FINAL REPORT

WASHINGTON COUNTY FREIGHT STUDY

JULY 2017

FINAL

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APPENDICES (AVAILABLE UPON REQUEST)

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The study was organized by the **Westside Economic Alliance (WEA).**

Study sponsors include:

- Intel
- Portland General Electric (PGE)
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- City of Tualatin
- City of Wilsonville
- Washington County

Consultants:

- DKS
- WSP | Parsons Brinckerhoff

1 EXECUTIVE SUMMARY

1.1 BACKGROUND

International trade is a critical part of Oregon's economy. Businesses in the state exported $22 billion of goods in 2016[1], making Oregon the 14th most trade-dependent state in the nation by exports' share of state GDP.[2] Trade is also a key driver of employment in the state, supporting over 500,000 jobs.[3]

Geography and past investments in infrastructure have made the Portland metropolitan area a gateway for freight movement by sea and air, and a hub for movement by rail and highway[4]. A large proportion of Oregon companies that produce goods for export are located in the Portland Metropolitan area, and many others use the infrastructure of the Portland Metropolitan area to move goods.

Washington County is the economic engine of the Portland-metro region and the state. The computer and electronics industry, which accounts for nearly half of state exports in terms of value[5], is centered on the western part of the Portland-metro region, primarily in Washington County[6]. The county contains over 15 percent of the state's jobs (second highest in the state) and has the highest average wages[7]. Given the trade-dependent nature of many businesses in Washington County, it is important to understand how freight congestion impacts these companies' ability to operate, compete, and grow.

1.2 STUDY PURPOSE AND SCOPE

The Transportation Futures Study analyzed the future transportation needs of Washington County based on anticipated population and employment growth. It found that delays for trucks would be more than twice that for other vehicles[8]. While that study outlined broad transportation needs for all users in the county, study partners determined that additional freight-specific data and analysis were needed to further identify and prioritize needs for trucks.

Previous studies have explored the dependence of traded sector jobs on the transportation system in the region. The purpose of this study is to identify and prioritize infrastructure problems within Washington County that impact freight. The results will inform the development of regional, state and federal funding requests and need for road improvements. They will also provide input regarding freight

[1] Oregon Department of Administrative Services, Office of Economic Analysis and International Trade Administration, U.S. Department of Commerce, 2014.
[2] U.S. Department of Commerce, International Trade Administration, Oregon Exports, Jobs and Foreign Investment, February 2017.
[3] Office of Trade and Economic Analysis, International Trade Administration, U.S. Department of Commerce, 2013.
[4] Economic Development Research Group (EDRG), Economic Impacts of Congestion on the Portland-metro and Oregon Economy, 2014.
[5] U.S. Department of Commerce, February 2017.
[6] Greater Portland Export Initiative (GPEI), Portland Region Westside Freight Access and Logistics Analysis, October 2013.
[7] U.S. Department of Labor, Bureau of Labor Statistics. County Employment and Wages in Oregon – Fourth Quarter 2015, July 2016
[8] Washington County, Transportation Futures Study, February 2017.

flows and market considerations (including cost sensitivity and urgency) to the future demand forecast for the Hillsboro Airport Masterplan.

Under the guidance of the Steering Committee composed of project partners, the study:

- Reviewed existing plans, studies and data
- Conducted interviews with companies that ship or carry goods into or out of Washington County
- Analyzed recent truck operations using real-time speed and volume data.
- Evaluated and prioritized truck needs within Washington County

1.3 Key Findings

- As the economic engine of Oregon and a major exporting region, Washington County is highly dependent on freight infrastructure.
- In addition to computers and related components, plastic, wood, paper, tools, nursery, seed, fruit and tree nut products all represent significant exports produced in Washington County[9].
- The Portland metropolitan area has the bulk of identified delay areas and corridors in the state according to the recently completed Freight Highway Bottleneck Project (FHBP)[10].
- Due to its relative speed and flexibility, truck is by far the most common mode. Whether on its own or in combination with other modes, it is a part of most freight trips.
- Businesses' heavy reliance on trucks makes highway and arterial congestion a major concern for many firms in Washington County and the region. Congestion adds time to deliveries, resulting in significant costs to businesses. Most interviewed firms indicated that highway congestion was a serious impediment and complained of significant impacts from consistent, pervasive roadway congestion. A severe national truck driver shortage, exacerbated by federal requirements and traffic delays, is impacting the ability of businesses to move goods.
- New real-time truck operations data on arterials was analyzed with truck counts in an analysis that allowed more detailed understanding of local delay and reliability issues critical to freight movement than previously.
- The limited number of routes into the county, the degree of delay and unreliability on them and the importance of county freight to the economy make access to Washington County a statewide issue. These concerns were expressed by stakeholders and supported by this evaluation and the statewide FHBP.
- The I-5 corridor was most often cited by stakeholders and represents the highest need in both this analysis and the statewide bottleneck study.
- The US 26 corridor near the Sylvan Tunnel followed I-5 in terms of stakeholder concerns and freight operational performance in this analysis and was also identified as a delay corridor in the statewide study.
- Many Washington County highways and arterials suffer from congestion throughout much of the day. Other key areas of freight operational delay and unreliability include portions of OR 217, OR 8, Tualatin-Sherwood Road, Cornelius Pass Road and Murray Boulevard.

[9] WSP, Washington County Export Analysis, November 1, 2016.
[10] https://www.oregon.gov/ODOT/TD/TP/Pages/FreightHighwayBottlenecks.aspx

- Farm to market roads near the edge of the urban area are not built for the volumes or loads they are subject to.

1.4 Stakeholder Suggestions to Improve Freight Movement

Stakeholders had a number of suggestions to improve freight movement, including the following general approaches:

- Adding HOV or truck-only lanes
- Providing incentives to encourage off-peak delivery
- Adding lanes or interchanges at bottleneck areas along specific corridors
- Expanding transit service, routes, and facilities along congested corridors
- Higher speed limits

Each of these tools offers its own set of opportunities and limitations. They might work in some locations or for some industries and not others. However, they should all be explored as part of a comprehensive approach to freight delay and reliability issues in the Portland metropolitan area.

1.5 Conclusions

This freight needs analysis was intended to provide information to decision-makers in establishing transportation funding priorities. Freight delay and reliability within and to Washington County are a major regional issue. Due to the importance of county traded sector businesses to the economy, the freight needs identified here rise to the level of statewide significance.

As summarized in this report and detailed in technical memos, this study identified and prioritized Washington County Freight needs. This study finds that freight access to, and movement within, Washington County represents a significant cost to businesses and drag on the economy. These findings demonstrate the location of significant freight needs in and around Washington County and underscore the importance of developing and funding road improvements to meet them.

2 Study Background and Purpose

2.1 Trade and the Oregon Economy

International trade is a critical part of Oregon's economy. Businesses in the state exported $22 billion of goods in 2016[11], making Oregon the 14th most trade-dependent state in the nation by exports' share of state GDP.[12] A wide variety of industries are dependent on exports; top categories in terms of value

[11] Oregon Department of Administrative Services, Office of Economic Analysis and International Trade Administration, U.S. Department of Commerce, 2014.
[12] U.S. Department of Commerce, International Trade Administration, Oregon Exports, Jobs and Foreign Investment, February 2017.

include computer and electronics products, machinery, transportation equipment, agricultural products, and chemicals.[13] Trade is also a key driver of employment in the state, supporting over 500,000 jobs.[14]

Geography and past investments in infrastructure have made the Portland metropolitan area a gateway for freight movement by sea and air, and a hub for movement by rail and highway[15]. A large proportion of Oregon companies that produce goods for export are located in the Portland Metropolitan area, and many others use the infrastructure of the Portland Metropolitan area to move goods.

2.2 Washington County's Role in the State Economy

Washington County is the economic engine of the Portland-metro region and the state. The computer and electronics industry, which accounts for nearly half of state exports in terms of value[16], is centered on the western part of the Portland-metro region, primarily in Washington County[17]. The county contains over 15 percent of the state's jobs (second highest in the state) and has the highest average wages[18]. Given the trade-dependent nature of many businesses in Washington County, it is important to understand how freight congestion impacts these companies' ability to operate, compete, and grow.

A high level analysis conducted as part of this study identified major exports produced in Washington County. That analysis indicated that, in addition to computers and related components, plastic, wood, paper, cutlery and handtools, nursery, seeds, fruit and tree nut products all represented significant exports produced in Washington County[19].

2.3 Study Context

Previous studies have explored the dependence of traded sector jobs on the transportation system in the region. The Economic Impacts of on the Portland-metro Area and Oregon Economy highlighted the Oregon's trade dependence and quantified the impact of transportation delays on businesses and individuals.[20] The International Trade and Logistics Initiative examined the needs of exporters statewide in light of the loss of marine container service from the Port of Portland in 2015[21]. The Westside Freight Access and Logistics Analysis explored the transportation challenges confronting the computer and electronics industry.[22]

More recently, the Transportation Futures Study analyzed the future transportation needs of Washington County based on anticipated population and employment growth. It found that delays for

[13] Ibid
[14] Office of Trade and Economic Analysis, International Trade Administration, U.S. Department of Commerce, 2013.
[15] Economic Development Research Group (EDRG), Economic Impacts of Congestion on the Portland-metro and Oregon Economy, 2014.
[16] U.S. Department of Commerce, February 2017.
[17] Greater Portland Export Initiative (GPEI), Portland Region Westside Freight Access and Logistics Analysis, October 2013.
[18] U.S. Department of Labor, Bureau of Labor Statistics. County Employment and Wages in Oregon – Fourth Quarter 2015, July 2016
[19] WSP, Washington County Export Analysis, November 1, 2016.
[20] EDRG, 2014.
[21] International Trade and Logistics Initiative, Keep Oregon Trade Moving - Steering Committee Report, 2016.
[22] GPEI, 2013.

trucks would be more than twice that for other vehicles[23]. While that study outlined broad transportation needs for all users in the county, it also concluded that additional freight-specific data and analysis were needed to further identify and prioritize needs for trucks.

2.4 Study Purpose and Scope

Based on recent studies, the Westside Economic Alliance, the Port of Portland and numerous other business organizations and transportation agencies determined that additional work was needed to identify and prioritize infrastructure problems within Washington County that impact freight[24]. The results will inform the development of regional, state and federal funding requests and need for road improvements. They will also provide input regarding freight flows and market considerations (including cost sensitivity and urgency) to the future demand forecast for the Hillsboro Airport Masterplan.

Under the guidance of the Steering Committee composed of project partners, the study:

- Reviewed existing plans, studies and data
- Conducted interviews with companies that ship or carry goods into or out of Washington County
- Analyzed recent truck operations
- Evaluated and prioritized truck needs within Washington County

2.5 Key Definitions

Below is a list of definitions for key terms in this report.

Shipper – A company that produces goods that need to be shipped

Carrier – A firm that provides freight transportation services

Reliability – The consistency or dependability in travel times, as measured from day-to-day and/or across different times of the day (per Federal Highway Administration)

Delay – A measure of extra time spent travelling on a road segment due to congestion

Bottleneck/Delay Area – Part of the state freight network that exhibits disproportionately high costs in terms of delay or reliability in the movement of freight (from Freight Highway Bottleneck Project (FHBP), discussed in section 5)

Delay Corridor – A string or grouping of multiple delay areas (from FHBP, discussed in section 5)

Incident – An event that creates a delay on a road segment

[23] Washington County, Transportation Futures Study, February 2017.
[24] See Acknowledgements for the full list of study sponsors.

3 EXISTING PLANS AND DATA

The project team reviewed past plans, studies and datasets to leverage previous efforts and data. The review allowed the team to understand the current insights into the transportation system and known deficiencies. It also allowed them to avoid repeating previous efforts and to benefit from lessons learned. A complete description of the various documents reviewed and their findings is located in the Summary of Prior Studies and Washington County Freight Data Technical Memo, which is attached to this report as Appendix A.

3.1 STATEWIDE AND REGIONAL PLANS AND STUDIES

The study reviewed the following plans:

- The Regional Transportation Plan (RTP) Freight Plan (2010)
- Economic Impacts of Congestion (2014)
- Westside Freight Access and Logistics Analysis (2013)
- The City of Portland Central City Sustainable Freight Strategy (2012)
- Metro Truck Model Update

Complete descriptions of the documents are in Appendix A. This review concluded that:

- Inadequate interchange spacing exacerbates congestion and safety issues on OR 217.
- There is a need for improved arterial connections to current and emerging industrial areas (e.g. I-5/OR 99W Connector area)
- Limited and inadequate last mile connections create chokepoints, including 124th Avenue.
- Portland-metro area is a key gateway for Oregon products and regional bottlenecks impact the entire state.
- Reliability of the roadway system is a key to C&E goods movement within the supply chain
- The Westside C&E industry is heavily dependent on two routes to PDX (US 26 and Cornelius Pass Road) both of which have significant deficiencies.
- Attempts to create urban consolidation centers to address freight congestion and distribution issues elsewhere have been largely unsuccessful. Previous studies have found increased delivery costs and time due to the insertion of an additional step in the supply chain.
- Metro is undertaking an update to its truck model within the regional travel demand model. However, the results were not ready for use as part of this study.
- The Oregon Freight Highway Bottlenecks Study was on-going during the time of this study and the results were included in Section 4.

3.2 WASHINGTON COUNTY AND LOCAL AGENCY PLANS

The team reviewed the following studies and plans:

- Washington County Transportation Futures (2017)
- Hillsboro TSP (2004 being updated in 2017)
- Wilsonville TSP (Revised 2016)
- Beaverton TSP (2010) Tigard TSP (2010)

- Tualatin TSP (2014)

Long range plans included a number of elements that are relevant for freight planning including policies, roadway designations, design requirements, freight needs and freight projects. Specific findings relevant to the Washington County Freight Study include:

- Major portals in and out of Washington County are at or approaching capacity
- Without new road capacity beyond those adopted in local TSPs, truck hours of delay, especially on freeways, is expected to increase 400 percent over the long term.
- Future levels of congestion on key highways and arterials are expected to spread traffic beyond the current peak periods into the midday, which is a critical time for local and regional freight delivery.
- Major portals including US 26, OR 217, I-5 and Cornelius Pass Road are expected to reach capacity during midday in the future.
- Added capacity from managed lanes for trucks transit and HOV could improve reliability, however growth is still anticipated to result in a doubling of delay over today.
- More aggressive traffic management, such as tolling or congestion pricing would be needed to provide greater reliability benefits for freight.
- Preferential treatments for trucks at on-ramps would help overall freight delay but they have limited value in addressing congestion on highways.
- Cargo consolidation centers near the Portland Airport, where goods are reloaded for domestic and international distribution, draw goods from all over the region. The Transportation Futures study examined whether a new Westside freight consolidation facility could better serve Washington County industry by avoiding travel on US 26 during congested periods. There is insufficient quantity of local commodities to warrant a new center in the immediate future. In addition, while a Westside center might help air cargo traffic, it would likely draw other freight traffic to the County[25].
- There are limited direct routes for freight to travel north-south in Wilsonville and improvements to complete the network have been identified. Priority routes include Day and Garden Acres Roads.
- Farmington Road/Canyon Road both need operations improvements to maintain freight mobility, some of which have been completed.
- Traffic operations on Murray Boulevard, Farmington Road, Hall Boulevard and Schools Ferry road are impacted by at grade rail crossings.
- Freight routes through downtown Tualatin impacted by travel delay include SW Tualatin-Sherwood Road, SW Boones Ferry Road and SW Martinazzi Avenue.

3.3 DATA

Specific data utilized in previous studies has limited applicability for this study due to focus or timeframe. However, Washington County has a robust traffic count program on a three year cycle which provide truck counts on urban arterials as well as some collector and rural routes. The technical memo (Appendix A) identified top truck count locations. Various locations on Tualatin-Sherwood Road

[25] WSP, Freight Sensitivity Test Technical Memo, Washington County Transportation Futures, August 2016.

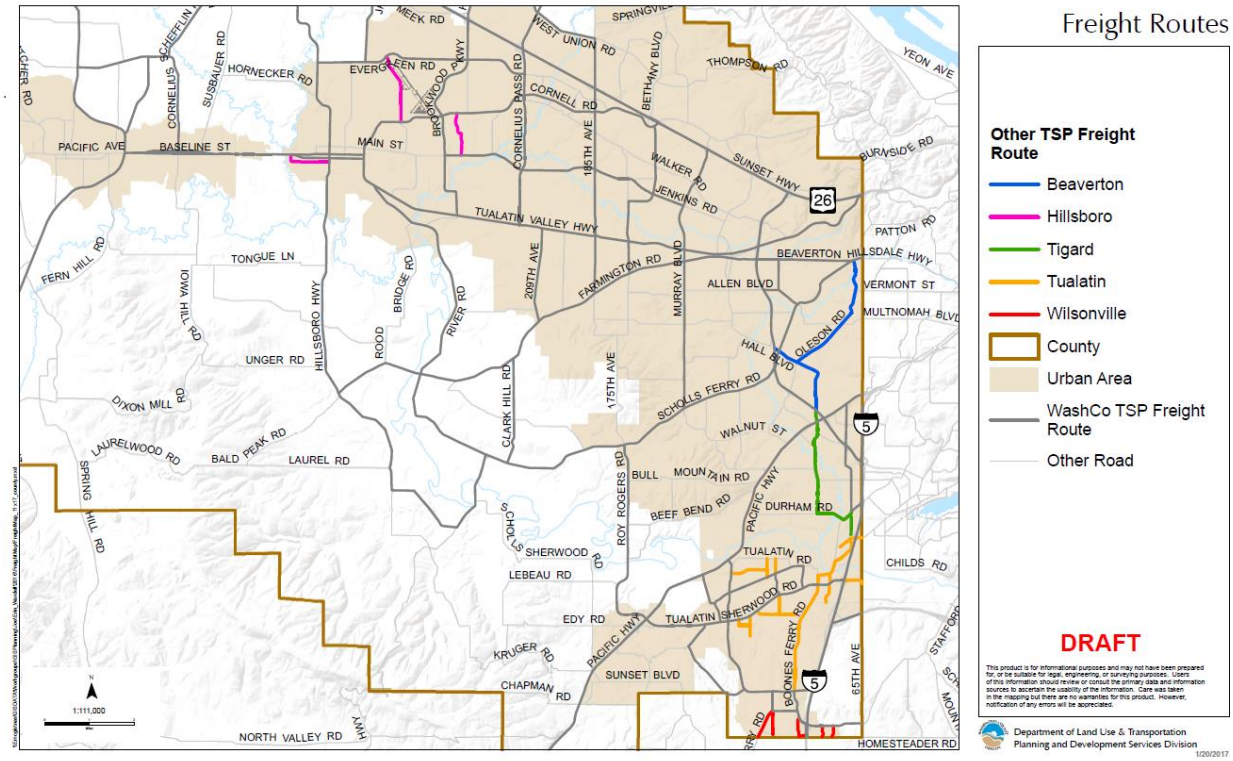
made up the top five locations by volume. These were followed by Shute Road, 185th Avenue, Cornelius Pass Road, Cornell Road and Farmington Road.

ODOT maintained truck count data on State routes shows I-5 as having the highest counts followed by US 26 and OR 217. ODOT has recently purchased real-time truck operations data from HERE which can be used to supplement previous datasets. Based on this analysis, the project team determined that truck counts on county and state facilities could be used together with HERE data to identify and analyze current locations for freight delay and reliability.

3.4 Overall Findings from Existing Plans and Data

There are a number of state, regional, county and local designated freight networks which serve a variety of purposes. While in many cases the local designations mirror the regional, several cities have more detailed networks that provide access to local destinations or routes that may be important for freight movement. Together, these designations provide a comprehensive network of freight routes that can be treated as a system for study and improvement. Washington County created a new map for this project that shows all levels of freight designation as shown in Figure 1.

Figure 1. Freight Routes



The array of truck specific data has been limited in prior transportation planning efforts and generally includes vehicle classification counts. This study will use county vehicle counts but additional datasets from prior studies are limited in nature and do not provide equal coverage for all county roads. HERE data can be used together with county truck counts to identify freight congestion that is not captured in prior studies.

4 STAKEHOLDER INTERVIEWS

Below is a summary of the stakeholder interview process and findings. More details are contained in the technical memo entitled Stakeholder Interview Summary, which is attached as Appendix B.

4.1 METHODOLOGY

4.1.1 Identification of Interview Targets

The Regional Commodity Flow Forecast, US Census Bureau Trade Statistics and Port of Portland estimates of container volumes were reviewed in order to reveal major export from the Portland-metro area. The team then used employment[26] and agricultural[27] data to determine which major regional exports are concentrated in Washington County. The Port of Portland also identified other high freight generating industries with significant employment in Washington County based on a review of confidential county business records.

The resultant targeted industries included:

- Computer and electronics
- Plastics
- Wood Products
- Paper
- Nursery Products
- Fruits, tree nuts and berries
- Metal tools, cutlery, etc.
- Prepared foods
- Recycling
- Minerals/Aggregates
- Wholesale trade
- Transportation and distribution

A more detailed explanation of the identification process can be found in Appendix B.

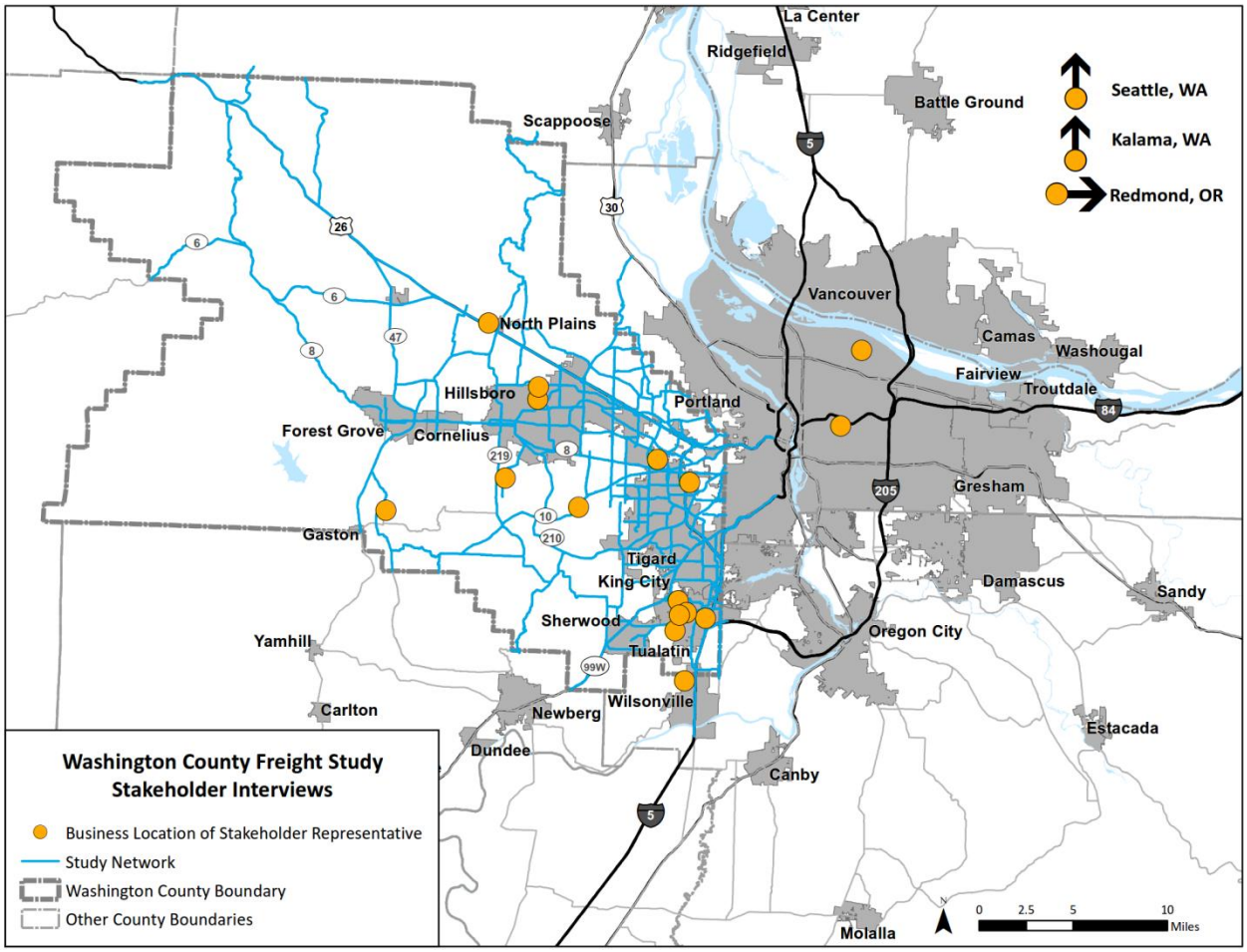
4.1.2 Companies Interviewed

Because previous efforts focused on the computer and electronics industry, this effort concentrated on reaching other industries. The Port identified firms with a larger number of employees within these industries, as well as an initial list of contacts at each. The Steering Committee reviewed the initial interview targets and supplemented the list with other firms and contacts. Finally, during initial interviews, firms were asked to provide contact information for their primary carriers, which resulted in additional transportation industry contacts.

[26] Census County Business Patterns, 2013.
[27] US Census of Agriculture, Profile of Washington County, 2012.

Ultimately, interviews were held with a total of nineteen firms throughout Washington County and the region. As shown in the map in Figure 2, firms were located throughout the county and the broader region.

Figure 2. Washington County Freight Study Stakeholder Interview Map



Firms interviewed included 13 manufacturers as well as six firms that provide freight transportation services (referred to as "carriers"). The carriers included one less-than-truckload company, two truckload companies, one perishables expeditor and two full service logistics and delivery service providers. Interviews covered the following goods and services:

- Nursery
- Berries and hazelnuts
- Plastic Footwear
- Wood products
- Paper/cardboard
- Food products
- Capital equipment for the Computer and Electronics Industry
- Restaurant supply
- Food distribution

- Aggregate/asphalt
- Health care
- Garbage/recycling
- Aviation services
- Transportation and distribution services

The list of companies interviewed is contained in the Stakeholder Interview Summary attached as Appendix B.

4.1.3 Interview Questions

Interviews covered the following topics:

- Freight type, quantities and modes
- Major gateways and routes
- Carrier selection supply chain trends
- Impact of congestion
- Strengths and weaknesses of the system
- Transportation needs and solutions

Appendix B contains the specific interview questions.

4.2 General Observations

The interviews benefitted from broad industry and geographic coverage. Due to the diversity of industries covered, firms interviewed had a range of relationships to transportation. Some provided their own delivery or were themselves carriers. They also had a variety of hours of operation, destinations and products that require the use of different modes. This diversity made it difficult to discern common themes.

Truck is by far the most common mode employed by shippers. Air freight is important to high value and time sensitive goods such as perishables and input to high end manufacturing processes. The limited frequency and carrying capacity of international flights from the Portland International Airport (PDX) means that most firms utilize other airports instead of or in addition to PDX. There is interest in additional air cargo offerings at PDX, notably the new Cathay Pacific freighter service.

Rail and marine shipping are used for long distances and heavy loads with less time sensitivity. The lack of marine container service in Portland was noted as a gap by some interviewees.

The majority of firms anticipate growth, although the degree is industry- and firm- specific. The biggest trends affecting the supply chain are the growth in direct residential delivery and the increased federal requirements on the trucking industry in terms of driver hours and maintaining electronic logs. These trends result in the need for additional drivers, which increases costs and further exacerbates a severe driver shortage.

Highway congestion was the most frequently cited problem and several firms indicated it is a serious impediment to their business. Firms traveling longer distances, who have 24-7 operations or who rely on carriers were less directly impacted by congestion. In response to congestion, most firms would like to

shift operations to start earlier in the day. However, several firms noted that they cannot avoid congestion due to customer pick-up and delivery windows or linehaul schedules.

I-5 and US 26 are the most commonly noted bottleneck areas, followed by OR 217. I-84 and I-205 were less frequently noted by those interviewed for this study. Several major arterials are overwhelmed, including Tualatin-Sherwood Road, OR 99W, and Tualatin-Valley Highway. Finally, several interviewees noted that older "farm to market" roads near the edge of the county are not sized for loads they are carrying.

General suggestions to address problems include adding truck only lanes and incentives to encourage nighttime delivery. Interviewees suggested adding lanes, interchanges or otherwise improving flow at bottleneck areas along specific corridors. Improving parallel routes, especially north-south, was a common theme. Several firms suggested expanded transit service, routes and facilities along congested corridors.

4.3 Transportation System Needs

4.3.1 General Observations

In terms of strengths of the regional transportation system, several firms noted that transit service and bicycle and pedestrian facilities were well developed. Some respondents noted that the roadway system is easy to understand and that surface streets are well developed in Washington County for the most part. Washington County's arterial roadways are mostly four-lane and perceived as operating pretty well, overall.

Substantial congestion to and from the west side during key freight times was noted as a significant weakness of the regional transportation system by most interviewees. A few businesses are not as affected by congestion due to their business model (e.g. hours of delivery, long distance destinations or reliance on carriers). Most firms and all carriers, however, complained of significant impacts from consistent and pervasive roadway congestion.

Highways and freeways are the most common congestion concern. In terms of specific facilities, I-5 and US 26 were cited most frequently. Other highways were noted to a lesser degree, along with a few arterials.

4.3.2 Suggested improvements

Following, in order of frequency, is the list of specific issues noted by more than one stakeholder:

- US 26 near tunnel, both coming in to Washington County in the A.M. and out in the P.M.
- I-5 north after 2 p.m.
- I-5 Boone Bridge
- I-5 Columbia River Bridge
- I-5/405 interchange during p.m. peak
- OR 217
- Needed alternative to I-5 (e.g. US 30)
- Cornelius Pass and Germantown Road
- I-84, especially around interchanges (Rose Quarter and I-84/I-205)

- Overloading of farm to country roads in areas at the edge of the region, such as Forest Grove and Banks (e.g. Laurel)
- Residential areas not configured for trucks (due to low trees, etc.)
- Lack of early morning bus service
- Tualatin-Sherwood Road (project on 124th Avenue should help)
- OR 99W (and 99E) through cities
- Tualatin-Valley Highway

Stakeholders suggested a number of general approaches to improve freight movement, including:

- More lanes on highways
- HOV or truck only lanes
- Incentives for off peak delivery
- Move freight at night
- More routes approved for triples or longer combination of doubles
- Incentives for sustainable practices, such as electric vehicles and fueling stations for alternative fuels
- Higher speed limit, like other western states
- Improve circulation around PDX
- Drones

The full list of specific improvements suggested by stakeholders is included in Appendix B.

5 ACCESS TO WASHINGTON COUNTY

One key finding from stakeholder interviews was that access to and from Washington County is the biggest issue affecting freight-dependent businesses in the region. This finding supported the results of previous studies, such as the Portland Regional Westside Access and Logistics Analysis. The Steering Committee therefore wanted to ensure that this study covered broader regional access issues that affect Washington County, but lie outside of the county proper. To accomplish that, this section of the study will discuss the method and results of the statewide Freight Highway Bottlenecks Project (FHBP).

The FHBP identified locations on Oregon's highway network that were experiencing significant freight truck delay, unreliability, and increased transportation costs. The FHBP looked at a number of indicators to identify these bottlenecks:

- **Delay –** The annual hours of delay that trucks accumulate on a given segment
- **Unreliability –** Unreliability of shipment travel times
- **Geometric Issues –** Percent grade, degree curvature, narrow lanes or shoulders
- **Volume –** Volume-to-capacity ratio and peak congested travel
- **Incidents –** Frequency of various collision types
- **Cost –** Transportation delay costs, inventory delay costs, and unreliability costs

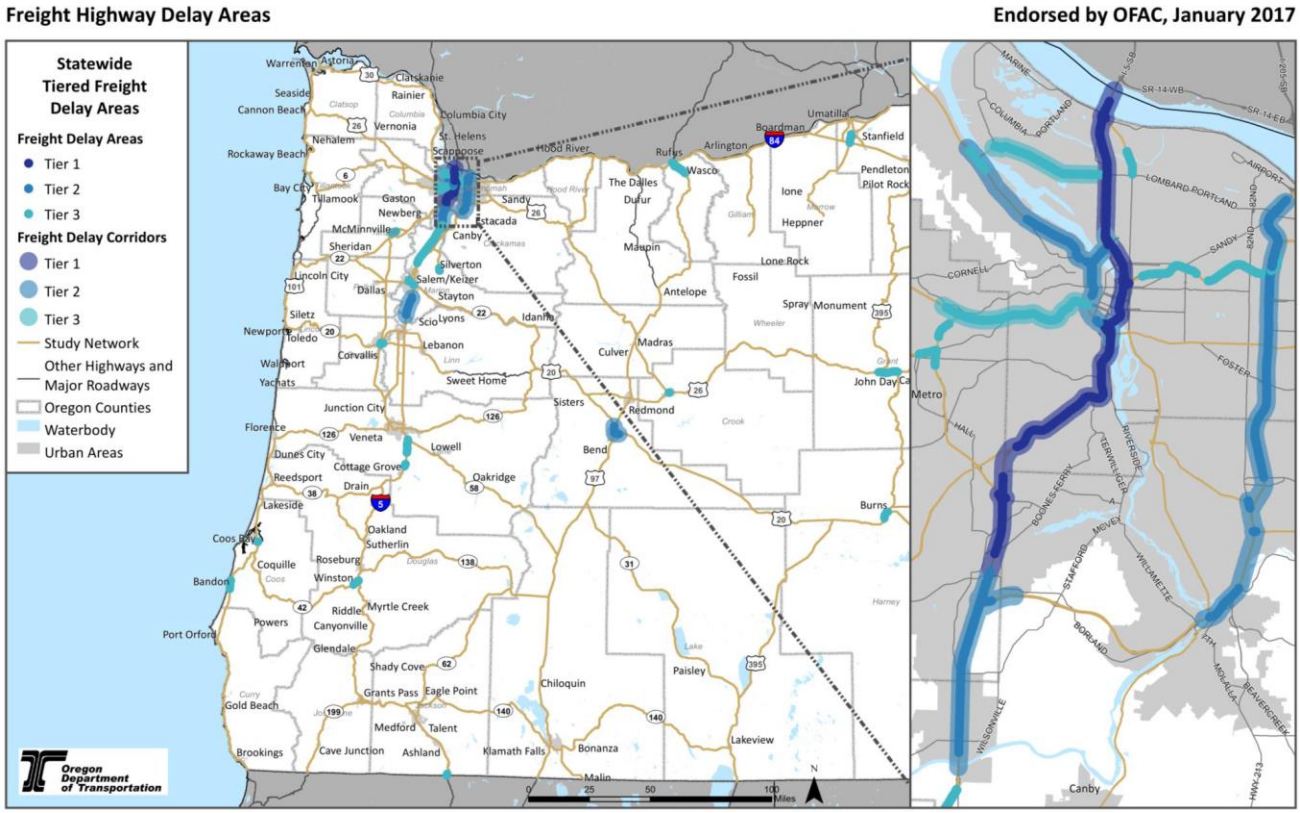
Stakeholders also considered a few additional factors to apply the aforementioned indicators to the wide variety of bottleneck locations:

- **Indicator Weight –** Stakeholder groups agreed that travel delay and unreliability were the two most important indicators of bottleneck locations. The other indicators were used primarily to understand the causes of bottlenecks and to tier the locations
- **Urban vs. Rural –** Since the analysis found that freight networks in urban areas operate at a different scale than those in rural areas, different thresholds were considered for each environment.
- **Corridors –** There were strings of delay areas, particularly in the Portland metropolitan area, that were better considered as corridors, than individual delay areas. This acknowledges the cumulative impact that adjacent segments can have on freight movements.
- **Tiering –** Bottlenecks in freight delay areas and corridors were tiered to reflect their relative impact on freight movement

The study found that bottlenecks were most severe in freight delay corridors, reflecting the high costs of cumulative delay and reliability on the industry. The analysis also found that the Portland metropolitan area had the bulk of identified delay areas and corridors, despite the fact that the thresholds for rural areas were substantially lower than those for urban areas.

As can be seen in Figure 3, several of these areas and corridors help link the city of Portland to Washington County. I-5, a vital access to Washington County from all directions, as noted in stakeholder interviews, is the only Tier 1 Corridor in the state. Additionally, all other major portals referenced by stakeholders – US 26, US 30 and I-405 – are all identified as delay corridors at the state level. The high transportation costs identified on these facilities pose a threat to the entire region, particularly Washington County.

Figure 3. Statewide Freight Highway Bottlenecks (with insert of Portland metropolitan area)



6 EVALUATION OF FREIGHT NEEDS WITHIN WASHINGTON COUNTY

As part of the effort to better understand problems confronting freight in Washington County, a study was conducted to identify the most pressing freight needs throughout the county. The study evaluated roads based on the degree of freight need, rather than the potential ability for a specific project to address the identified need. In other words, need locations, not projects, were evaluated.

The study proceeded by screening for potential freight needs, evaluating the identified needs on a set of five data-driven criteria, and then tiering the needs based on the results of the analysis. This section will provide an overview of this process and discuss the final results. More details may be found in Appendix C.

6.1 NEEDS IDENTIFICATION AND EVALUATION PROCESS

The evaluation process followed three steps:

- **Initial Screening** – Initial steps were performed to identify analysis locations.
- **Evaluation** – Locations identified as having significant freight needs were evaluated based on five criteria.
- **Tiering (Results)** – Following the evaluation process, road corridors were grouped into tiers that demonstrate the relative level of need for each location.

6.1.1 Initial Screening Based on Freight Operations

The initial screening process used several factors to identify locations for additional evaluation:

- **Conditions of existing freight operations** - The needs evaluation focused on corridors that were identified as having poor/moderate conditions in either direction for truck delay or reliability. These conditions are defined as being in the lower four categories on the operations maps displayed later in this section (

- Figure 4,

- Figure 5,

- **Figure 6**, Figure 7).

- **Route status** – The evaluation included only locations designated on a freight network (state, regional, county, or city) or those located along a state route. Street segments that did not meet at least one of these criteria were excluded.

- **Location** – Only segments within Washington County were included.

To assess the conditions of existing freight operations, the project team reviewed annual truck freight operations data for Washington County roads, based on vehicle probe data from HERE.[28] Coverage varied by road and level of use, but was generally available for most major roads in the county, including freeways, highways, arterials, and some collectors. Operations data were combined with truck counts to calculate two measures, truck delay and truck reliability.

Truck Delay

The delay measure approximates how many minutes of delay per mile of roadway are accumulated by trucks on an average day. Delay is an important measure for freight as it demonstrates extra time spent in traffic, which corresponds with additional labor, fuel, and equipment costs to the carrier. Nationally, these incremental costs are estimated to be in the range of $60.00/hour in 2015[29].

Truck delay is calculated by combining information from two data sources: travel time data throughout the day and truck Annual Average Daily Traffic (AADT) counts. The metric uses two indicators from the travel time data: free flow travel time and average travel time. Free flow travel time is defined as the 10th percentile fastest travel time, while average travel time is simply the average of all travel time records. The difference between these two metrics provides a sense of how much slower average operations on the roadway are relative to how fast trucks could be traveling. This difference is then multiplied by the number of trucks that use the roadway, creating a total that represents the total delay faced by trucks throughout the day. This value is then divided by segment length to provide a ratio that can be compared consistently throughout the roadway network.

Results of the truck delay measure are shown by direction in the two figures below. As shown on the legend, there are six categories, with green representing better performance and orange and red representing worse performance. The specific thresholds are indicated on the legend and represent natural breaks.

As shown on the maps, the worst delays occur on I-5, followed by both directions of Tualatin-Sherwood Road, the eastbound direction of US 26 as it approaches the tunnel, and a short segment of OR 47 as it travels southbound through in Forest Grove. Other segments of US 26, OR 47, and OR 217 show up in the third worst category. Numerous highway and arterial segments are in the fourth worst category (shown in yellow), indicating moderately poor performance.

[28] https://here.com/en
[29] ATRI, An Analysis of the Operational Costs of Trucking: 2016 Update, September 2016. http://atri-online.org/wp-content/uploads/2016/10/ATRI-Operational-Costs-of-Trucking-2016-09-2016.pdf

Figure 4. Truck Delay – Northbound & Westbound Directions

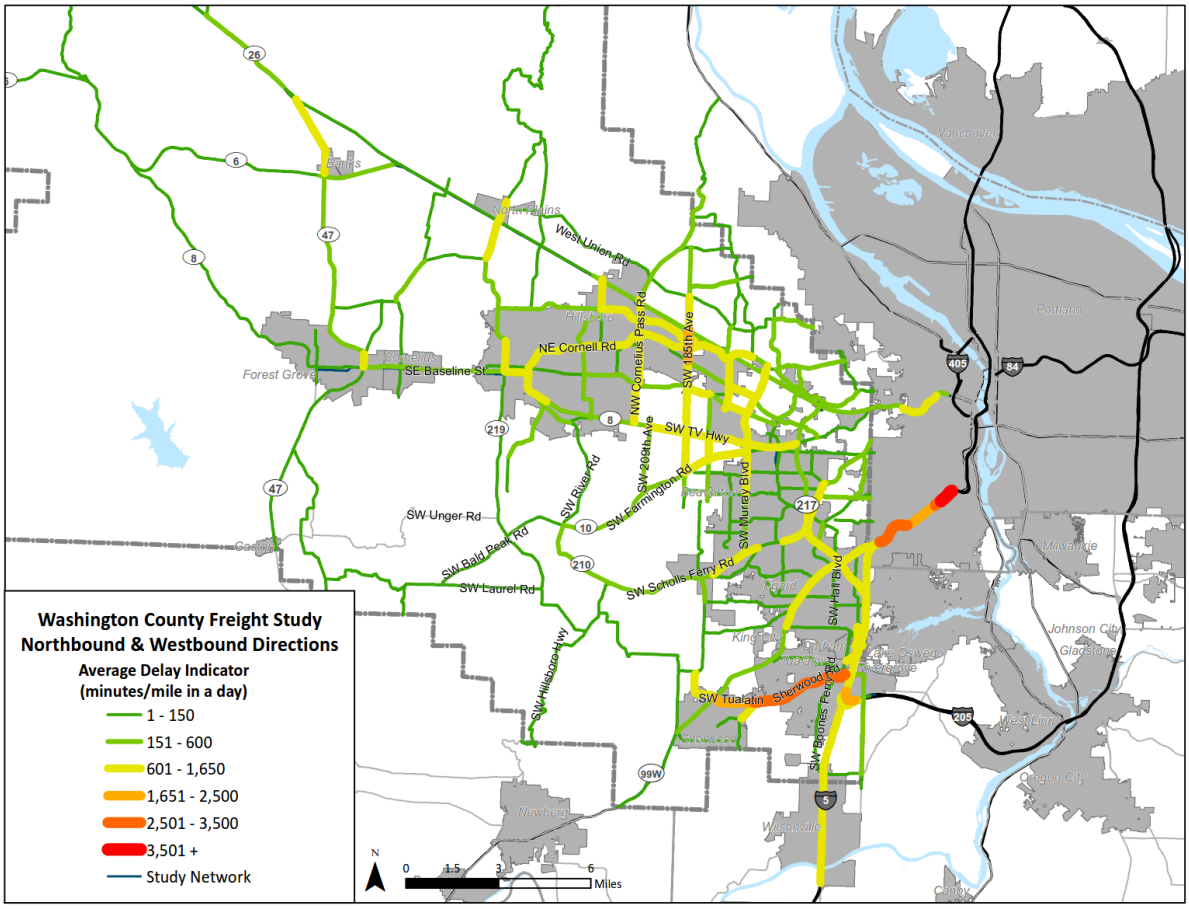
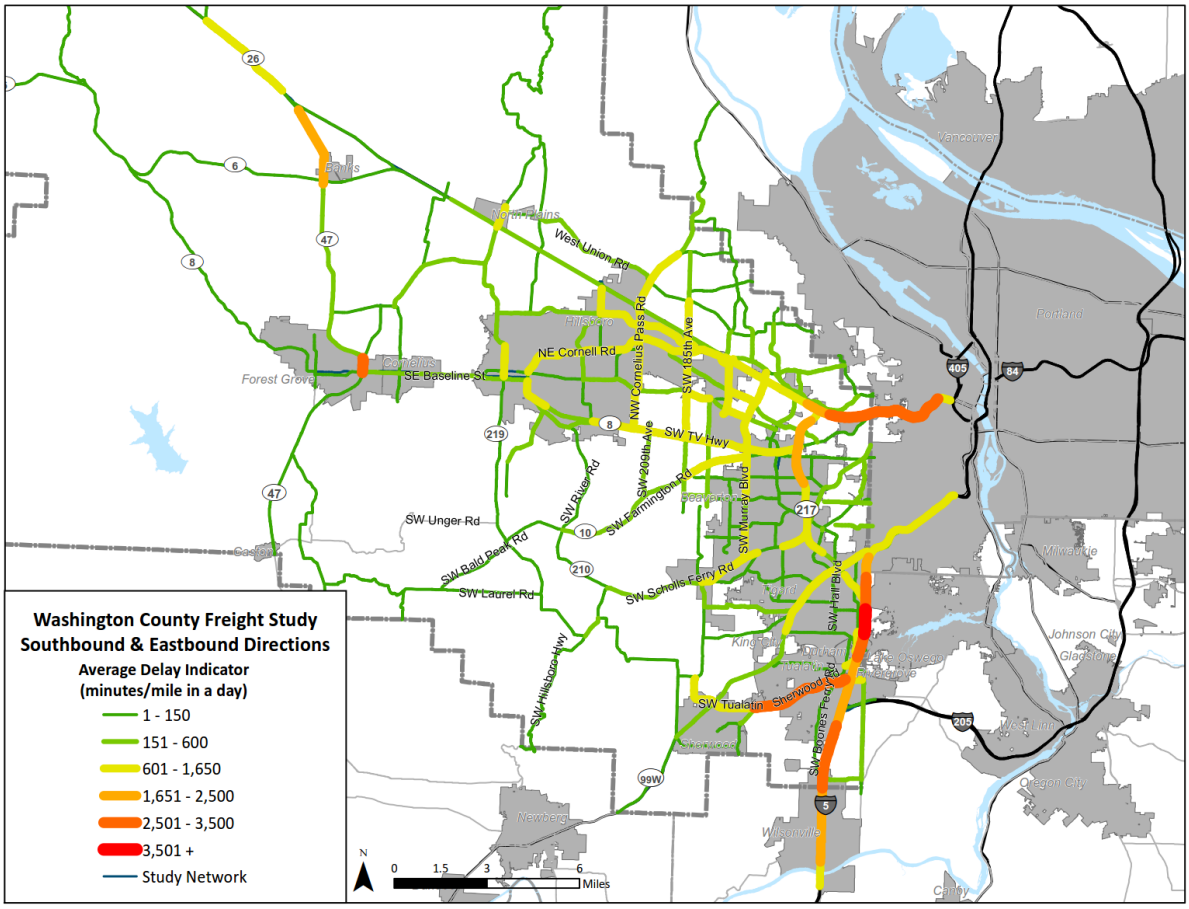


Figure 5. Truck Delay – Southbound & Eastbound Directions



Truck Reliability

A truck reliability measure was developed based on the Travel Time Index (TTI), a measure that highlights the locations on the roadway system where unreliability affects trucks. Reliability is a key measure for freight, as on-time delivery is the most fundamental performance requirement of any freight company. As expressed in stakeholder interviews summarized in Section 0, reliability is so basic that many companies take it as a given.

The truck reliability measure used in this study relies on the ratio between the 95th percentile travel time and the 50th percentile travel time to indicate how much extra time drivers must budget above the average to arrive on time most of the time. This ratio is then multiplied by the truck AADT to obtain a measure of unreliability impacts throughout the system. The 50th and 95th percentiles are calculated for the whole day, consistent with USDOT recommendations in its rule regarding performance assessment.[30] This approach captures both recurring (variation throughout the day) and non-recurring

[30] https://www.federalregister.gov/documents/2017/01/18/2017-00681/national-performance-management-measures-assessing-performance-of-the-national-highway-system

unreliability. If calculated for each hour separately, the result would highlight only non-recurring unreliability.

Results of the truck reliability measure are shown by direction in two figures below. As shown on the legend, there are six categories, with green representing better performance, and orange and red representing worse performance. The specific thresholds for each category are indicated on the legend and represent natural breaks.

As shown on the maps, many of the same facilities that had delay problems also show up as having reliability problems. I-5 again shows the worst performance, followed by US 26 in the eastbound direction. However, more segments of both facilities, as well as a longer stretch of OR 217, show up in the top categories under this metric than the delay metric. This might be because these segments have safety issues, leading to delay-causing incidents. On an already congested facility, an incident causes significant repercussions. This non-recurring delay from incidents contributes to unreliability problems.

On the other hand, Tualatin-Sherwood Road, which has severe recurrent delay problems for trucks, suffers from fewer reliability problems. This may be because the congestion is more on-going and less due to incidents. Daily congestion causes a lot of delay for trucks, but the travel time swings are less extreme.

Similar to the delay measure, moderate reliability problems are evident on the rest of the freeway system, the highways and some arterials. Fewer segments overall appear to be impacted by severe reliability issues than by delay.

Figure 6. Truck Reliability – Northbound & Westbound Directions

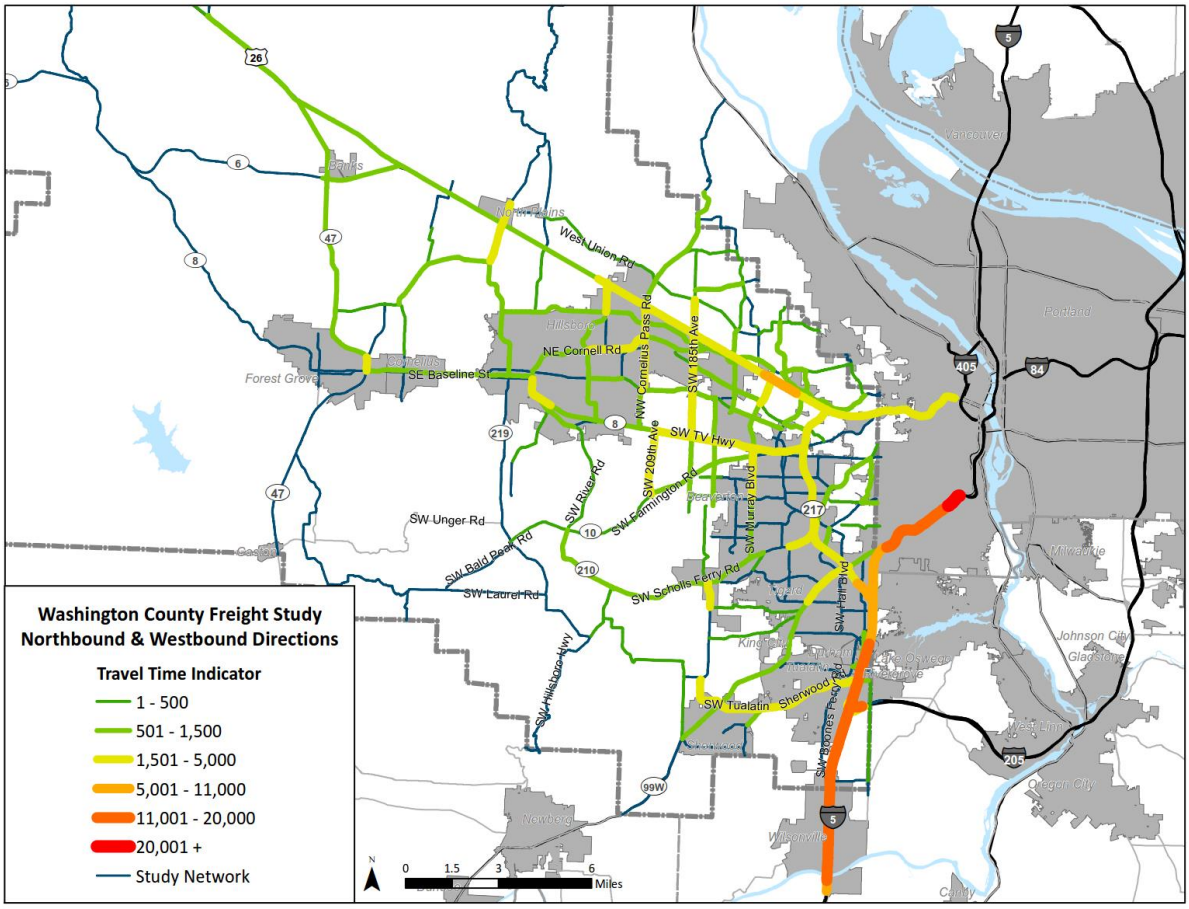
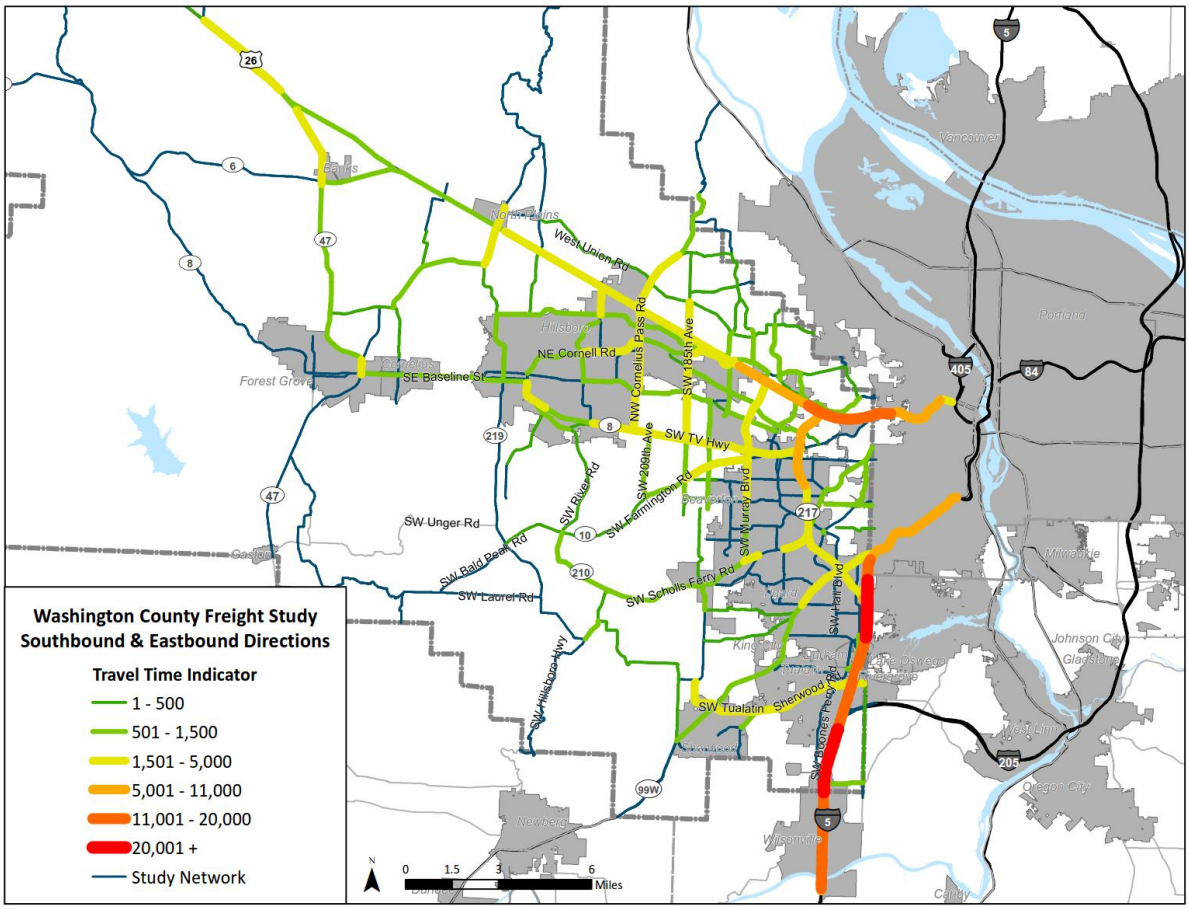


Figure 7. Truck Reliability – Southbound & Eastbound Directions



As mentioned previously, segments falling into the lower four categories on either the truck delay or reliability measures were identified as having operational problems and selected for further evaluation. Approximately 200 street segments within Washington County met these initial criteria. Adjacent segments along a corridor were aggregated into groups, which yielded approximately 60 total locations for evaluation. The final evaluation of needs is described in the following section.

6.1.2 Evaluation Process

The study team applied a set of criteria to the identified locations to evaluate the relative degree of freight need. Five evaluation criteria were developed based on stakeholder interviews, the project Steering Committee, and a consideration of available datasets:

- **Freight delay** – How much total truck delay does a segment have? This is measured as daily truck delay (in minutes) per mile.
- **Travel Time Reliability** – What is the variability of travel time along the segment? This is based on the Travel Time Reliability Index, the product of truck volumes and the ratio between 50th and 95th percentile travel times.

- **Safety** – Did the segment include a top ten percent safety need identified on Washington County or ODOT's Safety Priority Index System (SPIS)?
- **Stakeholder/Plan Identified** – Was the location identified by a stakeholder or a transportation plan as a freight congestion location?
- **Future Growth** – What is the degree of future growth that the segment is projected to carry? Growth is measured as average daily PM peak hour total traffic growth from 2010 to the horizon year (undefined year based on land use development) of the Washington County Futures Study.

Evaluation criteria were primarily data-based. Due to the variations between each dataset (including coverage and precision), the team implemented a stepped-scoring approach to smooth the effects of "noise" created by nominal differences. The stepped scoring was developed manually based on observed natural data breaks.

The scoring for each evaluation criteria ranged from 0 to 1 (safety, stakeholder/plan identified, and future growth) and from 0 to 2 (freight delay and travel time reliability). A lower score indicated a lower relative degree of need. Delay and travel time reliability criteria received a higher potential score due to the richness of the datasets. The maximum possible score by summing all criteria was 7. Table 1 summarizes the data steps and scoring used for each of the criteria.

Table 1. Summary of Evaluation Criteria

Evaluation Criteria	Scoring Method
Delay (Daily truck minutes of delay per mile)	How much total truck delay does a segment have? • <1,650 – 0.5 points • 1,651 to 2,500 – 1 point • 2,501 to 3,500 – 1.5 points • > 3,500 – 2 points
Travel Time Reliability Index (Daily trucks x unreliability factor)	How unreliable is the segment for timely freight movement? • <5,000 – 0.5 points • 5,001 to 11,000 – 1 point • 11,001 to 20,000 – 1.5 points • > 20,000 – 2 points
Safety (Number of SPIS locations)	Was the location included in Washington County or ODOT top 10% SPIS? • No – 0 points • 1 location – 0.5 points • 2+ locations – 1 point
Stakeholder/Plan Identified	Was a location identified by a stakeholder or identified in a plan? • No – 0 points • Yes – 1 point
Future Growth Locations (PM peak hour vehicle growth, 2010 to land use buildout)	How much growth is forecasted on the segment from 2010 to 2055? • Less than 300 vehicles – 0 • 301 to 600 – 0.25 • 601 to 800 – 0.5 points • 801 to 1,200 – 0.75 points • > 1,200 – 1 point

There are some limitations with the analysis worth noting. Stakeholder identification of needs was based on interviews and plans, not a statistically valid survey. While natural breaks were used to establish thresholds for the delay and reliability criteria, these were not exact and the assignment of points based on those thresholds could mean that two segments with slightly divergent results on one criteria end up with different scores. In addition, the scope of the study limited the level of detail of the analysis. Further study would be needed to investigate the cause of a delay, for example, and determine the solution, which might influence final investment priorities. In sum, this was a high level evaluation based on criteria considered to be important to the freight industry. The results shed important new light on freight needs in Washington County but should considered in that context.

Needs Evaluation Results

Each corridor segment was placed into one of three tiers based on the total score of the evaluation process:

- Tier 1 (3.5 to 7.0 points) – 11 locations
- Tier 2 (2.25 to 3.25 points) – 23 locations
- Tier 3 (0 to 2.0 points) – 26 locations

The two maps on the following pages display the evaluation results.

Figure 8. Evaluation Results – Northbound & Westbound Directions

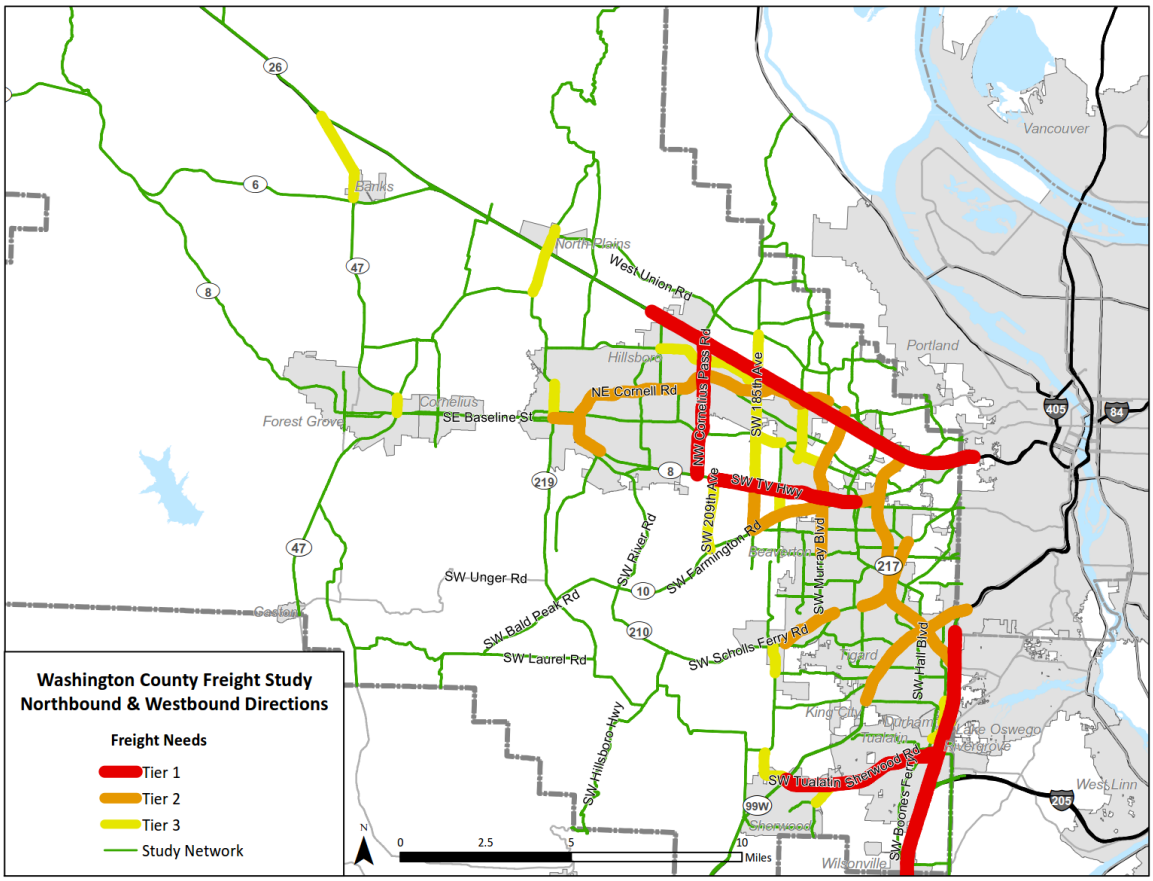
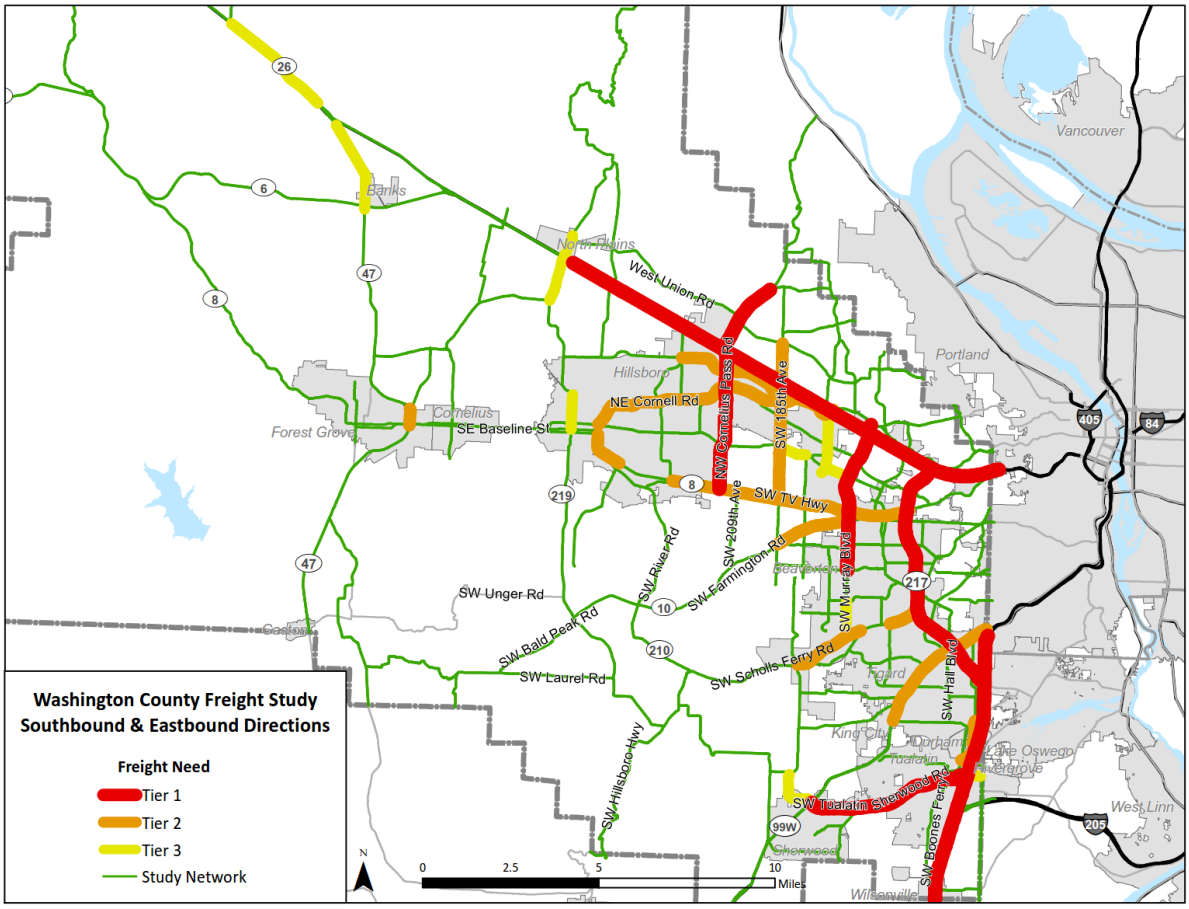


Figure 9. Evaluation Results – Southbound & Eastbound Directions



Below is the tiered list of needs based on the analysis. The list is by direction and the directions are abbreviated (NB stands for Northbound, etc.):

Tier 1 Investment Needs:

1. I-5 SB (Barbur/OR 99W to Elligson Road Interchange)
2. I-5 NB (Elligson Road Interchange to Barbur/OR 99W)
3. US 26 WB (Skyline/Scholls Ferry to Brookwood)
4. US 26 EB (Glencoe/North Plains to Skyline/Scholls Ferry)
5. SW Tualatin-Sherwood Rd WB (OR 99W to I-5)
6. SW Tualatin-Sherwood Rd EB (I-5 to OR 99W)
7. OR 217 SB (US 26 to I-5)
8. Cornelius Pass Rd SB (Germantown Road to Tualatin-Valley Highway)
9. Cornelius Pass Rd NB (Tualatin-Valley Highway to US 26)
10. Murray Blvd SB (Cornell/US 26 to Hart)
11. OR 8 WB (OR 217 to 209th)

Tier 2 Investment Needs:

1. OR 10 WB (Murray to 185th)
2. OR 10 EB (185th to Murray)
3. OR 8 EB (Brookwood to Murray)
4. OR 8 EB (Murray to OR 217)
5. OR 8 WB (Cypress/Minter Bridge to 10th/Oak)
6. OR 8 EB (10th/Oak to Cypress/Minter Bridge)
7. OR 8 WB (10th/Oak to 1st/Hillsboro)
8. OR 47 SB (Martin to OR 8)
9. Murray Blvd NB (Hart to Cornell/US 26)
10. OR 217 NB (I-5 to US 26)
11. OR 99W NB (Durham to Barbur/I-5)
12. OR 99W SB (Barbur/I-5 to Durham)
13. 160th Avenue NB (Farmington to TV Highway)
14. 162nd Avenue SB (West Union to TV Highway)
15. Cornell Rd EB (Main Street to 143rd/US 26)
16. Cornell Rd WB (143rd/US 26 to Main Street)
17. Lower Boones Ferry Rd SB (I-5 to Upper Boones Ferry)
18. NW Evergreen Pkwy EB (Brookwood to Cornell)
19. SW 72nd Ave SB (Upper Boones Ferry to Lower Boones Ferry)
20. SW Scholls Ferry Rd NB (Roy Rogers/175th to 135th)
21. SW Scholls Ferry Rd NB (121st to Allen/OR 217)
22. SW Scholls Ferry Rd SB (135th to Roy Rogers/175th)
23. SW Scholls Ferry Rd SB (OR 217 to 121st)

Tier 3 Investment Needs:

1. OR 47 SB (US 26 to Wilson River)
2. OR 47 NB (Wilson River to US 26)
3. OR 47 NB (Or 8 to Martin)
4. US 26 EB (Highway 47 to Highway 47)
5. 158th Avenue NB (Merlo to US 26)
6. 159th Avenue SB (US 26 to Merlo)
7. 161st Avenue NB (TV Highway to West Union)
8. 1st Avenue NB (Baseline to Glencoe)
9. 2nd Avenue SB (Glencoe to Baseline)
10. Lower Boones Ferry Rd NB (Upper Boones Ferry to I-5)
11. Murray Boulevard SB (Brockman to Scholls Ferry)
12. NW Evergreen Parkway WB (Cornell to Brookwood)
13. NW Glencoe Rd NB (Zion Church/Scotch Church to North Ave/Shadybrook)
14. NW Glencoe Rd SB (North Ave/Shadybrook to Zion Church/Scotch Church)
15. SW 170th Avenue NB (Farmington to TV Highway)
16. SW 209th Avenue NB (Farmington to TV Highway)
17. SW 72nd Avenue NB (Lower Boones Ferry to Upper Boones Ferry)

18. SW Jenkins Rd EB (158th to Murray)
19. SW Jenkins Rd WB (Murray to 158th)
20. SW Nyberg Street EB (I-5 to 65th)
21. SW Oregon Street NB (Oregon St/Murdock Rd Roundabout to Tualatin-Sherwood Rd)
22. SW Roy Rogers Rd NB (OR 99W to Scholls Sherwood)
23. SW Roy Rogers Rd SB (Scholls Sherwood to OR 99W)
24. SW Roy Rogers Rd NB (Bull Mountain to Scholls Ferry)
25. W Baseline Rd EB (185th to 170th)
26. W Baseline Rd WB (170th to 185th)

6.2 Overall Freight Needs Findings

- **I-5 corridor** – a critical corridor for freight both within Washington County as well as within the larger Portland metropolitan region, scored higher than any other corridor due to the scale of daily truck use, freight delay, and travel time reliability needs.
- **US 26 eastbound** – near the tunnel, scored next highest in terms of freight needs within Washington County.
- **Other top tier freight needs** – comprise nine locations on freeways, highways and arterials, including portions of OR 217, OR 8, Tualatin-Sherwood Road, Cornelius Pass Road and Murray Boulevard.
- **Tualatin-Sherwood Road arterial** – experiences the highest truck use and most significant operational problems in Washington County.
- **US 26/US 30 Cornelius Pass Road freight movement** – identified as important in prior planning efforts, including the Westside Freight Access and Logistics Analysis. This analysis reinforces those findings by demonstrating its operational and safety problems today and high future anticipated growth compared to other locations.
- **Second and third tier of freight needs** – represent 23 and 26 locations respectively, primarily located on highways and arterials. These locations do not score as high as the first tier, but still demonstrate significant freight operational needs. These locations serve a critical freight role in the context of overall freight movement within Washington County.

7 KEY STUDY FINDINGS AND CONCLUSIONS

There are a number of key takeaways that can be gleaned from the stakeholder interviews, FHBP study, and Washington County Freight Needs Evaluation. This section synthesizes and distills those findings.

7.1 KEY FINDINGS

- As the economic engine of Oregon and a major exporting region, Washington County is highly dependent on freight infrastructure.
- The Portland metropolitan area has the bulk of identified delay areas and corridors in the state according to the recently completed Freight Highway Bottleneck Project (FHBP)[31].
- In addition to computers and related components, plastic, wood, paper, tools, nursery, seed, fruit and tree nut products all represent significant exports produced in Washington County[32].
- Due to its relative speed and flexibility, truck is by far the most common mode. Whether on its own or in combination with other modes, it is a part of most freight trips.
- Businesses' heavy reliance on trucks makes highway and arterial congestion a major concern for many firms in Washington County and the region. A severe national truck driver shortage, exacerbated by federal requirements and traffic delays, is impacting the ability of businesses to move goods.
- Most interviewed firms indicated that highway congestion was a serious impediment and complained of significant impacts from consistent, pervasive roadway congestion. Firms prefer to shift their hours to start earlier to avoid congestion, however, some are limited by customer pick up or delivery times. Driving in congestion adds time to deliveries, resulting in significant costs to businesses.
- New real-time truck operations data on arterials was analyzed with truck counts in an analysis that allowed more detailed understanding of local delay and reliability issues critical to freight movement than previously.
- The limited number of routes into the county, the degree of delay and unreliability on them and the importance of county freight to the economy make access to Washington County a statewide issue. These concerns were expressed by stakeholders and supported by this evaluation and the statewide FHBP.
- The I-5 corridor was the most often cited by stakeholders in this study and represents the highest need in both this and the statewide bottleneck study.
- The US 26 corridor near the Sylvan Tunnel followed I-5 in terms of Washington County stakeholders and the operational analysis in this study and was also identified as a delay corridor in the statewide study.
- Many Washington County highways and arterials suffer from congestion throughout much of the day. Other key areas of operational delay and reliability include portions of OR 217, OR 8, Tualatin-Sherwood Road, Cornelius Pass Road and Murray Boulevard.

[31] https://www.oregon.gov/ODOT/TD/TP/Pages/FreightHighwayBottlenecks.aspx

[32] WSP, Washington County Export Analysis, November 1, 2016.

- The Transportation Futures Study found that, without new road capacity beyond those adopted in local TSPs, truck hours of delay, especially on freeways, is expected to increase 400 percent over the long term.
- Farm to market roads near the edge of the urban area are not built for the volumes or loads they are subject to.

7.2 Stakeholder Suggestions to Improve Freight Movement

Stakeholders had a number of suggestions to improve freight movement, including the following general approaches:

- Adding HOV or truck-only lanes
- Providing incentives to encourage off-peak delivery
- Adding lanes or interchanges at bottleneck areas along specific corridors
- Expanding transit service, routes, and facilities along congested corridors
- Higher speed limits

7.3 Conclusions

This freight needs analysis was intended to provide information to decision-makers in establishing transportation improvement and funding priorities. Freight delay and reliability within and to Washington County are a major regional issue. Due to the importance of county traded sector businesses to the economy, the freight needs identified here rise to the level of statewide significance.

As summarized in this report and detailed in technical memos, this study identified and prioritized Washington County Freight needs. This study finds that freight access to and movement within Washington County represents a significant cost to businesses today. Further, with anticipated growth in truck traffic going forward, businesses are rightfully concerned about the ability of the roadway network to reliably accommodate their future needs. Failure to address these infrastructure needs could result in loss of future business and drag on the economy.

These findings demonstrate the location of significant freight needs in and around Washington County. The report also underscores the importance of developing and funding road improvements to meet them.