8%
Nonmetallic minerals (NEC)	40.3%
Precision instruments and apparatus	27.7%

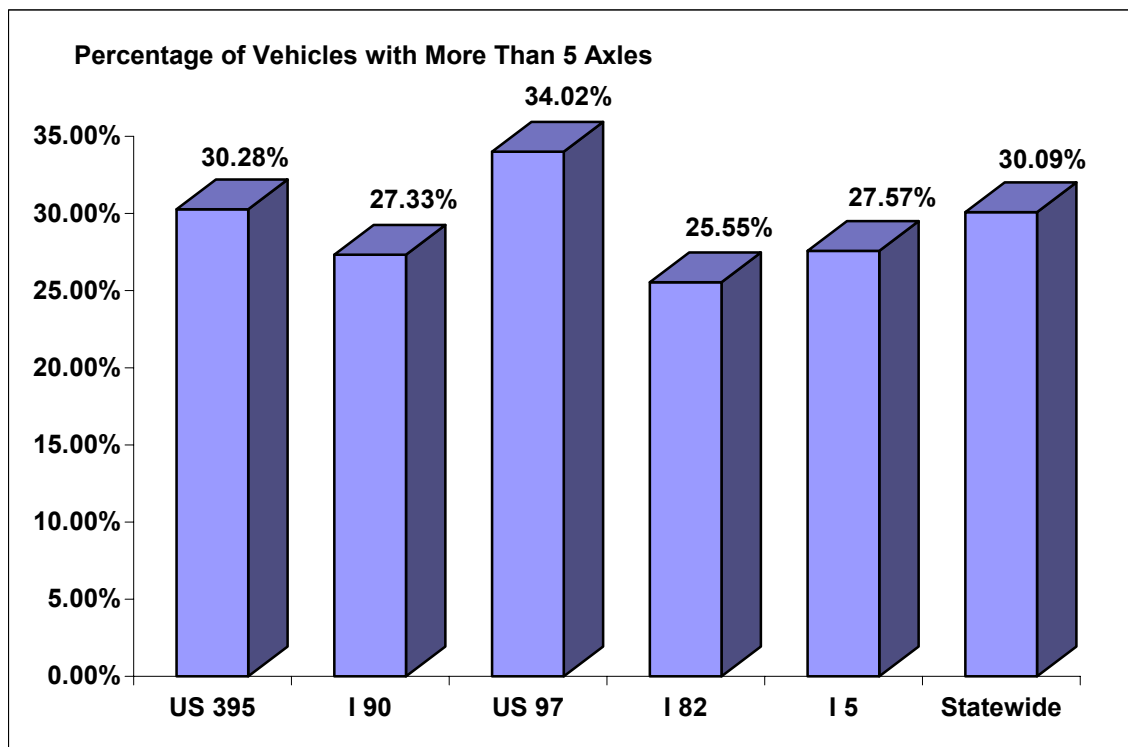
Source: SFTA Freight Truck Origin and Destination Study

Chart 3.2: Multiple Trailer Truck Configurations by Major Highway



Source: SFTA Freight Truck Origin and Destination Study

Chart 3.3: Percent of Vehicles with More than 5 Axles on Major Highways



Source: SFTA Freight Truck Origin and Destination Study

Chart 3.2 and 3.3 provide an overview of multiple trailer configurations and vehicles with more than five axles traveling on major freight corridors in Washington. On average, just over 11 percent of all freight vehicles surveyed have a multiple trailer configuration, with most of these trucks on US 97 and US 395. Trucks configured with more than 5 axles (the standard tractor-trailer rig configuration) account for over 30 percent of all vehicles carrying freight in Washington State. Again, the majority of trucks so configured are found on US 97 and US 395, which are the primary generators of shipments of timber and forest products, and basic materials such as sand, gravel and quarried stone.

Section 4: Implications of Future Growth in Freight Volumes and the Efficient Movement of Freight Cargo in Washington State

Implications of Future Growth

Freight volumes traveling by truck in Washington State have increased consistently and substantially over the last 10 years. The implementation of NAFTA, increased globalization, modernization of ports, and the general growth of economic activity in the United States resulted in substantial increases in freight traffic within the state. For example, the volume of freight in-bound to the Central Puget Sound area comprising King, Pierce, Snohomish and Thurston counties experienced over 200 percent growth between 1994 and 2003. Also, Interstate 90 experienced over 97 percent growth in eastbound traffic and 52 percent growth in westbound traffic during the same period.¹¹ Overall, freight truck volumes in Washington State as a whole were up over 150 percent between 1994 and 2003.

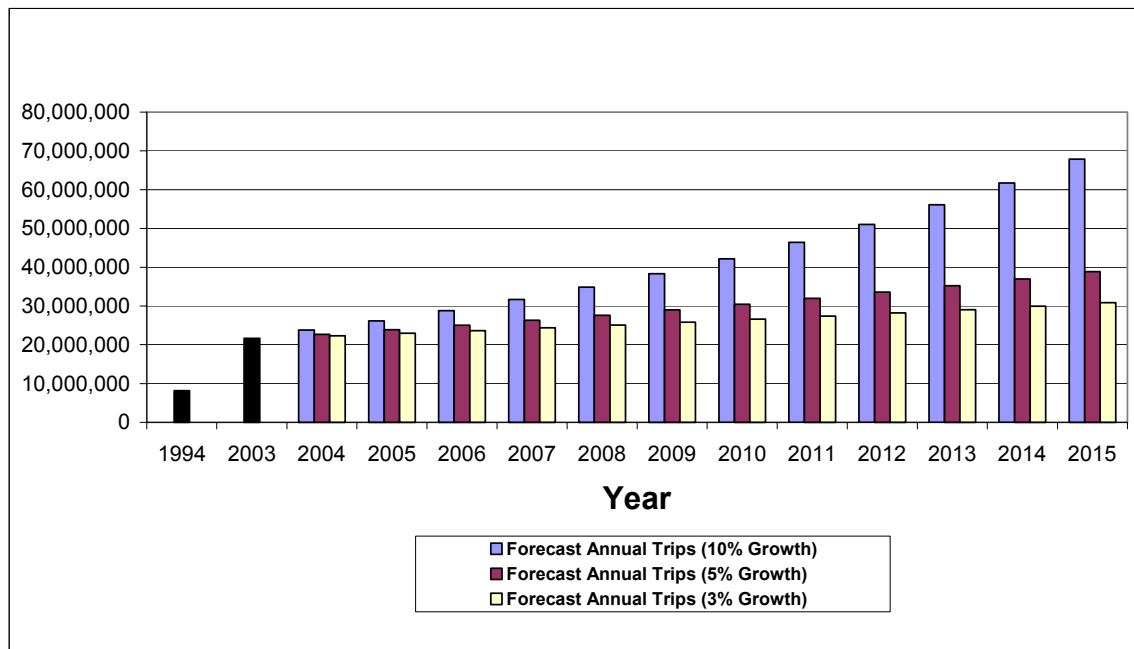
The 1994 EWITS study forecasted rates of freight traffic growth using expected rates of market growth for various agricultural products grown in Washington, and rates of market growth in other industrial categories. As a result, expected annual rates of growth in freight truck traffic were estimated at just over 2 percent. As is illustrated anecdotally above, such a methodology did not successfully forecast the increase in freight traffic volumes over the 10-year period, which was closer to 5 percent annual growth. Accordingly, this study will rely on other sources to estimate the expected growth in freight truck volumes in Washington State and provide high, average and low growth forecasts for future traffic growth.

In a recent paper, Resor and Blaze note that during the period 1990-2000, truck tonnage grew by 6.9 percent annually. Also, total freight traffic (for all modes) is estimated to grow 57% in the next 16 years. Due to capacity limitations in rail and waterborne infrastructure, most of this volume will be placed on the nation's highway transportation network.¹² As a result, average expectations of growth in freight truck volumes will be approximately 8 percent per year. If the entire expected increase in total freight volumes is transported on the highway network via truck, growth may be as high as 10 percent per year. From these growth estimates, forecasts for high, average and low growth scenarios have been constructed. The high-growth scenario will assume 10 percent annual growth; the average-growth scenario a rate of 5 percent, and the low-growth estimate will be based on a 3 percent rate of growth. The forecasts are only for expected tonnage and not for expected value of cargo shipments. The estimated results for each scenario are illustrated below.

¹¹ A complete comparison of the results of the 1994 EWITS survey and the 2003 SFTA survey is forthcoming. The results will be available as a SFTA Report, which can be accessed via the Internet at <http://www.sfta.wsu.edu>.

¹² Resor, Randolph R. and James R. Blaze, "Short Haul Rail Intermodal: Can It Compete With Truck?", a paper presented to the Transportation Research Board, January 2004.

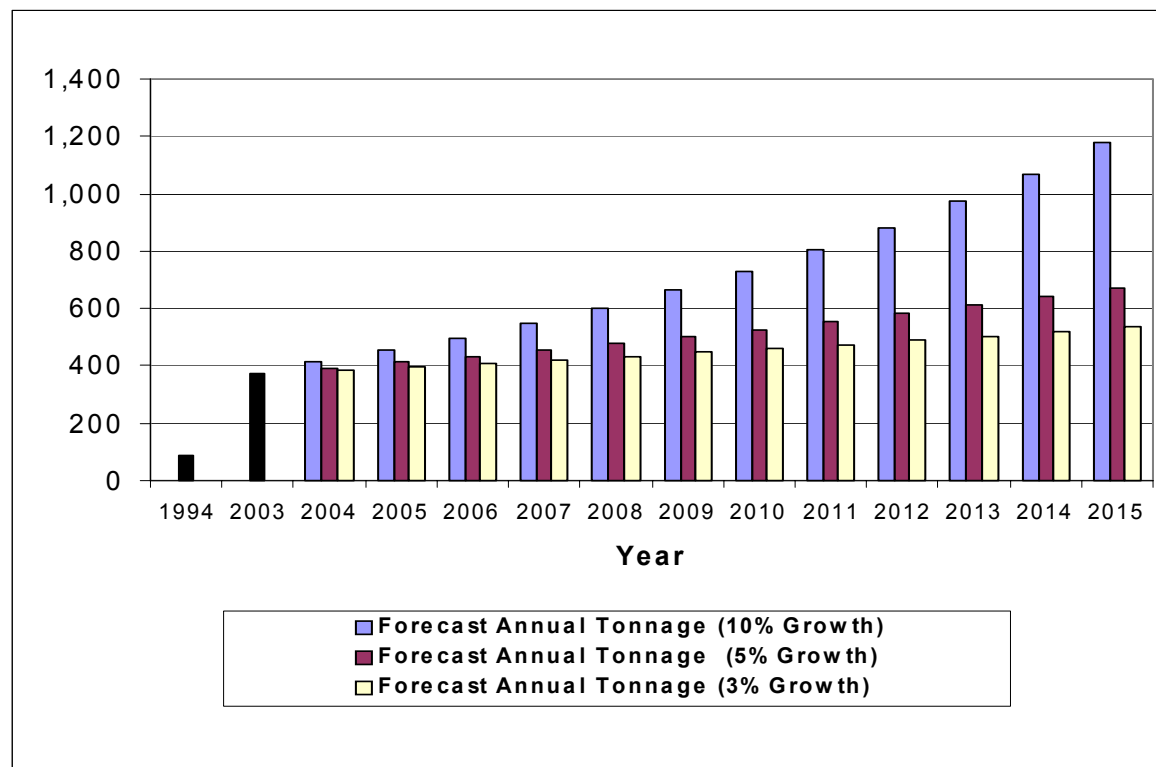
Chart 4.1: Comparison of Forecast Annual Growth in Freight Truck Trips



Source:

SFTA Freight Truck Origin and Destination Study

Chart 4.2: Comparison of Forecast Annual Growth in Total Freight Tonnage



Source: SFTA Freight Truck Origin and Destination Study

Summary and Conclusions

This report offers both a summary and general analysis of the results of the 2003 statewide origin and destination survey. The information compiled in these surveys provides a detailed profile of freight truck movements within and through the state of Washington. While this is not a policy or planning guide for transportation planners and decision makers within the state, ideally the information contained in this study will enable future policy and planning decisions regarding freight transport in Washington to be made more informatively. The final section of this report presents several of the more important findings and the implications for the improvement of freight mobility and efficiency within the state.

The study focused on the results of over 24,000 roadside driver interviews from all regions of the state and at various times of the year. Drivers reported destinations within every county in Washington State and about 400 individual communities. Shipments moving into Washington came from over 40 US states, including Alaska, every Canadian province except the Maritime Provinces and far northern extremes of the Yukon and Northwest Territories, as well as Mexico. Such variety in origins and destinations underscores the importance of an integrated and functional freight transportation network for the citizens of Washington and for the rest of North America.

Over 15 million truck trips carrying close to 375 million tons of cargo move on Washington highways each year. The value of these cargoes is estimated to be almost \$20 billion. The greatest amount of freight activity occurs in Western Washington; freight movements related to the activities of the Ports of Seattle and Tacoma, the large population and manufacturing base of the Puget Sound communities and the increasing volume of north-south trade between Washington and British Columbia all contribute to the rise in freight traffic in the region.

Effective and efficient integration of Washington's highways into the regional, national and international traffic network is critical to the state's economic vitality. Between 35 and 40 percent of all freight traffic originating in Washington ships to locations outside of the state, while almost one-third of the freight traffic on state roadways originates outside Washington. In fact, there are more interstate and international freight movements in Washington than freight shipments between the Eastern and Western regions of the state. More importantly, out of state freight shipments comprise the largest share of total cargo value traveling on Washington's freight transportation network.

Intermodal access is of great importance for freight trucks traveling in Washington State. With two major deep-water ports within the state and the river port system of the Columbia-Snake River Basin, Washington is a major attractor of freight shipments moving over water. Flexible and efficient transportation networks that address mobility issues related to port activities are vital to the continued attraction of business in these facilities.

Also, continued expansion of containerized intermodal freight by the major North American railroads points out the need for effective transportation systems that smoothly integrate highway freight truck transportation with intermodal rail terminals within the state.

This study has provided an overview of freight truck movements on Washington highways. It has highlighted the similarities and differences between the regions of Washington and their contributions to freight volumes on the state's highway system.

Appendices

Appendix A: Origin and Destination Survey Questionnaire

Record #: _____ <small>(for Data Entry Use Only)</small>	CONFIDENTIAL
Washington State Department of Transportation & Washington Strategic Freight Transportation Analysis Project: Truck	
Season <i>[Circle One]</i> Spring Summer Fall Winter	
1) Station Location: _____	
2) Name of Interviewer: _____	
3) Interview Shift: <i>[Please Circle One]</i>	
1. Day Shift 6:00 a.m. – 2:00 p.m.	2. Evening Shift 2:00 p.m. – 10:00 p.m.
3. Night Shift 10:00 p.m. – 6:00 a.m.	
4) Time of Interview: _____ a.m. _____ p.m.	
5) Truck Configuration <i>[Please Check Only One]</i>	6) Trailer Style <i>[If Appropriate, Check More Than One]</i>
1. <input type="checkbox"/> Straight Truck 2. <input type="checkbox"/> Straight Truck and Trailer 3. <input type="checkbox"/> Tractor Only 4. <input type="checkbox"/> Tractor and Trailer 5. <input type="checkbox"/> Tractor with two Trailers 6. <input type="checkbox"/> Other: _____	1. <input type="checkbox"/> Van (Without Temperature Control) 2. <input type="checkbox"/> Van (With Temperature Control) 3. <input type="checkbox"/> Flatbed 4. <input type="checkbox"/> Car Carrier 5. <input type="checkbox"/> Hopper 6. <input type="checkbox"/> Stake and Rack 7. <input type="checkbox"/> Concrete Mixer 8. <input type="checkbox"/> Tanker 9. <input type="checkbox"/> Float 10. <input type="checkbox"/> Dump 11. <input type="checkbox"/> Container 12. <input type="checkbox"/> Chip 13. <input type="checkbox"/> Animal Carrier 14. <input type="checkbox"/> Logging 15. <input type="checkbox"/> Other: _____
<div style="display: flex; justify-content: space-around;"> <div># of Axles on Truck or Tractor</div> <div># of Axles on 1st Trailer</div> <div># of Axles on 2nd Trailer</div> </div>	
7) Number of Axles on the Ground: _____	
8) Is a Hazardous Material Placard Displayed? <input type="checkbox"/> Yes If Yes, ID #: _____ <input type="checkbox"/> No	

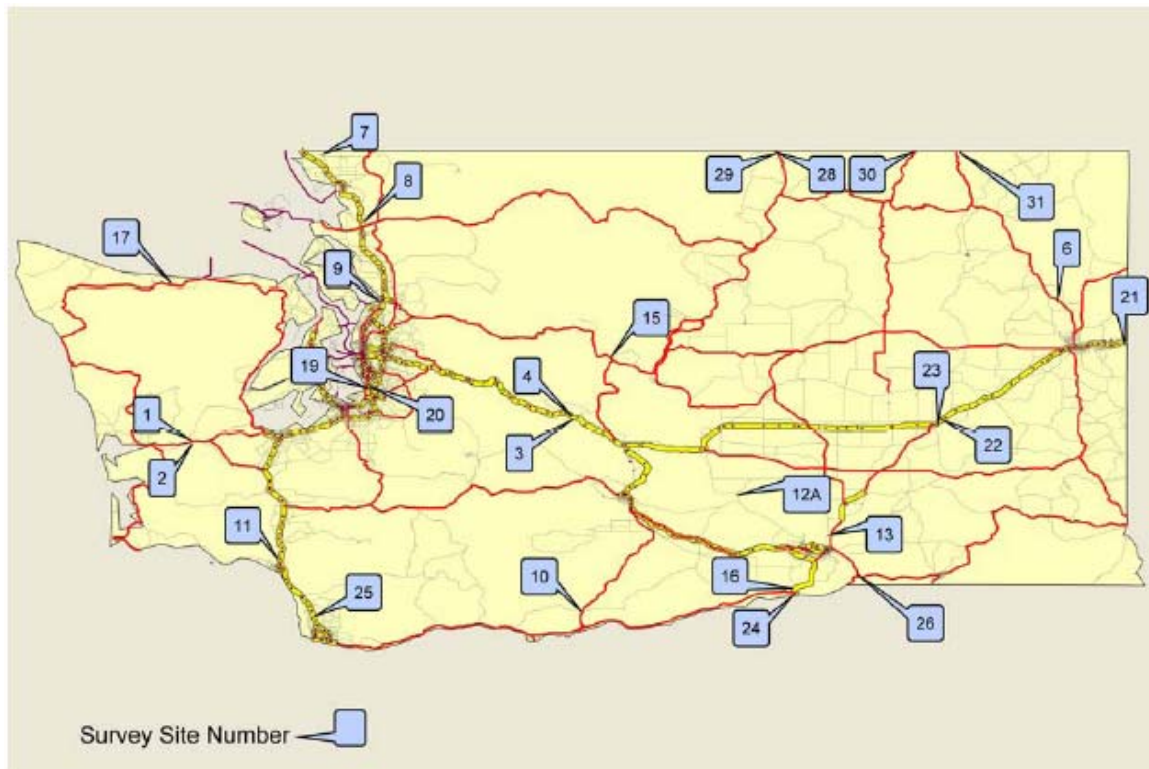
- 9) Carrier Name: _____
- 10) Carrier Home Base [City and State/Province] _____
- 11) What is the **Unloaded Weight** of this Vehicle?
_____ Lbs. [OR] _____ Kgs.
- 12) What is Your Estimated **Payload Weight?** *[Weight of cargo only, Please enter 0 if the rig is **EMPTY**]*
_____ Lbs. [OR] _____ Kgs.
- 13) What is the **Registered Maximum Weight** of this Vehicle?
_____ Lbs. [OR] _____ Kgs.
- 14) Is the vehicle **LOADED** or **EMPTY**?
☐ ☐
- 15) What is the **Major Commodity** on Board?

[Please fill out the following section COMPLETELY]

Where Did THIS Trip Begin?	Where Will THIS Trip End?
<p>16) City, State/Province : _____</p> <p>17) Facility:</p> <p>1. <input type="checkbox"/> Truck Terminal</p> <p>2. <input type="checkbox"/> Rail Terminal</p> <p>3. <input type="checkbox"/> Marine Terminal</p> <p>4. <input type="checkbox"/> Air Terminal</p> <p>5. <input type="checkbox"/> Factory</p> <p>6. <input type="checkbox"/> Warehouse/Distribution Center</p> <p>7. <input type="checkbox"/> Farm</p> <p>8. <input type="checkbox"/> Point of Sale/ Consumption</p> <p>9. <input type="checkbox"/> Other : _____</p>	<p>19) City, State/Province: _____</p> <p>20) Facility:</p> <p>1. <input type="checkbox"/> Truck Terminal</p> <p>2. <input type="checkbox"/> Rail Terminal</p> <p>3. <input type="checkbox"/> Marine Terminal</p> <p>4. <input type="checkbox"/> Air Terminal</p> <p>5. <input type="checkbox"/> Factory</p> <p>6. <input type="checkbox"/> Warehouse/Distribution Center</p> <p>7. <input type="checkbox"/> Farm</p> <p>8. <input type="checkbox"/> Point of Sale/Consumption</p> <p>9. <input type="checkbox"/> Other: _____</p>
<p>18) If LTL, List Origin Cities, States/Provinces:</p> <p>a. _____</p> <p>b. _____</p> <p>c. _____</p> <p>d. _____</p>	<p>21) If LTL, List Destination Cities, States/Provinces:</p> <p>a. _____</p> <p>b. _____</p> <p>c. _____</p> <p>d. _____</p>
<p><i>[Please Go to Question #19]</i></p>	<p><i>[Please Go to Question #22]</i></p>

- 22) Please Identify the Washington State Highways Used to Travel from the Listed Origin to Destination on the Attached Map.

Appendix B: Survey Locations



Site Location Information

Weigh Station	Site Number	Road	Milepost	Traffic Direction Captured
Brady West	1	US12	13	West
Brady East	2	US12	14	East
Cle Elum East	3	I90	83	East
Cle Elum West	4	I90	83	West
Deer Park South	6	US395	179	South
Douglas North	7	SR543	270	North
Everett North	8	I5	193	North
Everett South	9	I5	193	South
Goldendale	10	US97	13	North/South
Kelso South	11	I5	39	South
Vernita Bridge	12A	SR24	-	East/West
Pasco	13	US395	27	South
Peshastin West	15	US2	185	West/South
Plymouth	16	SR14	167	East/West
Port Angeles	17	US101	246	West
Sea Tac South	19	I5	144	South
Sea Tac North	20	I5	152	North
E. Spokane	21	I90	285	West
Tokio East	22	I90	231	East
Tokio West	23	I90	231	West
Umatilla	24	US395	13	South
Vancouver North	25	I5	7	North
Wallula	26	US12	307	All
Osoyoos North	28	US97	336	North
Oroville South	29	US97	336	South
Danville	30	SR21	191	North and South
Laurier	31	US395	270	North and South

Site Number	Survey Site	Season				Hours of Operation	Duration
		Spring April 2002	Summer July 2002	Fall October 2002	Winter January 2003		
1	Brady West	24 th ³	24 th	16 th	22 nd	7AM-3PM	8hrs
2	Brady East	3 rd	10 th	2 nd	8 th	7AM-3PM	8hrs
3	Cle Elum East	10 th	17 th	9 th	15 th	7AM-3PM	8hrs
4	Cle Elum West	3 rd	10 th	2 nd	8 th	6AM-6AM	24hrs
6	Deer Park South	3 rd	10 th	2 nd	8 th	7AM-3PM	8hrs
7	Douglas North	- ⁴	17 th	9 th	15 th	7AM-7AM	24hrs
8	Everett North	17 th	24 th	16 th	22 nd	6AM-10PM	16hrs
9	Everett South	3 rd	10 th	2 nd	8 th	8AM-4PM	8hrs
10	Goldendale	17 th	24 th	16 th	22 nd	7AM-5PM	10hrs
11	Kelso South	17 th	24 th	16 th	22 nd	6AM-6PM	12hrs
12A	Vernetta Bridge	10 th	17 th	9 th	15 th	8AM-3PM	7hrs
13	Pasco	May 1 st ⁵	31 st	23 rd	29 th	6AM-6PM	12hrs
15	Peshastin West	24 th	31 st	30 th ⁶	29 th	7AM-5PM	10hrs
16	Plymouth	10 th	17 th	9 th	15 th	6AM-6AM	24hrs
17	Port Angeles	24 th	31 st	23 rd	29 th	7AM-3PM	8hrs
19	Sea Tac South	10 th	17 th	9 th	15 th	7AM-3PM	8hrs
20	Sea Tac North	24 th	31 st	23 rd	29 th	7AM-3PM	8hrs
21	E. Spokane	10 th	17 th	9 th	15 th	6AM-6AM	24hrs
22	Tokio East	3 rd	10 th	2 nd	8 th	7AM-5PM	10hrs
23	Tokio West	17 th	24 th	30 th ⁷	22 nd	7AM-5PM	10hrs
24	Umatilla	17 th	24 th	16 th	22 nd	6AM-9PM	15hrs
25	Vancouver North	3 rd	10 th	2 nd	8 th	6AM-6AM	24hrs
26	Wallula	3 rd	10 th	30 th ⁸	8 th	8AM-4PM	8hrs
28	Osoyoos North	24 th	31 st	23 rd	29 th	6AM-9PM	15hrs
29	Oroville South	17 th	24 th	16 th	22 nd	6AM-6PM	12hrs
30	Danville	24 th	31 st	23 rd	29 th	8AM-12PM	4hrs
31	Laurier	10 th	17 th	9 th	15 th	8AM-12PM	4hrs

3 The Brady West site was rescheduled from April 17th to April 24th, because of a lack of personnel.

4 Data collection at the Douglas site was canceled for the spring season due to facility problems.

5 The collection of surveys at the Pasco site in the spring season was rescheduled for May 1st due to scheduling problems on the original day, April 24th.

6 The Peshastin West location was rescheduled from October 23rd to October 30th, due to a conflict with scheduling interview personnel.

7 Tokio West was rescheduled from October 23rd to October 30th due to a scheduling conflict.

8 The fall season at Wallula was rescheduled for October 30th, due to an accident in the vicinity that required the attention of the WSP CVEO assigned to the weigh station on the original day, October 2nd.

Appendix C: Data Sources

Standard Classification of Transported Goods (SCTG)	US Department of Commerce, Census Bureau, "Commodity Coding Manual: 1997 Commodity Flow Survey." 1997.
Value of commodities	US Department of Commerce, Census Bureau, "1997 Commodity Flow Survey." 1997.
Geo-codes	Washington State Department of Transportation, GeoData Distribution Catalog. "Populated Places in Washington."