OREGON FREIGHT INTERMODAL CONNECTOR SYSTEM (OFICS) STUDY

Final Report

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Minor revisions were made by ODOT Staff

prepared for

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Table of Contents

List of Acronyms ..... **iii**

Acknowledgements ..... **vi**

Executive Summary **ES-1**

1.0 Project Background, Purpose and Approach **1-1**

2.0 Stakeholder Engagement **2-1**

2.1 Technical Advisory Committee 2-2

2.2 Stakeholder Survey 2-2

2.3 Oregon Freight Advisory Committee 2-5

3.0 Analyzing the Existing NHS Freight Intermodal Connectors **3-1**

3.1 NHS Criteria 3-1

3.2 Existing Conditions 3-3

4.0 Identifying Intermodal Terminals/Businesses **4-1**

4.1 Process 4-1

5.0 Identifying Additional Intermodal Connectors **5-1**

5.1 Criteria 5-1

5.2 List of Additional Intermodal Connectors 5-2

5.3 Intermodal Connector Tiering 5-3

6.0 Intermodal Connector Needs **6-1**

7.0 Prioritization Strategy for Intermodal Connector Needs Investment **7-1**

7.1 Methodology & Strategy 7-1

8.0 Next Steps/Implementation **8-1**

List of Tables

Table 3.1 NHS Intermodal Connector Criteria 3-2
Table 3.2 Designated NHS Oregon Freight Intermodal Connectors 3-3
Table 3.3 Information Inventoried on Intermodal Connectors and 3-4
Table 4.1 Intermodal Terminal/Businesses Commodities 4-2
Table 5.1 Primary Criteria for Intermodal Connectors 5-2
Table 5.2 Number of Intermodal Connectors by Type and ODOT Region 5-3
Table 6.1 OFICS Categories of Needs for Intermodal Connectors 6-2
Table 7.1 Prioritization Strategy for Intermodal Connector Needs Investments 7-1

List of Acronyms

AADT – Average Annual Daily Traffic

AASHTO – American Association of State Highway and Transportation Officials

ADA – Americans with Disabilities Act

ATRI – American Transportation Research Institute

BNSF – Burlington Northern Santa Fe

BP – British Petroleum

BTS – Bureau of Transportation Statistics

CAF – critical agricultural facilities

CIP – Capital improvement Plan

CRC – Columbia River Crossing

DOT – Department of Transportation

DVRPC – Delaware Valley Regional Planning Commission

FHWA – Federal Highway Administration

FRA – Federal Railroad Administration

GIS – geographic intermodal systems

GM – goods movement

GPS – global positioning system

H-GAC – Houston-Galveston Area Council

HERS-ST – Highway Economic Requirements System

HPMS – Highway Performance Measurement System

IC – intermodal connectors

ID – identification

ILC – Intermodal Logistics Centers

IRI – International Roughness Index

ITB – Intermodal Terminal/Business

MAP-21 – Moving Ahead for Progress in the 21st Century

MLK – Martin Luther King

MOVES – Motor Vehicle Emission Simulation

MPO – metropolitan planning organization

N/A – not available

NB – northbound

NCFRP – National Cooperative Freight Research Program

NE – northeast

NHS – National Highway System

NOACA – Northeast Ohio Areawide Coordinating Agency

NPMRDS – National Performance Measures Research Data Set

ODOT – Oregon Department of Transportation

OFAC – Oregon Freight Advisory Committee

OFICS – Oregon Freight Intermodal Connector

OFP – Oregon Freight Plan

OTP – Oregon Transportation Plan

PANYNJ – Port Authority of New York and New Jersey

PDX – Portland International Airport

PFN – Principal Freight Network

RR – railroad

RTPO – regional transportation planning organizations

RVMPO – Rogue Valley Metropolitan Planning Organization

RVTR – Rogue Valley Terminal Railway

SE – southeast

SIS – Strategic Intermodal System

TAC – Technical Advisory Committee

TEU – twenty foot equivalent units

TIP – Transportation Improvement Plan

TSP – Transportation System Plan

UP – Union Pacific

WSDOT – Wisconsin Department of Transportation

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This project was guided by a Technical Advisory Committee (TAC) and Friends of the TAC. Without their input and consideration, this project would not have been possible. We thank the members of the TAC and Friends of the TAC for their participation in the Oregon Freight Intermodal Connector System Study. Members of the two groups are listed below.

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Executive Summary

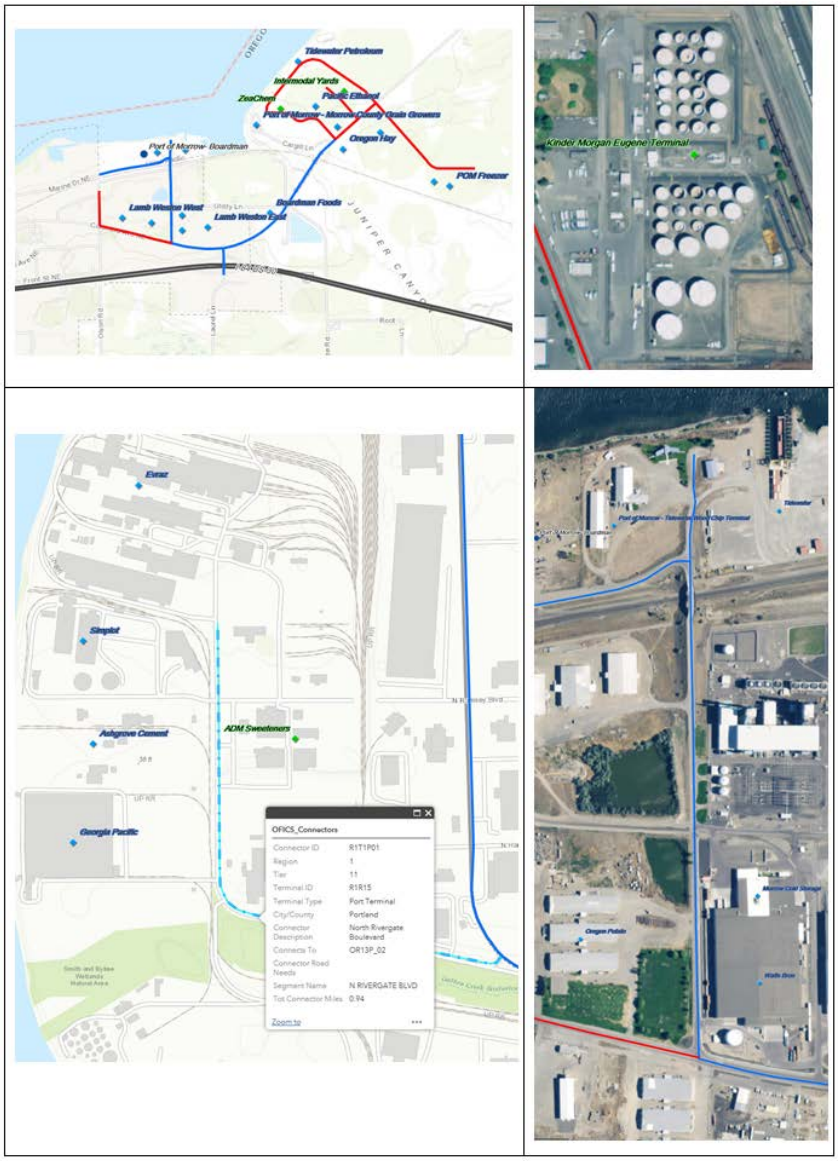
Congress designated the NHS (National Highway System) network in the National Highway System Designation Act of 1995 and mandated the "NHS Intermodal Freight Connectors Report" in the Transportation Equity Act for the 21st Century. Freight intermodal connectors are roads that provide the “last mile” connection between major intermodal freight facilities (e.g., ports, airports, intermodal rail yards) and the NHS. The 2011 Oregon Freight Plan (OFP) incorporated strategic implementation initiatives 3.1and 3.2, that direct the state to “identify additional freight intermodal connectors…and monitor the mobility, infrastructure conditions and performance of the NHS intermodal connectors and other last-mile connections to important freight generation sites”.

Although the NHS intermodal connectors account for a small percentage of the total NHS mileage in Oregon, these roads are critical for the timely and reliable movement of freight. It is therefore important to understand the use, condition, and performance of these intermodal connectors since they have a direct impact on efficient goods movement and economic health. The Oregon Freight Intermodal Connector System (OFICS) study identified intermodal terminals, additional intermodal connectors, validated the existing NHS intermodal connectors, identified connector needs and developed a tiered list and map of connectors.

To identify additional intermodal connectors (in addition to the existing NHS intermodal connectors) it was necessary to first locate the intermodal terminals. Freight intermodal terminals are defined as facilities, which provide for the transfer of freight from one mode to another. Examples include the NHS intermodal terminals such as Port of Portland Terminal 5 and Union Pacific’s Brooklyn Yard. The intermodal connectors serve the intermodal terminals by functioning as the roadway link between the terminal and the state highway. After a thorough statewide effort, several smaller intermodal terminals such as airports, ports and rail transload facilities were identified. In addition, there are many manufacturing businesses in the state that use more than one mode (onsite) to receive raw materials and/or ship finished products. Examples include Georgia Pacific, Tree Top (fruit products) and Knife River (aggregate). For the purposes of this study, these types of businesses along with the smaller intermodal terminals are defined “Intermodal Terminal/Businesses”. The study resulted in the identification of approximately 100 intermodal connectors that serve approximately 200 Intermodal Terminal/Businesses. A majority of the connectors and Intermodal Terminal/Businesses are in Portland, the Willamette Valley and along the Columbia River. Information about commodity types that move on the intermodal connectors was also collected.

All of the intermodal connectors and terminals are mapped and can be accessed online through the OFICS GIS Tool. This tool allows a user to view a variety of information including the street network, Intermodal Terminals/Businesses (ITB), intermodal connectors, tier designations and other features. The OFICS Intermodal Connectors web application is available through the ODOT ArcGIS Online gallery at https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=0b35d56e2cfa4ffd8c308c09722f1da5.

Figure ES.1 Screenshot of OFICS GIS Tool



This project was supported by a significant stakeholder process, which included the Project Management Team (PMT), the Technical Advisory Committee (TAC), Friends of the Committee, the Oregon Freight Advisory Committee (OFAC) and a stakeholder survey. The stakeholder vetting process was instrumental in determining the criteria to identify the intermodal connectors and the tiering process. Endorsement of the key elements of the study occurred at the April 12, 2017 OFAC meeting.

The study identified intermodal connectors' needs and issues through stakeholder questionnaires surveys, meetings with agency staff and desktop analysis using the aerial image of the GIS tool and Google Street View. The needs identification effort revealed a wide range of improvements needed for the intermodal connectors. The most common type of need is pavement repair.

Due to the wide range of freight activity intensities on the intermodal connectors, a tiering system was developed to sort the connectors by levels of importance. All of the intermodal connectors were assigned to

one of three tiers; with tier one being the highest level of importance. All of the NHS intermodal connectors are in Tier One, while other connectors important to the state can be found in Tier 2 and Tier 3.

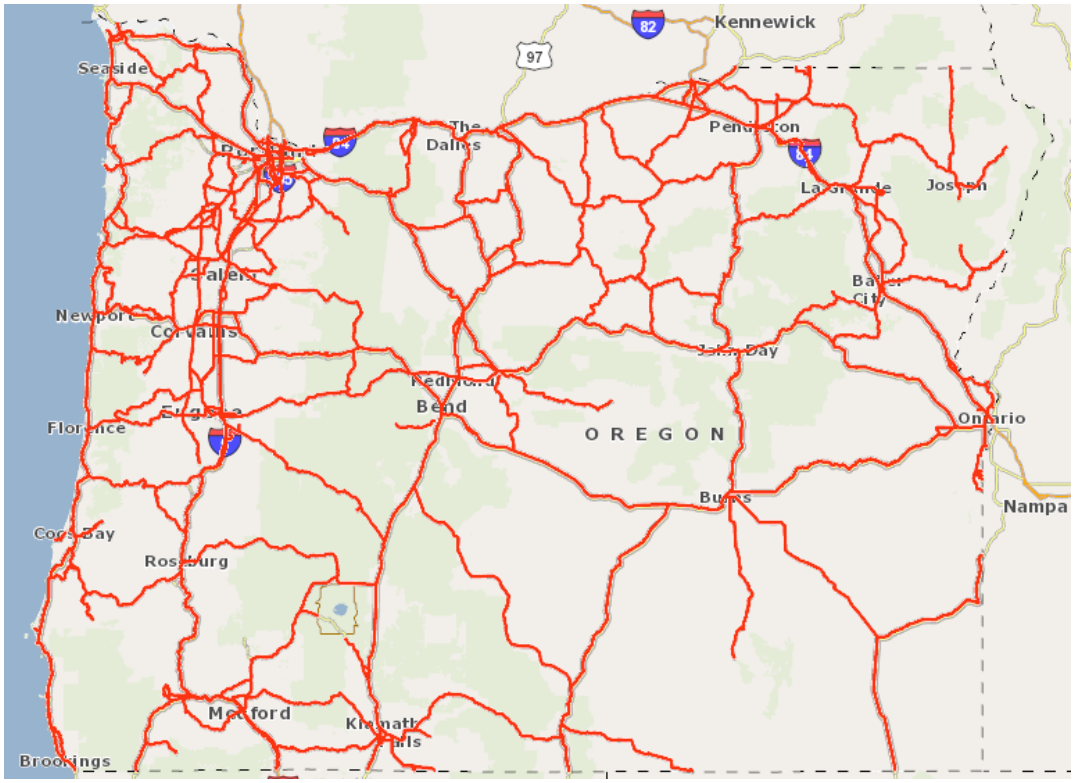
The methodology for prioritizing investments to address the needs consists of a broad systematic investment decision approach based on the tiering system mentioned above. This methodology takes into consideration the amount of intermodal activity and level of importance of each intermodal connector.

The OFICS study assembled and collected a large amount of information and data on freight connectors in Oregon. This data is now available for usage in multimodal planning efforts. One of the implementation steps from this study is to ensure that this information is incorporated into regional planning efforts such as MPO long-range transportation plans and local Transportation System Plans (TSP). This will allow for projects that improve freight connectors to be considered alongside other improvements when project selection is occurring. At the state level, the state of Oregon may want to consider developing a statewide program to improve both designated NHS connectors along with Tier 2 and Tier 3 connectors.

1.0 Project Background, Purpose and Approach

The Oregon Freight Intermodal Connector System (OFICS) study is directed by the Oregon Department of Transportation's (ODOT) Freight Planning Unit, as an implementation initiative from the 2011 Oregon Freight Plan (OFP). As recognized in the OFP, it is important for ODOT to direct funding to projects that improve mobility on the freight intermodal connectors. The primary outcome of the OFICS project is a list and map of tiered intermodal connectors identifying needs based on analysis and background research. The entire state highway system was analyzed in this study.

Figure 1.1 State Highways in Oregon



There are 24 Oregon NHS Intermodal Connectors, most of which are freight intermodal connectors (IC). A freight IC is a road connecting an intermodal facility through which goods move between modes. Sometimes a connector consists of 2 or 3 roads that are needed to travel between the intermodal facility and the highway. Most of the freight IC in Oregon are in the Portland area while others are in Astoria, Coos Bay, Medford, Eugene and Boardman. Passenger intermodal connectors connect to airports, train stations and bus terminals and are not part of this study.

This study is the first of its kind in the state to attempt to identify additional IC beyond the NHS Intermodal Connectors. For some time now, the Oregon Freight Advisory Committee (OFAC) and staff have desired this study to be conducted understanding the important roles these connectors play as the vital first and last mile that trucks travel when taking goods to or from an intermodal facility. The 2011 Oregon Freight Plan (OFP) contains several strategies and actions that recommend collecting mobility, congestion and infrastructure condition data on IC. This study implements these strategies and actions.

Connectors are critical components of Oregon's freight system that tie modes together and facilitate distribution of products to users. However, their importance is sometimes overlooked and these key connections between modes sometimes fall between the cracks. These routes tend to be lower volume industrial roads and often have less vocal constituents than major commuter routes or transit lines.

Most of the connectors in Oregon are city streets that must handle heavy large trucks moving between terminals and highways. If they are in not very good condition or have design deficiencies they can slow freight movement and decrease efficiency. An efficient freight system which includes the connectors is needed for economic competitiveness in industries that rely on frequent shipments including manufacturing, construction, and retail trade.

The objectives of the Oregon Freight Intermodal Connector System (OFICS) study are to:

1. Develop criteria to define additional roadways (beyond the currently designated NHS IC) that should be included in the OFICS.

2. Develop a list of additional freight IC based upon the criteria above.

3. Assess the current condition of the OFICS (which include the NHS Intermodal Connectors) and assess performance (such as mobility, efficiency, and safety).

4. Develop criteria, key factors, and or performance indicators to help prioritize potential future investment in the OFICS.

5. Develop a tiered list of the freight IC.

6. Recommend next steps for implementation

One of the first tasks for the study involved a literature review of previous freight planning efforts in Oregon, other states and at the federal level related to freight intermodal connectors. It was discovered that many states have developed studies on their NHS intermodal connectors but very few states have completed studies that identify additional intermodal connectors. Therefore, several different approaches were tested before an appropriate methodology was settled on.

The biggest challenge of the study was finding freight data on the streets that were potential intermodal connectors. Most of the local governments did not have the data we needed to conduct a comprehensive study such as lists of intermodal facilities within their jurisdiction, truck counts on the connector roads and roadway needs for truck movements. This data gap affected the criteria developed to identify additional intermodal connectors and the tiering criteria. FHWA has criteria to identify NHS intermodal connecters and a scaled down version of those criteria were developed to identify the additional intermodal connectors.

Considerably more data was available for the NHS freight intermodal connectors because ODOT collects data about these roads in part to meet the requirements of the FHWA Highway Performance Management System (HPMS). The approach used to carry out the study is based on criteria presented in Section 4.0.

The majority of the data gathered for this study were collected using an internet-based survey combined with follow-up phone calls and telephone interviews. Respondents were contacted multiple times by phone and by email during the course of data collection to encourage maximum participation.

The needs identification effort revealed a wide range of improvements needed for the intermodal connectors. Four categories of needs were identified; pavement, congestion, pinch points/accessibility and safety. The functional classes of the streets that comprise the intermodal connectors vary dramatically and include segments of local streets, minor collectors, minor arterials and major arterials. Cost estimates for the needed improvements were not obtained as this study focuses on the general types of improvements needed in order to improve truck mobility and access. The needs for the intermodal connectors were then prioritized in order to strategically improve the efficient movement of trucks. The methodology for prioritizing is primarily based on the tiering of the intermodal connectors.

One of the challenges of the prioritization effort is that most of the connectors are under the jurisdiction of a large number of cities and counties. These agencies have their own Transportation System Plans and Capital Improvement Programs that identify needs, projects and funding. Coordination is needed with these agencies to get buy-in on the goals of this study including the prioritization of needs for the intermodal connectors. The implementation phase of this study addresses this coordination issue. It is expected that the recommendations in the study will be implemented incrementally over the long term as awareness of the OFICS increases at the local, regional and state level.

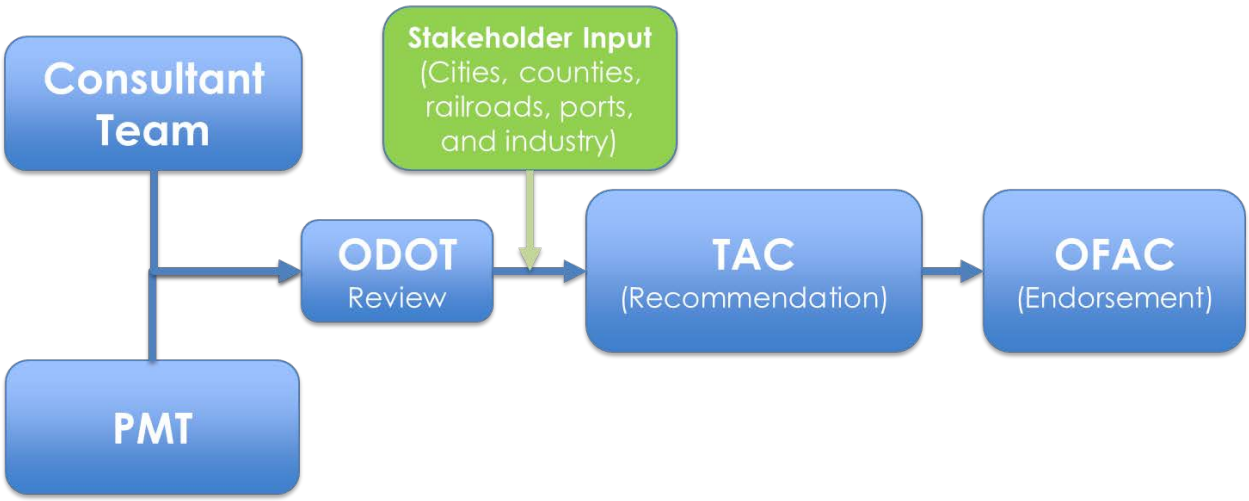
2.0 Stakeholder Engagement

The OFICS project utilized a robust facilitated stakeholder engagement process to identify, evaluate and agree upon the final, tiered list of intermodal connectors. The purpose of the outreach program was to generate advisory input from a well-informed cross-section of the interested and impacted freight public to help identify and prioritize intermodal connectors. These stakeholders have knowledge of the freight industry and its use of the state highways and provided useful input throughout the study.

A Project Management Team (PMT) of the primary ODOT and consultant project team members was formed from day one. The PMT met twice each month to direct project progress, discuss potential concerns and coordinate for stakeholder meetings. A Technical Advisory Committee (TAC) was established and relied upon for review of draft findings and key decisions. In addition, the Oregon Freight Advisory Committee (OFAC) was consulted throughout the project and endorsed the final product.

The flow chart below (Figure 2.1) represents the project decision-making structure. As shown, products were developed by the consultant and PMT. After review by ODOT project management, they were submitted to the TAC for review and facilitated input. Next, the OFAC was briefed on the materials and provided input and ultimately endorsed the final OFICS study.

Figure 2.1 Decision Making Flow Chart



There were three key elements of stakeholder engagement that were undertaken as part of this study:

- A technical advisory committee was formed to guide the work conducted in the study.
- A freight stakeholder questionnaire was developed and used to conduct a survey of stakeholders.
- The Oregon Freight Advisory Committee (OFAC) provided review and comment on draft and final versions of the study.

2.1 Technical Advisory Committee

A technical advisory committee (TAC) was formed to provide guidance related to the analytical components of this study. The TAC was formed based on considering the stakeholders for this project including local governments, Oregon Public Ports Association, private ports, railroads, owners of intermodal facilities, ODOT Rail, metropolitan planning organizations (MPOs), League of Oregon Cities, FHWA, forest products businesses, and others. The TAC was supported by a Friends of TAC group that also attended TAC meetings and provided input on deliverables and progress over the course of this study.

The TAC met on four occasions for this study covering a wide range of topics. The meeting dates and primary agenda items covered in each meeting are as follows:

- TAC Meeting #1 (August 31, 2016) – Study overview, literature review, IC identification criteria
- TAC Meeting #2 (October 27, 2016) – Review of list of additional intermodal connectors, draft questionnaire, draft performance indicators, demonstration of OFICS GIS tool
- TAC Meeting #3 (December 13, 2016) – Review of list and characteristics of NHS and additional intermodal connectors, survey implementation and findings, strategies for tiering intermodal connectors, supplemental demonstration of OFICS GIS tool
- TAC Meeting #4 (March 29, 2017) – Review of list of connectors and intermodal terminals/businesses, intermodal connectors tiering and needs, prioritization of investments.

At the fourth and final TAC meeting, the TAC endorsed the list of intermodal terminals/businesses, the list of intermodal connectors, the tiering criteria, the intermodal connector needs, and the methodology used for prioritizing investment in the connectors.

2.2 Stakeholder Survey

This section describes the implementation of a freight stakeholder questionnaire which was undertaken as Task 6 of this study. The purpose of the survey is to:

- Confirm the alignment of intermodal connectors identified in Task 4
- Inform and validate the issues and concerns for the freight intermodal connectors
- Identify patterns in the types of issues across different connector categories
- Describe potential recommendations to consider to mitigate the issues that are identified.

2.2.1 Data and Methodology

The majority of the data gathered for this study were collected using an Internet-based survey combined with follow-up phone calls and telephone interviews. An initial list of survey questions was developed by the consultant team for ODOT review. After making revisions based on ODOT comments, the survey instrument was converted into an on-line survey for distribution to respondents. Respondents were contacted multiple

times by phone and by email during the course of data collection (November 18, 2016 to January 4, 2017) to encourage maximum participation.

The information requested on the surveys were divided into three categories. First, information on the type of survey respondent was collected. This included information on the agency or company that they represent, the specific connector that they are filling out information for, and the specific organization name and respondent name. The second category of information collected was related to the terminal. This included confirmation that the respondent was assigned to the correct terminal(s) and an estimate of truck traffic generated at the terminal. The third portion of the survey pertained to the connectors associated with the terminal. This was the longest portion of the questionnaire and requested information on the following topics:

- Identification of appropriate connector
- Estimate of daily truck traffic on connector
- Pavement condition
- Time periods of recurring congestion
- Roadway features (roadway width, rail crossings, bridges)
- Operational Issues/Concerns - Safety, Parking, Signage, Turning Movements, Trains, Mixing with other traffic types and land uses
- Recommendations on improvements

A more detailed discussion of the survey time frame, data collection procedures, and survey recipients may be found in a separate technical memorandum that was developed to capture the survey activities

2.2.2 Summary of Survey Responses

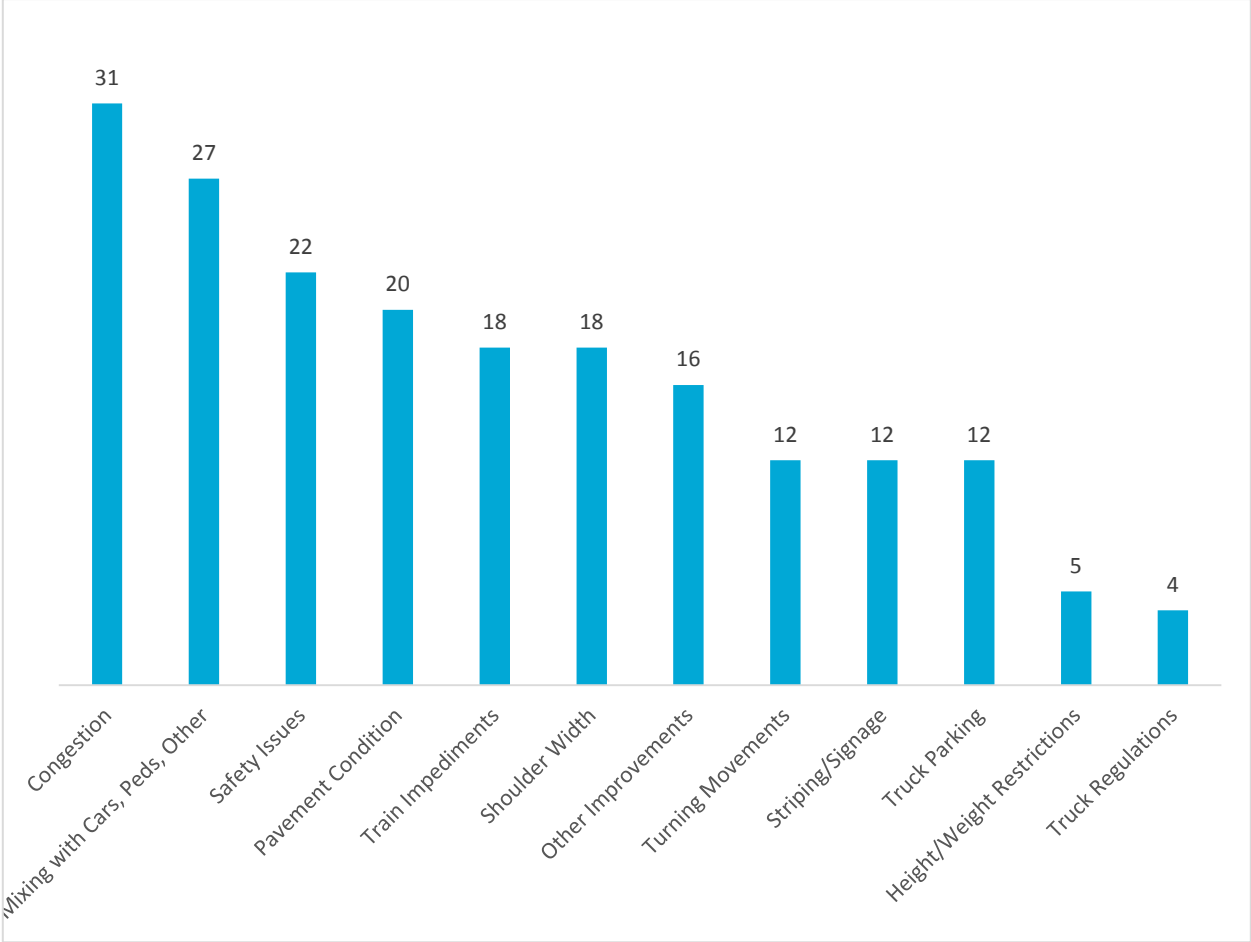
In total 132 stakeholders were contact as part of the survey, including:

- 3 intermodal pipeline terminal operators;
- 7 airport operators;
- 40 intermodal and transload rail terminal operators;
- 30 intermodal and transload marine terminals; and
- 55 city, county, and MPO staff.

There were several issues identified for the intermodal connectors through the survey process. Figure 2.2 shows the distribution of these issues across 12 different categories. Congestion is the largest issue category with 31 of the responses identifying this type of issue. The second most common issue was the mixing of trucks with cars, pedestrians, bicyclists and incompatible land uses with 27 responses indicating that there were issues relating to this category. Issues related to safety, pavement, impediments from trains,

and shoulder width registered between 18 and 22 responses each. Turning movements, striping/signage, and truck parking each had 12 responses. Height/weight restrictions and truck regulations had the fewest responses numbering four and five, respectively. More issues related to truck mobility and operational issues probably would have been captured if truck drivers were included in the survey. However, the study was subject to time constraints. This is something to consider whenever this study is updated or expanded.

Figure 2.2 Number of Connector Issues Identified Through Survey by Issue Category



2.2.3 Meeting with Portland Freight Stakeholders

In November of 2016, representatives of the Oregon DOT, the City of Portland, Metro, the Port of Portland, and the consultant team convened to discuss issues and needs related to the intermodal connectors in the Portland region. Information collected in this meeting can be found in the OFICS Study Appendix https://www.oregon.gov/ODOT/Planning/Documents/2017-OFICS-Study-Appendix.pdf

2.2.4 Supplemental Survey and Interviews

A supplemental survey and interview process was conducted to collect information for connectors that were not captured through the other efforts. An initial survey was completed using information publicly available on the internet. In general, this included looking at aerial and street view images available through Google Maps and Bing Maps, county and city Transportation System Plan (TSP) documents and ODOT traffic volume data. After the preliminary survey was completed additional information was collected by directly contacting agencies by e-mail and phone. Generally, the city/county representative was initially contacted via e-mail to schedule a time for a phone interview. Phone interviews lasted anywhere from 10 to 35 minutes depending on the number of sites. If e-mail attempts were not successful then attempts were made to contact agencies directly by phone. Most attempts to contact agencies were successful with only three failed attempts.

The key findings of the data collection effort were:

- Many agencies were unaware of the average daily truck volumes on the connectors. Only a few agencies could respond with qualitative information. The interviewees used online data resources from agencies to collect ADT data where possible.
- Various agencies throughout the phone interviews indicated that the identified connectors were either not the primary route to the terminal used by trucks, or that other secondary routes were also used. A few agencies indicated that there are future planning projects which would change or affect the primary route used.
- A total of 116 issues were identified as part of this supplemental effort.

2.3 Oregon Freight Advisory Committee

The Oregon Freight Advisory Committee (OFAC) was formalized in 2001 by the Oregon Legislature. The OFAC meets on a regular basis to provide input and guidance on a range of freight planning activities conducted by ODOT. Information from the OFICS study was presented at multiple OFAC meetings for review and comment.

3.0 Analyzing the Existing NHS Freight Intermodal Connectors

This section analyzes the NHS intermodal connectors to determine if they still meet the 1998 NHS intermodal connector criteria. The existing conditions of the connectors was also evaluated. General information about the NHS intermodal connectors is discussed in Section 1.0 Project Background, Purpose and Approach. General NHS intermodal connector needs can be found in Section 6.0 while specific needs are located in a separate document entitled, "OFICS Inventory Table". https://www.oregon.gov/ODOT/Planning/Documents/2017-OFICS-Inventory-Table.pdf

As part of this study, a GIS tool was created to display map information on freight intermodal terminals and connectors in Oregon. The GIS Tool allows users to zoom in to see a variety of information including the street network, ITBs, intermodal connectors, their tier and other features. Layer and legend information is located at the top right corner of the program. The base map icon will change the map layer to the air photo layer. Besides zooming in with the map, users can search for specific intermodal connectors and ITBs by using the search box in the top left corner. The OFICS Intermodal Connectors web application is available through the ODOT ArcGIS Online gallery at https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=0b35d56e2cfa4ffd8c308c09722f1da5s. The designated NHS connectors are shown in blue in the GIS tool. More information on the GIS tool can be found in the Appendix https://www.oregon.gov/ODOT/Planning/Documents/2017-OFICS-Study-Appendix.pdf

3.1 NHS Criteria

Congress designated the NHS network in the National Highway System Designation Act of 1995, which was signed into law in 1995. The inventory of the NHS was completed in 1998 and approved by Congress as part of the Transportation Equity Act for the 21st Century. Intermodal connectors are one of four subsystems that comprise the NHS. The other three subsystems are: 1) Interstates, 2) Other Principal Arterials, and 3) the Strategic Highway Network. Intermodal connectors can be either freight or passenger roadways. Freight intermodal connectors are roads that provide the "last-mile" connection between major rail, port, airport, and intermodal freight facilities on the NHS. The officially designated network of NHS freight intermodal connectors accounts for less than one percent of the total NHS mileage, but these roads are critical for the timely and reliable movement of freight.

The criteria used by FHWA to designate freight intermodal connectors is provided in Table 3.1 on the next page. Currently designated NHS freight intermodal connectors in Oregon are listed in Table 3.2 (page 3.3). The connectors with the highest truck volumes in the state are Going Street (west end), Marine Drive, and Columbia Boulevard. These connectors handle over 3,000 daily trucks per day. All of the connectors in Oregon meet the primary NHS criteria based on 100 truck counts in each direction, except for Terminal 5 Access Road, California Avenue, and Sheridan Avenue. These connectors do meet the secondary criteria as they each connect to a major intermodal terminal in Oregon. Information on twenty-foot equivalent units (TEUs) was not available on these roadways and therefore truck volumes were utilized to meet criteria.

Table 3.1 NHS Intermodal Connector Criteria

Mode	
Commercial Aviation Airports – Cargo	100 trucks per day, in each direction, on the principal-connecting route, or 100,000 tons per year arriving or departing by highway mode.
Port Terminals	Handle more than 50,000 TEUs (a volumetric measure of containerized cargo which stands for 20-foot equivalent units) per year, or other units measured that would convert to more than 100 trucks per day, in each direction. (Trucks are defined as large single-unit trucks or combination vehicles handling freight.)
Port Bulk Commodity Terminals	Handle more than 500,000 tons per year, by highway, or 100 trucks per day, in each direction, on the principal-connecting route. (If no individual terminal handles this amount of freight, but a cluster of terminals in close proximity to each other does, then the cluster of terminals could be considered in meeting the criteria. In such cases, the connecting route might terminate at a point where the traffic to several terminals begins to separate.)
Truck/Rail	50,000 TEUs/year, or 100 trucks per day, in each direction, on the principal-connecting route, or other units measured that would convert to more than 100 trucks per day, in each direction. (Trucks are defined as large single-unit trucks or combination vehicles carrying freight.)
Pipelines	100 trucks/day in each direction on the principal-connecting route
Secondary Criteria	
Intermodal terminals that handle more than 20 percent of freight volumes by mode within a state.	
Intermodal terminals identified either in the intermodal management system, or the State and metropolitan transportation plans as a major facility.	
Significant investment in, or expansion of, an intermodal terminal.	
Connecting routes targeted by the State, metropolitan planning organization (MPO), or others for investment to address an existing, or anticipated, deficiency as a result of increased traffic.	

Source: FHWA, https://ops.fhwa.dot.gov/freight/freight_analysis/nhs_intermod_fr_con/app_a.htm.

Table 3.2 Designated NHS Oregon Freight Intermodal Connectors

Intermodal Connector ID#	Street Segment with Highest Average Annual Daily Truck Traffic	2014 Average Annual Daily Truck Traffic	City
OR12R	Going St (west end)	4753	Portland
OR13P_02	Marine Dr	4147	Portland
OR8A_01	Columbia Blvd	3506	Portland
OR23P_1	Going St (east end)	2318	Portland
OR23P_2	Greely Ave	1974	Portland
OR21A	Biddle Rd	1888	Medford
OR8A_04	Airport Way	1600	Portland
OR14P	N. Pacific Gateway	1293	Portland
OR17R	Garfield	1226	Eugene
OR6R	Holgate Blvd	1006	Portland
OR8A_02	Alderwood	968	Portland
OR2P	Columbia Blvd	952	Boardman
OR10L	Front Ave	866	Portland
OR9R	NW Balboa Ave	866	Portland
OR11R	Front Ave	646	Portland
OR24P	NW 26th Dr	568	Portland
OR8A_03	82nd Ave	568	Portland
OR22P	Trans Pacific	468	North Bend
OR16A	Airport Rd	372	Eugene
OR15P	N. Terminal Rd	247	Portland
OR1P	Portway St	209	Astoria
OR5P	Mullen	376*	Coos Bay
OR13P_01	Terminal 5 Access Rd	123	Portland
OR4P_01	California Ave	103	Coos Bay
OR4P_02	Sheridan Ave	44	Coos Bay

3.2 Existing Conditions

Much of the data on the NHS intermodal connectors is collected by ODOT in part to meet the requirements of the FHWA Highway Performance Monitoring System (HPMS) and in part to support routine planning and programming efforts in Oregon. Other data sources include the FHWA National Performance Measurement Research Data Set (NPMRDS) and the survey conducted as part of this study and described in the Task 6 report. Additionally, a meeting of freight stakeholders in Portland was held to collect information on the location and issues associated with freight connectors in the Portland metropolitan region. There was also extensive outreach and field data collection conducted of freight connectors in ODOT Region 2 to gather information on needs in that region. Table 3.3 on the next page presents the sources of information.

Table 3.3 Information Inventoried on Intermodal Connectors and

Type of Information	Primary Sources of Information
Truck count data including truck configurations	ODOT, Survey
Truck crash data	ODOT
Pavement conditions and specific problem spots	ODOT
Roadway and shoulder widths, on-street parking	HPMS
Warning devices at active railroad crossings	FRA

A description of the data available on designated NHS intermodal connectors in Oregon and summary of the information include:

- Truck and total count data - Total vehicle and truck count data were taken from the ODOT vehicle classification database. Forecast of truck volumes are from the FHWA HPMS and represent the estimated truck volumes for 2040. Truck volume estimates provided in the survey were also considered. In most cases, the truck volume estimates from the survey were well below the ODOT truck count data.

- Truck-Involved Crashes - Between 2007 and 2014, there were 337 truck-involved crashes on Tier 1 freight intermodal connectors in Oregon. The crash data indicate that these truck-involved crashes are concentrated on a relatively small number of connectors in Portland. One-quarter of the truck-involved crashes occurred on Columbia Boulevard, the location of two of the five truck-involved fatal crashes.

- Roadway condition - Pavement condition information was available for most of the Tier 1 connectors based on information in the HPMS. The pavement condition data is based on International Roughness Index (IRI) values. The IRI measures the smoothness of the roadway using an algorithm based on the longitudinal profile of a section of the road.[1]

- Railroad crossing data - Railroad crossing data were extracted from the HPMS and supplemented with data from the Federal Railroad Administration as needed. The data show that 19 of the 61 Tier 1 connector segments have railroad crossings. The vast majority of the segments (15 of the 19) that have crossings were reported as having a single crossing, while three of the segments had two crossings, and one segment (OR11R, Front Street in Portland) has nine crossings.

- Truck speed data - Speed data on the Tier 1 connectors was extracted from the FHWA National Performance Monitoring Research Data Set (NPMRDS), while speed limit data was taken from the HPMS. The speed data are available on 18 of the 61 connectors (30 percent). Locations that had both truck speed data available and speed limit data available showed that actual speeds during the peak period are typically much lower than the posted speed limits with the average reduction during the peak hour being 39 percent.

- Segment length and number of lanes and bridge data - Information on segment length and number of bridges were available for 61 connector segments. Number of lanes data is available for 55 of the 61

[1] Federal Highway Administration (1999). Chapter 3—System Conditions, *Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance Report*, Accessed December 11, 2014.

connector segments. The vast majority of the segments where data are available (71 percent) indicate that there are two lanes on the connector segments. One location had just one lane, while 16 have more than two lanes. The average condition rating for bridges located on connector segments is 80.

- Functional classification, ownership and rural/urban status - The vast majority (79 percent) of the Tier 1 connectors are either local roads, major collectors, or minor arterials. Local roads comprise 16 of the 61 connector segments. The same number of connector segments are also minor arterials. Twelve of the connector segments are major collectors. Five of the connector segments are principal arterials and four have multiple classifications. The majority of Tier 1 connectors are owned by cities. Tier 1 connectors are primarily located in urban areas with 55 of the 61 connector segments (90 percent) being located exclusively in urban areas. Five of the connectors are located in rural areas and one is partially in an urban area and partially in a rural area.

4.0 Identifying Intermodal Terminals/Businesses

4.1 Process

To identify additional intermodal connectors (beyond the NHS Intermodal Connectors), it was necessary to first locate intermodal terminals. Freight intermodal terminals are defined as facilities, which provide for the transfer of freight from one mode to another. Examples include the NHS Intermodal terminals such as Port of Portland Terminal 5 and Union Pacific's Brooklyn Yard.

Several different methods were used to identify the terminals:

- Coordination with ODOT Rail Unit in terms of a list of rail transload facilities
- Stakeholder input from the TAC and Friends of the Committee members
- Stakeholder input from other agencies and organizations via phone calls and emails
- Review of statewide plans pertaining to airports and ports
- Stakeholder input from ODOT Region Planners
- Air photo analysis with Google Maps by ODOT staff (primarily examining businesses along rail spurs in urban areas)

The process used above revealed that there are some many smaller intermodal terminals in the state such as rail transload facilities, airports and ports. In addition, there are many manufacturing businesses in the state that use more than one mode (onsite) to receive raw materials and/or ship finished products. Examples include Georgia Pacific, Tree Top (fruit products) and Knife River (aggregate). For the purposes of this study, these types of businesses along with the smaller intermodal terminals and the NHS intermodal terminals are defined "Intermodal Terminal/Businesses" (ITBs). Many of the ITBs are located on state highways and therefore are not associated with any intermodal connectors but they are included in the OFICS Inventory Table and the GIS tool https://www.oregon.gov/ODOT/Planning/Pages/Plans.aspx#OFP

The study research effort identified approximately 200 ITBs with most of them using rail as the secondary transportation mode. A majority of the ITBs are in Portland, the Willamette Valley and along the Columbia River. The OFICS Inventory Table provides information on all of the ITB, the intermodal connectors and related needs. Each intermodal connector has an ID number in the table (second column) that correlates to the GIS tool. Using the GIS tool, a user can type the intermodal connector ID number and click on the magnifying glass and the map will zoom in to that connector https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=0b35d56e2cfa4ffd8c308c09722f1da5s.

Table 4.1 on the next page lists commodity types, modes used and specific products that move through the Oregon ITBs and on the intermodal connectors. Knowing what commodities move on the intermodal connectors and the modes they use helps us better understand the state's freight transportation system and the role the connectors play in the economy of the state.

Table 4.1 Intermodal Terminal/Businesses Commodities

	Commodity Types	Primary Modes Used	Examples
1	Agriculture	Truck, rail, marine	Potatoes, wheat, grass seed, hay, barley, soybean, corn
2	Automobiles & Transportation Equipment	Rail, marine	Toyota, Ford, Hyundai, Honda, barges, tugboats
3	Chemicals	Truck, rail	Magnesium Chloride, fertilizers, sulfuric acid, antifreeze, solvents
4	Computer and Electronic	Truck, air	Semiconductors, computer parts
5	Construction Materials (non-wood)	Truck, rail	Sheetrock, PVC pipe, sheetrock, shingles
6	Energy	Truck, rail, marine, pipeline	Gasoline, diesel fuel, heating oil, propane, ethanol
7	Fish and Seafood Products	Truck, marine	Dungeness crab, salmon, pink shrimp, tuna, pacific whiting, halibut, oysters
8	Food Manufacturing	Truck, rail, marine	Frozen foods, cereal grains, flour products, condiments, sweeteners
9	Forestry & Wood Products	Truck, rail, marine	Lumber, utility poles, plywood, trusses, siding, wood chips, paper, fuel pellets, bark dust
10	Metals Manufacturers	Truck, rail, marine	Steel coils, scrap metal, steel rail
11	Mineral Bulk	Truck, rail, marine	Potash, soda ash, soil additives
12	Sand, Gravel, Rock	Truck, rail, marine	Construction sand, crushed rock, asphalt
13	Wholesale Trade	Truck, air	Footwear, apparel and recreation products

5.0 Identifying Additional Intermodal Connectors

5.1 Criteria

One of the primary goals of the OFICS study was to identify additional freight intermodal connectors in the state besides the NHS freight Intermodal Connectors. These additional freight intermodal connectors will supplement the designated NHS intermodal connectors and reflect a broader set of connectors on Oregon roadways. Identifying designated freight intermodal connectors was also a strategy identified as an implementation step from the 2011 Oregon Freight Plan.

The additional intermodal connectors are important because they are key components of the state and national intermodal freight system that enables more efficient use of all freight modes. These intermodal connectors serve as the last and first mile for many of the state's manufacturing and industrial businesses. In order for Oregon to remain competitive, the connectors must be able to efficiently move raw materials, partially assembled products and finished goods to and from all areas of the state for national and international markets.

The task of identifying additional intermodal connectors builds off the task completed in Section 4.0 Identifying Intermodal Terminals/Businesses (ITB). Once the list of ITB were identified, it was then necessary to identify the local road(s) that connected the ITB to the closest state highway. At that point guidance was needed in order to help determine which of these local roads function as intermodal connectors. Several options were considered for the development of criteria for freight intermodal connectors. The NHS intermodal connector criteria was used as a starting point. Some proposed criteria could not be uniformly applied throughout the State due to data limitations associated with truck counts on roadways, marine port freight movements and rail carload counts. The final criteria were based on easily identifiable characteristics of potential intermodal connectors and includes ownership of the roadway, Intermodal Terminal/Businesses (ITBs) using the roadway and length of the roadway between the ITB and the closest state highway.

During analysis of the ITB and the additional intermodal connectors it was apparent that the level of freight activity at the ITB and on the connector varied considerably. In order to sort and better comprehend the freight activity levels on the connectors, a tiering system was needed which is discusses further in Section 5.2. Table 5.1 provides the primary criteria for each of the three tiers.

The additional intermodal connectors are displayed in the GIS tool and identified as belonging to Tier 1, Tier 2 or Tier 3 of the intermodal connector network. The intermodal connectors are color-coded in the GIS tool to correspond to the appropriate tier. Tier 1, 2, and 3 intermodal connectors are colored blue, red, and green, respectively https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=0b35d56e2cfa4ffd8c308c09722f1da5s.

The full list of intermodal connectors with detailed information is provided in the OFICS Inventory Table https://www.oregon.gov/ODOT/Planning/Documents/2017-OFICS-Inventory-Table.pdf

Table 5.1 Primary Criteria for Intermodal Connectors

	Primary Criteria
Tier 1 **Primary Intermodal Connectors**	Must meet the NHS Intermodal Connector criteria, which are generalized below in order to fit in this table. See Appendix for complete NHS criteria. 1. 50,000 TEUs/year or 100 trucks/day each direction 2. Secondary Criteria: Connecting routes targeted by state or MPO to address existing deficiency caused by increased traffic
Tier 2 **Secondary Intermodal Connectors**	1) Must be public road 2) Must serve as the primary access between intermodal terminal and any state highway or an existing NHS connector 3) Maximum length of the connector should be 5 miles however it can be longer if justified 4) Principal-connecting street of the connector should have > 50 trucks/day, in each direction **OR** one of the following must apply to the connector: a) Serves two or more Intermodal Terminals/Business (ITB) b) Serves a critical industry from an economic competitiveness perspective c) Serves an ITB of significant size with respect to acreage or facilities d) Serves a Category I Airport in the Oregon Aviation Plan. *These airports support some level of scheduled commercial air cargo service*
Tier 3 **Minor Intermodal Connectors**	1. Principal-connecting street of the connector must have < 50 trucks/day, in each direction 2. Generally serves only one smaller ITB 3. Connectors with only ITB with seasonal variances in truck volumes 4. Connector serves ITB that is currently using only trucks to move freight (An example is an ITB that has a rail spur but is only using trucks to move freight)

5.2 List of Additional Intermodal Connectors

The study identified 76 additional intermodal connectors across the state for a total of 101 which includes the 25 designated NHS intermodal connectors. Table 5.2 provides information on the number of connectors by ODOT Region and Connector Tier. Region 1 has the most intermodal connectors with 34, followed by ODOT Region 2 and Region 3 with 29 and 24 connectors, respectively. Just under half of the intermodal connectors (45) are Tier 3 connectors. The full list of intermodal connectors with detailed information is provided in the OFICS Inventory Table https://www.oregon.gov/ODOT/Planning/Documents/2017-OFICS-Inventory-Table.pdf

Table 5.2 Number of Intermodal Connectors by Type and ODOT Region

	Region 1	Region 2	Region 3	Region 4	Region 5	Total
Existing NHS Tier 1	16	3	5	0	1	25
Additional Tier 1	3	0	1	0	0	4
Tier 2	7	8	5	3	4	27
Tier 3	8	18	13	5	1	45
Total	34	29	24	8	6	101

5.3 Intermodal Connector Tiering

Due to the wide range of freight activity intensities on the intermodal connectors, a tiering system was needed to sort the connectors into various levels of importance. All of the intermodal connectors were assigned to one of three tiers developed for the OFICS. One of the criteria pertains to identifying the average number of trucks per day on the intermodal connectors. During the analysis and data collection stage of the study it was discovered that this data was difficult to obtain. Most of the cities that own the local streets that comprise the intermodal connectors collect total vehicle traffic counts on these roadways but not separate truck counts therefor other criteria were developed.

Public street segments that connect the ITB to the closest state highway were mapped resulting in the establishment of the intermodal connector alignment. The study effort identified 76 additional intermodal connectors. This is the first time this type of study has been developed in Oregon and it is likely that not all of the ITB and intermodal connectors in the state were identified. It is expected that the database will be updated in the near future in order to create a more accurate database.

Several ITB are located directly on a state highway and therefore are not served by an intermodal connector. These ITB are however included in the OFICS Inventory Table and GIS tool.

5.3.1 Tier 1 Intermodal Connectors

The Tier 1 intermodal connectors are the highest level of connectors and are considered as the primary classification of intermodal connectors in the state. The majority of the state's ITB are served by the Tier 1 connectors. The Tier 1 intermodal connectors consist of 25 NHS existing intermodal connectors and 4 recommended additional connectors for a total of 29 connectors. ODOT will recommend to FHWA that the 4 additional intermodal connectors be designated as NHS intermodal connectors.

5.3.2 Tier 2 Intermodal Connectors

The Tier 2 intermodal connectors are the second highest level of importance and are considered as the Secondary intermodal connectors in the state. They connect to any state highway (not just the NHS). Some of these connectors connect to an existing NHS Intermodal Connector instead of a highway. The Tier 2

intermodal connectors usually serve one large ITB, several ITB, or a Category I Airport that transports air cargo. Most of the ITB on these 27 connectors are truck/rail operations.

5.3.3 Tier 3 Intermodal Connectors

The Tier 3 intermodal connectors are the third level of importance and are considered as the Minor intermodal connectors in the state. They connect to any state highway (not just the NHS). The Tier 3 intermodal connectors usually serve one smaller sized ITB and carry less than 100 truck trips per day. Most of the ITB on these connectors are truck/rail operations. There are 45 Tier 3 intermodal connectors. The table on the previous page shows the number of intermodal connectors in each ODOT region and tier.

6.0 Intermodal Connector Needs

For efficient intermodal freight movement, intermodal connectors must be capable of accommodating a variety of truck sizes and configurations. Most intermodal connectors are owned and maintained by local governments. The OFICS study identified needs and issues for intermodal connectors through stakeholder questionnaires surveys, meetings with agency staff and desktop analysis using the aerial image of the GIS tool and Google Street View.

The stakeholder questionnaire survey was conducted using an Internet-based survey combined with follow-up phone calls and telephone interviews. An initial list of survey questions was developed by the consultant team for ODOT review. After making revisions based on ODOT comments, the survey instrument was converted into an on-line survey for distribution to respondents. Respondents were contacted multiple times by phone and by email during the course of data collection (November 18, 2016 to January 4, 2017) to encourage maximum participation.

The information requested on the surveys were divided into three categories. First, information on the type of survey respondent was collected. This included information on the agency or company that they represent, the specific connector that they are filling out information for, and the specific organization name and respondent name. The second category of information collected was related to the terminal. This included confirmation that the respondent was assigned to the correct terminal(s) and an estimate of truck traffic generated at the terminal. The third portion of the survey was related to the connectors associated with the terminal. This was the longest portion of the questionnaire and requested information on the following topics:

- connector identification
- Estimate of daily truck traffic
- Pavement condition
- Time periods of recurring congestion
- Roadway features (roadway width, rail crossings, bridges)
- Operational Issues/Concerns - Safety, Parking, Signage, Turning Movements, Trains, Mixing with other traffic types and land uses
- Recommended improvements

A more detailed discussion of the survey timeframe, data collection procedures, and survey recipients may be found in a separate technical memorandum which includes the survey instrument, the actual responses and a definition of the roadway identification numbers described in this chapter.

The survey covered both designated freight intermodal connectors and other roadways that serve as connectors in Oregon. For intermodal connectors located in the Portland region, a variation of the survey was implemented. Information on connectors was collected during a meeting with staff from the City of Portland, Metro, Port of Portland and ODOT staff.

The information collected in the survey revealed a significant gap in the identification of needs for the intermodal connectors in ODOT Region 2. Therefore, additional strategies were conducted to collect more needs information in the Willamette Valley including contacting cities and counties by e-mail and phone and examination of aerial and street view images available through Google Maps and Bing Maps. This strategy identified needs on several of the additional Tier 2 intermodal connectors.

The needs identification effort revealed a wide range of improvements needed for the intermodal connectors. Some of the surveys sent to local governments were not fully completed and in addition several intermodal connectors were added after the survey phase of the study. This has created some data gaps for identifying street needs for some intermodal connectors. In addition, most of the needed improvements were identified in general for entire street segments and not at specific locations. As described in Section 3 of this report, ODOT tracks the pavement condition for the NHS Intermodal Connectors so that information was identifiable for purposes of this study

The functional classes of the streets that comprise the intermodal connectors vary dramatically and include segments of local streets, minor collectors, minor arterials and major arterials. Many of the intermodal connectors are narrow 2-lane local or minor collector streets in the industrial parts of cities that lack shoulders, bike lanes and sidewalks.

Cost estimates for the needed improvements were not **o**btained as this study focuses on the general types of improvements needed in order to improve truck mobility and access. Further analysis is needed for each intermodal connector to determine the specific improvements that would make truck movements more efficient. Some of this information may be available in city Capital Improvement Plans (CIP) and MPO Transportation Improvement Plans (TIP). Long-range projects appear in city and regional Transportation System Plans (TSP). The connector needs are divided into four categories; Congestion, Pavement, Pinch Points/Accessibility and Safety. Table 6.1 provides specific types of needs for each category.

Table 6.1 OFICS Categories of Needs for Intermodal Connectors

Congestion	• Interchange improvement or new interchange • Additional travel lane needed • Turn lane needed • Shoulders needed • Grade separation needed between railroad tracks and road *(also a Safety issue)* • Traffic control modification • Truck cueing at terminal gate
Pavement	• Overlay • Complete reconstruction
Pinch Points/Accessibility	• Weight restricted bridge • Low clearance railroad overpass or pedestrian bridge • Narrow lane width • Inadequate turning radii
Safety	• Bike lanes • Sidewalks • Pedestrian crossing features • Locations with frequent crashes

Intermodal connector needs vary extensively throughout the state. The most common type of need is poor pavement condition. Congestion is more of a capacity need in Portland as the city functions as the intermodal freight hub of the state. Portland has the largest intermodal connectors some of which function as city arterials like Marine Drive and Columbia Blvd. Some of the most expensive needs are improvements needed to the I-5 interchanges that connect to Marine Drive and Columbia Blvd. However, highway interchange improvements are not part of the intermodal connectors and therefore outside the scope of this study. The four categories of intermodal connector needs shown above primarily relate to infrastructure deficiencies. The stakeholder survey revealed few regulatory or operational needs.

Pinch points and accessibility typically are more of an issue in the larger cities where there are more structures and intersections. Conflicts with pedestrians and bicyclists fall within the Safety category and occur more often where connectors pass through residential areas like the St. Johns community in Portland.

The needed improvements identified for the intermodal connectors are listed in the OFICS Inventory Table https://www.oregon.gov/ODOT/Planning/Documents/2017-OFICS-Inventory-Table.pdf

The needs for several intermodal connectors have not yet been identified due to incomplete survey information and it is expected that there will be attempts to collect this information during the next update of the study.

7.0 Prioritization Strategy for Intermodal Connector Needs Investment

As stated in the previous section, the four categories of intermodal connectors needs are; Congestion, Pavement, Pinch Points/Accessibility and Safety. After identifying these needs, the next task is to prioritize investments to strategically improve the efficient movement of trucks on the intermodal connectors.

Prioritization was needed because limited funding prohibits the ability to fix or improve all of the intermodal connectors at once. Therefore, prioritization allows for specific improvements to be considered as funding becomes available through local, state, or federal sources. One of the challenges of the prioritization effort is that most of the connectors are under the jurisdiction of a large number of cities and counties which makes it difficult to collect data on needed improvements. These agencies have their own Transportation System Plans (TSP) and Capital Improvement Programs (CIP) that identify needs, projects and funding. In addition, some connectors are located within an MPO that has a regional TSP and a Transportation Improvement Program (TIP). Coordination is needed with these agencies to get buy-in on the goals of this study including the prioritization of needs for the intermodal connectors. The implementation phase of this study needs to address this coordination issue.

7.1 Methodology & Strategy

The methodology for prioritizing investments consists of a broad systematic investment decision approach based on the tiering system developed for the OFICS. This methodology takes into consideration the amount of intermodal activity and level of importance of each intermodal connector. The first priority of investment are the designated NHS intermodal connectors, the proposed additional NHS connectors and the other Tier 1 connectors. These connectors have the highest truck volumes and therefore improvements on these connectors will likely have the greatest impact on freight flows in Oregon.

The second priority of investment are the Tier 2 connectors. These connectors serve relatively large intermodal terminals and businesses. Even though Tier 2 connector total truck volumes are not as high as those that have Tier 1 status, issues on Tier 2 connectors have the potential to disrupt much larger supply chains. The third priority of investment are the Tier 3 connectors. These roadways serve smaller intermodal terminals and businesses and improvements to these roadways remain important for retaining and growing freight-related businesses in Oregon.

The prioritization strategy is presented below in Table 7.1.

Table 7.1 Prioritization Strategy for Intermodal Connector Needs Investments

Priority Level	Description	Tier
First Priority	Primary intermodal connectors (includes the NHS intermodal connectors, proposed additional NHS connectors and other Tier 1 connectors.)	Tier 1
Second Priority	Secondary intermodal connectors (serves larger ITB and/or multiple ITB)	Tier 2
Third Priority	Minor intermodal connectors (serves one smaller ITB)	Tier 3

The planning and scheduling of street improvements is complex and sometimes involves a variety of funding sources including property taxes, State Highway Trust Funds, system development charges, local gas tax, local improvement districts etc. In addition there are various grants available from state and federal agencies. The Tier 1 intermodal connectors are part of the NHS and have more funding opportunities available at the federal level than the Tier 2 and 3 intermodal connectors.

While the priority of investments should generally be focused on needs for Tier 1 intermodal connectors, investment in Tier 2 and even Tier 3 intermodal connectors may be justified under the following situations:

- Leverage opportunities from other public funds
- Timing – improvements for Tier 2 and 3 may have a higher degree of readiness
- Cost – some improvements to Tier 1 connectors could be expensive with insufficient funding
- Leverage opportunities from semi- private investments

It will be important to consider the types of improvements that are needed for each of the connectors. The most common issues for connectors identified through the survey process were congestion, trucks mixing with other roadway users, and safety issues. Relieving congestion issues typically involve increasing capacity, but may also be alleviated through traffic management, operational improvements and ITS.

Freight movements on connectors with heavy truck volumes can be may be improved through the development of truck friendly travel lanes, turning lanes and intersection design, which go above and beyond the typical design standards for arterials and local roads. Safety improvements will require a more in-depth study of crash history to identify targeted solutions that address the specific safety concerns for a connector. Some of these improvements involve significant investment in infrastructure which may only be possible over the long term.

It is expected that the investment strategy will be implemented incrementally over the long term as freight issues become more elevated and awareness of the OFICS increases at the local, regional and state level. The strategy will be effective when it helps justify a street improvement project for an intermodal connector during the development of CIPs and TIPs that cities and MPOs use to identify and schedule projects. The implementation section of the study describes options for:

- Increasing awareness of the OFICS to the local, regional governments
- Updating ODOT's TSP guidelines to include information on OFICS
- Including intermodal connector criteria for project selection process in ODOT funds
- Increasing awareness of the OFICS in other ODOT facility plans and documents

The results of applying the methodology to all of the intermodal connectors in the OFICS Inventory Table sorts the connectors into the three tiers (Tier 1, Tier 2 and the Tier 3 connectors). The first priorities are the needs for the 29 Tier 1 intermodal connectors, followed by the needs for the 27 Tier 2 connectors and then the needs for the 45 Tier 3 connectors.

8.0 Next Steps/Implementation

The process of identifying and analyzing freight intermodal connectors involved assembling information from existing databases, collecting information from a wide range of stakeholders, and usage of multiple GIS tools/services. There were several lessons learned across all of these work efforts including the following:

- Online freight transportation surveys tend to get lower response rates with private sector freight stakeholders relative to public sector freight stakeholders.
- Meeting with small groups of stakeholders with distinct, but overlapping perspectives is a very efficient method of collecting a large amount of information in a small period of time. The meeting of public sector stakeholders in Portland was a useful activity for getting information and consensus on the use, condition and performance of freight intermodal connectors in the Portland region.
- There is a wide range of information available on designated NHS freight connectors. There is much less information available on what were determined to be Tier 2 or Tier 3 connectors. In particular, information on truck volumes, pavement condition, and truck speeds are readily available for most of the NHS freight connectors. Truck volume and roadway condition information are available through HPMS data. Truck speed data is available through the NPMRDS.
- The freight activity level between the modes on the intermodal connectors varies considerably in Oregon. Many of these locations are relatively small and do not generate a large volume of trucks and most of the freight is transloaded rather than moved using an intermodal container.
- Intermodal connectors have a significant amount of needs related to pavement condition, roadway geometry, pinch points and operations.

The work completed in this study does have implications for future planning and programming activities related to freight connectors. There will be a need to update the list of intermodal terminals/businesses on a regular basis to ensure that changes in these facilities are captured. Similarly, there will be a need to monitor and update the freight connectors to these facilities as these access roads often change. Future data collection studies can also be conducted to collect additional truck volume data on Tier 2 and Tier 3 connectors. There are also Tier 2 and Tier 3 connectors in ODOT Regions 4 and 5 where data were generally sparse. Supplemental data collection efforts in these regions can be conducted to obtain a more complete statewide database for the connectors.

The OFICS study has assembled and collected a large amount of information and data on freight connectors in Oregon. This data is now available for usage in future multimodal planning efforts. One of the implementation steps from this study is to ensure that this information is incorporated into regional planning efforts such as MPO long-range transportation plans and Transportation System Plans. This will allow for projects that improve freight connectors to be considered alongside other improvements when project selection is occurring.

The specific next steps from this study are as follows:

1. Create a home for the GIS tool on ODOT's internet servers so that the GIS data can be accessed by potential users in ODOT and the general public. Consider making OFICS a layer on ODOT's TransGIS.

2. Incorporate key information from the study into the update of the TSP Guidelines.

3. Work with MPOs to incorporate the OFICS into their regional plans.

4. Incorporate key information from the study into the update of the Oregon Freight Plan.

5. Work with the ODOT Roadway Inventory and Classification Services (RICS) Unit to develop a report to FHWA that includes the changes ODOT is requesting to make to the designated NHS intermodal connectors (alignment changes, mileage changes, street name changes, additional NHS intermodal connectors). Submit the report and work with FHWA to get approval of these changes.

6. As funding opportunities arise, include projects in programs that will address some of the needed improvements to the Tier 1 & 2 intermodal connectors.

7. Work with the ODOT regions to increase awareness of the intermodal connectors in planning and programming.

8. Working with local and regional governments, explore opportunities to collect better truck count data (and other information about freight movements) on the intermodal connectors.

9. Consider conducting a statewide study that looks at truck warehousing and distribution facilities to augment the OFICS study as these types of land uses generate a significant amount of freight.