Seattle Department of Transportation

CITY OF SEATTLE FREIGHT MASTER PLAN

September 2016

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Appendices available on
www.seattle.gov/transportation/freight_fmp.htm

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CHAPTER1: INTRODUCTION

IN THIS CHAPTER:

Seattle Freight Master Plan Vision:
"A vibrant city and thriving economy connecting people and products within Seattle and to regional and international markets."

Every day, products and goods move into, out of, and around Seattle. This is freight – and people, businesses, schools, manufacturers and many others rely on timely delivery of products and goods throughout their day. Goods movement supports economic activity and the quality of people's lives.

Just about every product purchased by someone reaches its final destination by some combination of truck, plane, train, and ship. The result is a massive network of freight infrastructure, including airports, seaports, rail yards, and distribution centers, connected by a large system of truck routes and rail lines.[1]

It is critical to ensure goods are moving to, from, and within Seattle in an efficient, predictable, and sustained manner so businesses and consumers receive deliveries on time to help maintain the economic health and vibrancy of the city. The Seattle Department of Transportation's (SDOT) top priority is safety. It is crucial that our freight network provide freight facilities that ensure people driving delivery vehicles and trucks, both large and small, can travel safely among people walking, riding bicycles, taking transit, or driving other vehicles. This will also advance other key SDOT values (as discussed in Chapter 3), including having a fully interconnected transportation system.

To achieve the Seattle Freight Master Plan (FMP) vision, we need to design our limited roadway network to effectively connect people and products to their marketplaces. Not only does this plan seek to ensure that goods move efficiently on Seattle's roadway network, it also considers regional and international destinations and what it means to connect to them by road, railroad, waterways, and air.

HOW GOODS MOVEMENT AND DELIVERIES BENEFIT SEATTLE

Seattle's diverse economy and trade relations are important elements of the city's history and cultural identity. Seattle's economy includes industry sectors, such as aerospace manufacturing, that are primarily connected to national and global economies, as well as regionally oriented sectors like the retail industry, which includes local grocers and restaurants. All of these industry sectors are significant freight generators. Washington State is the most trade-dependent state in the nation, and Seattle is at the center of that trade economy. Currently, 40% of all jobs in Washington are tied to freight-related activity.[2]

In the most general sense, freight mobility is the term applied to moving goods from one place to another by any mode – vehicle (mainly truck), plane, train, pipeline and/or boat – often with complex moving parts and logistics. It is the process by which the latest gadget you ordered over the internet makes it from the warehouse to your doorstep.

[1]California State Department of Transportation, Healthy Communities and Healthy Economies a Toolkit for Goods Movement. March 2009. www.rctc.org/uploads/media_items/healthy-communities-and-healthy-economies-a-toolkit-for-goods-movement.original.pdf.
[2]Washington State Department of Commerce. www.commerce.wa.gov/Economic-Development/Exports/Pages/default.aspx.

Making the case for investing in freight mobility

Livelihood

By 2035, an additional 120,000 people are expected to call Seattle home. Accommodating the daily needs of people living here today and over the next 20 years will be critical to our quality of life. Seattle is also expected to gain an additional 115,000 jobs, an increase of 25%, over the next 20 years. Additional residents and jobs will require the delivery of more goods to serve their needs. Ensuring our roadways can accommodate these demands is essential to ensuring a thriving city in the future.

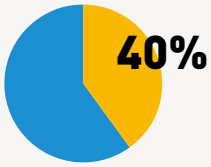
Freight transportation makes our economy and quality of life possible. Without freight transportation to get goods where they need to go and when they need to get there, the shelves in our local grocery stores and retail shops would be empty. We would be unable to receive and send mail and packages. Hospitals would be unable to procure highly specialized devices needed for medical procedures. Our cars and other vehicles would sit in driveways or in garages with empty gas tanks. Our homes would be unheated. Garbage, recycling, and compost wouldn't be picked up. Freight transportation is critical to allow us to get the goods and services we need, when we need them.

Economy

Washington's transportation industry supports nearly 900,000 jobs in the Puget Sound economy through freight-dependent sectors such as agriculture, forestry, construction and manufacturing – producing an economic impact of $91.9 billion.[3]

Freight is vital to the regional economy

WASHINGTON JOBS
tied to freight



PUGET SOUND JOBS
tied to freight

Industry	Jobs
Wholesale & Retail	**466,000**
Manufacturing	**233,000**
Construction	**131,000**
Transportation	**47,000**
Agriculture/Timber & Wood Products	**16,000**
Total	**almost 900,000!**

ECONOMIC IMPACT
of freight in Puget Sound

$91.9 Billion
in regional domestic product

[3]Washington State Freight Mobility Plan. 2014. p. 7. www.wsdot.wa.gov/NR/rdonlyres/4AB1DCDE-5C29-4F08-B5E7-697F432C34D7/0/2014WashingtonStateFreightMobilityPlan.pdf

Our economy has prospered and grown in part due to thriving seaport and maritime commerce. In fact, the Port of Seattle is the fifth largest US container port in the United States by volume and recently created a Seaport Alliance with the Port of Tacoma (more information in Chapter 2).[4] The majority of container terminals are located within the Duwamish Manufacturing/Industrial Center (MIC), one of two MICs in the City of Seattle.

The Duwamish MIC and the Ballard-Interbay-Northend MIC (BINMIC) account for more than 64,000 jobs, which is 15% of all jobs in Seattle. A network of marine terminals, railroads and rail spurs, roadways, and airports serve the MICs. Having a diverse economy—that is, one based on a wide range of profitable sectors, not just a few—has long been thought to play a key role in a sustainable economy for long-term economic health.[5]

Monetary and Societal Costs

Trucks often have limited times when deliveries can be made. When roads are congested or poorly maintained deliveries may be delayed. This increases costs that are passed on to consumers (regardless of income), and decreases business viability. In some cases, trucks may divert to alternative routes, which can affect mobility in residential areas or cause conflicts with other transportation modes.

Environmental Impacts and Benefits

While goods movement can create environmental impacts throughout the city, investments in freight mobility improvements can help mitigate these negative impacts.

Goods movement can increase air, water, and noise impacts in areas with high freight volumes. Each of these markers influences quality of life, and can be quantifiable, although citywide data is not currently available. Truck emissions contribute to air pollution and global climate change; unpaved streets, or streets with inadequate storm water facilities contribute to poor water quality; and goods delivery by truck can produce higher noise levels than other freight modes.[6]

Investing in freight mobility improvements can help mitigate adverse impacts. Eliminating bottlenecks helps reduce congestion, vehicular idling and greenhouse gas emissions (GHG). Noise and water quality impacts can be mitigated using several of the strategies and actions identified in Chapter 5.

A freight plan that provides for adequate wayfinding, uses intelligent transportation systems (ITS), and has a well thought-out and integrated freight network will be instrumental in our efforts to meet citywide, state, and federal GHG reduction goals.

Reliability

A reliable transportation network for movement and delivery of goods is vital to ensure on-time deliveries for consumers, to maintain the confidence of existing business and industry sectors, to encourage businesses to locate in Seattle, and to generate additional jobs, businesses and tax revenue. Operational improvements are an essential, cost-effective way to improve freight transportation reliability and enhance mobility, safety, and environmental conditions in communities affected by truck movements.

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[4]The Nortwest Seaport Alliance. www.nwseaportalliance.com/#/maps/overview.
[5]Booz and Co. 2008, The road to economic diversification, Rabih, Abouchakra, Chadi N. Moujaes, Mazen Ramsay Najjar, Richard Shediac,
[6]Organization for Economic Cooperation and Development, 1997, The Environmental effects of freight.

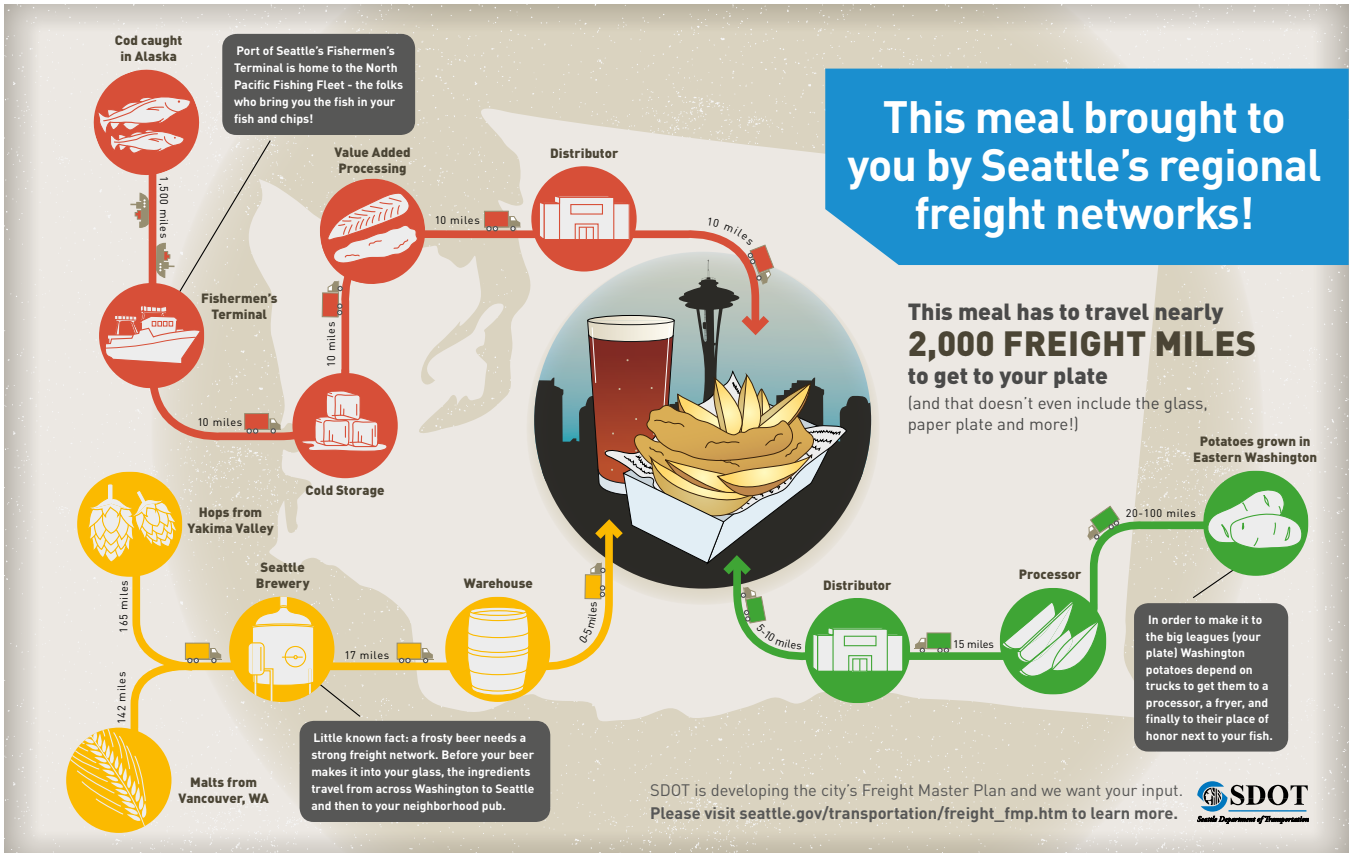
Supply chain

A supply chain consists of the people and facilities involved in manufacturing, distribution and retail. They are linked by information and transportation in a seamless, integrated network to supply goods or services from the source of production to the point of consumption. Speed to market is one of the most important factors in supply chain design and execution. It influences whether a product moves by truck, rail, ship, or air at a particular stage.

One way to better understand supply chains is to look at the many steps and long distances required to get food from farm to table. The infographic in Figure 1-1 shows the nearly 2,000 miles it takes to deliver products that result in a pint of beer and a plate of fish and chips on the table of a local pub.

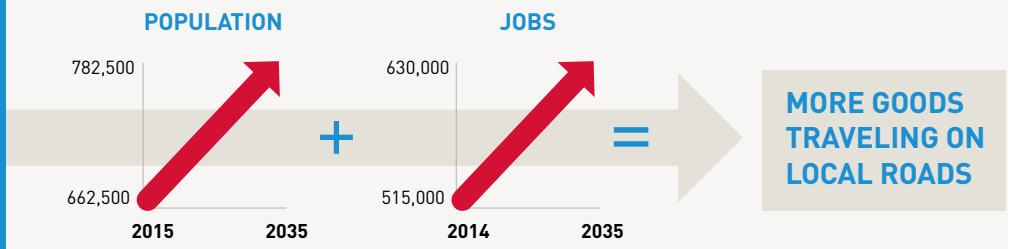
If any part of the supply chain breaks down, costs will be reflected in the price of your beer and plate of fish and chips, as demonstrated in Figure 1-1, or your milk, bread, and eggs at the grocery store. If trucks carrying goods are delayed due to congestion, or if businesses are not open to accept deliveries, or if truck drivers receive parking tickets due to lack of allocated curb space or loading docks, the costs of gas and additional time are passed to the consumer and raise the cost of living and doing business in the city.

FIGURE 1-1: SEATTLE SUPPLY CHAIN



Freight trucks deliver goods you depend on

Our city is growing, increasing demand for local freight



WHY DOES SEATTLE NEED A FREIGHT PLAN?

The FMP is one of our City's four modal master plans: pedestrian, bicycle, transit, and freight. Move Seattle is Mayor Ed Murray's 10-year strategic vision for all transportation modes, including freight. This vision seeks opportunities to integrate the plans and create a comprehensive multimodal system that safely moves people and goods.[7]

In Seattle, thousands of local jobs and deliveries depend on an efficient, connected freight network. To ensure Seattle is prepared for continued growth, the FMP will serve as the 20-year blueprint to guide freight mobility investments and improvements, increase safety, and address freight-related issues.

Future freight volumes are inextricably linked with economic growth in Seattle and the region, as well as international trade moving through regional air and sea ports. With our anticipated growth in population and jobs over the next 20 years, we anticipate freight volumes to increase by at least 60% because many of these jobs are tied to freight-reliant industries.[8] As the city grows, more trucks will use our streets to support city and regional needs.

With many of Seattle's streets currently at capacity during peak hours and bottleneck conditions worsening, it is increasingly important to identify key infrastructure investments that will provide the most relief and benefits for truck freight mobility now and into the future.

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[7]SDOT. Move Seattle. www.seattle.gov/transportation/citywide_planning.htm.
[8]Washington State Freight Advisory Committee, Washington State Freight Trends & Policy Recommendations for Air Cargo, Freight Rail, Ports & Inland Waterways, & Trucking, May 2014 www.fmsib.wa.gov/fac/20140602-FINALComplete%20Folio_for%20printer5-7-14.pdf

In 2013, Washington exported merchandise worth $82 billion, and it is estimated that $37 million of goods move on Washington roadways every hour of every day.

Many different types of travelers depend on Seattle's roadway network. It is important to ensure trucks can operate efficiently and safely while not inhibiting or obstructing the ability of other travelers and trip purposes. This, in turn, will enhance and ease freight mobility while making our roadway network safer for everyone.

The FMP focuses primarily on urban truck movement to support Seattle's increasing demand for the delivery of goods and services in a safe and reliable manner. Railroad, marine, air freight, and pipeline, which primarily transports natural gas, are also critical components in the plan. However, because the roadway network is within the City's purview, the FMP focuses on how truck freight provides access to these other modes. The plan outlines the crucial role that goods movement and deliveries play in meeting our goals for social equity, economic productivity, sustainability, and livable neighborhoods.

Seattle FMP Vision and Goals

The foundation of the Seattle FMP is expressed in its vision:
"A vibrant city and thriving economy connecting people and products within Seattle and to regional and international markets."

The following 6 goals reflect our current needs and desired outcome of freight infrastructure investments in Seattle. They are described in detail in Chapter 3, Policy Framework.

Economy – Provide a freight network that supports a growing economy for Seattle and the region.

Safety – Improve safety and the predictable movement of goods and people.

Mobility – Reliably connect manufacturing/ industrial centers and business districts with the local, state, and international freight networks.

State of Good Repair – Maintain and improve the freight transportation network to ensure safe and efficient operations.

Equity – Benefit residents and businesses of Seattle through equity in freight investments and improve the health of communities impacted by goods movement.

Environment – Improve freight operations in Seattle and the region by making goods movement more efficient and reducing its environmental footprint.

What will the FMP accomplish?

The FMP was developed to address the unique characteristics, needs, and impacts of freight mobility in Seattle. It identifies why goods movement is so important to the City and the region, examines the challenges of moving goods, and provides solutions to address these challenges. The FMP answers two key questions:

- How can we help build a strong and diverse economy in Seattle by improving our position as a gateway for global trade and increasing family wage jobs in the maritime and manufacturing industries?
- How can we efficiently and sustainably accommodate the need to move goods and people in a fast-growing, densely populated, compact environment?

The FMP is a long-term plan aimed at ensuring that freight needs are met in a safe and sustainable way that supports Seattle's residents and businesses. The plan:

- Expands the designated freight network
- Proposes strategies, actions, and projects to help goods move more efficiently and reliably while minimizing impacts on people and communities
- Develops truck design guidelines
- Prioritizes projects to implement the plan

THE PLANNING PROCESS

Development of the FMP was formally initiated in 2014. The process included public input through district councils and other public events sponsored by the City, briefings to freight stakeholders, and coordination with City staff and other agencies. Data relating to past freight action plans, the Freight Access Project (FAP), the City's land use pattern, topography, traffic volumes, and a number of other factors were reviewed. It relies on extensive geographic information systems (GIS) and field analysis of our existing transportation network to identify freight facilities, determine their needs, and identify potential solutions.

Understanding the context for goods movement within Seattle and the greater region has been integral to the development of the plan. A number of existing studies, analyses, and reports were written prior to, or during, the FMP process that served as building blocks for this plan. These documents include:

- Freight Mobility Strategic Action Plan[9]
- Industrial Lands Study[10]
- Basic Industries Economic Impacts Analysis[11]
- Seattle Industrial Areas Freight Access Project[12]
- Washington State Freight Mobility Plan[13]
- Washington Freight Advisory Committee Report[14]

Additionally, the City of Seattle commercial vehicle load zone information[15] and documents from the Port of Seattle and Puget Sound Regional Council (PSRC) were reviewed.

These reports and other applicable studies were supplemented with the development of several key technical memos, all included as appendices to this report:

- Sustainable Freight Opportunities
- Role of Freight in Seattle's Economy
- FMP Design Guidelines
- Existing and Future Truck Mobility and Access in Seattle
- Neighborhood Case Studies

[9]SDOT, June 2005, www.seattle.gov/transportation/freight.htm#plan.
[10]City of Seattle, August 2005, www.seattle.gov/Documents/Departments/economicDevelopment/keyIndustries/industrial_land_study_final_91305.pdf.
[11]City of Seattle, July 2009 www.seattle.gov/Documents/Departments/economicDevelopment/keyIndustries/CAI-BasicIndustries2009-0803Final.pdf.
[12]SDOT & Port of Seattle, May 2015, www.seattle.gov/transportation/freight_industrialareas.htm.
[13]WSDOT, October 2014, www.wsdot.wa.gov/Freight/freightmobilityplan
[14]Washington Freight Advisory Committee, May 2014, www.fmsib.wa.gov/fac.cfm
[15]SDOT, 2016, www.seattle.gov/transportation/parking/parkingload.htm.

This research framed the existing conditions of freight in Seattle and the region, as well as how our economy is linked to the greater Washington state economy. The analyses culminated in an FMP Existing Conditions Report, which identified current locations of congestion, weight and height restrictions, and other needs such as parking and loading. This information is summarized in Chapter 2.

Based on existing conditions, we sought to understand how future growth in Seattle will affect freight mobility and accessibility through the year 2035. The analysis of existing freight trends and likely future needs informed the development of the freight network.

We then identified future key congestion points and safety issues in the freight network to identify possible improvements. We developed a wide range of solutions including:

- Safety education programs
- Traveler information systems
- Signal and intersection improvement
- Major capital investments

Working with our project advisory committee and residents, we prioritized projects and created an implementation strategy.

PUBLIC ENGAGEMENT PROCESS

Understanding the concerns of our residents and freight stakeholders was critical to the FMP. To ensure that many voices were heard, we carried out a robust public engagement process as part of the project. This included the creation of a project advisory committee and three phases of public outreach and engagement. The first phase engaged freight stakeholders and the second two phases focused on both residents and the freight community. Figure 1-2 illustrates the public engagement process for the FMP. SDOT's comprehensive Public Engagement Strategy for the project is attached as Appendix A.

FIGURE 1-2: PUBLIC ENGAGEMENT PROCESS FOR FMP

FMP Advisory Committee

The FMP Advisory Committee was established at project inception to provide freight expertise and community perspectives. The committee comprises a diverse group of external stakeholders, including representatives of trucking companies, railroads, distributors, the Port of Seattle, Seattle's Planning Commission, the City's Freight, Pedestrian and Bicycle Advisory Boards, and residents from neighborhoods located in or adjacent to industrial areas. The committee met during the planning process to provide input on all major products.

Phase 1: Information gathering

Our outreach started by engaging stakeholders to learn more about their freight needs and issues throughout the city. More than 25 individual stakeholder interviews were held. Stakeholders included:

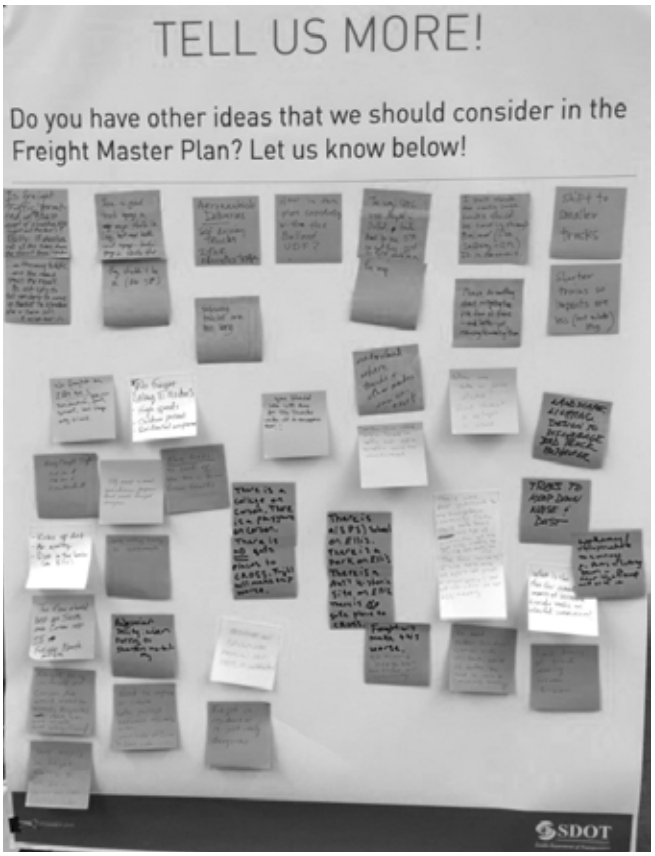
- Freight carriers
- Manufacturers
- Restaurant owners
- Business and industrial organizations
- State and local partners
- District and neighborhood councils
- Community organizations
- City commissions and boards

In addition, 3 group interviews were held and we met with more than 29 other organizations. To supplement the individual and group interviews, an online survey was conducted targeting people who drive trucks, with more than 60 responses provided.

The input we received informed the existing conditions process and provided insight about safety concerns, congestion, bottleneck impacts, and parking and loading needs. The input also yielded information on the impacts to communities experiencing high truck volumes such as air quality, vibrations from heavy vehicles, and safety concerns with large trucks in residential areas.

Phase 2: Input on the proposed network

Results of existing and future conditions analysis and preliminary network proposals were shared with a broader group of stakeholders and residents at open houses in Ballard and Georgetown. In addition, we met with the City's commissions and modal advisory boards, several district and community councils, and industrial associations, among others. In total, 17 outreach meetings were conducted during Phase 2.



Input from the second phase of outreach resulted in modifications to the proposed freight network and informed the development and prioritization of solutions.

Phase 3: Public review of the draft FMP

A third phase of engagement obtained public input on the draft FMP. Comments received during the public review period were used to develop the final plan.

PLANNING CONTEXT

The FMP exists on a foundation of citywide planning policy. The City's primary policy document is the Seattle Comprehensive Plan, *Toward a Sustainable Seattle*. It is a 20-year vision and roadmap for Seattle's future. The plan guides City decisions on where to direct new jobs and housing, how to improve our transportation

system, and where to make capital investments such as utilities or libraries. The FMP is one of several key modal plans, including master plans created to guide the future of walking, bicycling, and riding transit in Seattle. More information on how the FMP relates to other City planning documents and mobility plans is provided in Chapter 3, Policy Framework.

The FMP is, by its nature, a work in progress. Updates to the FMP should occur about every 5 to 7 years. These future updates will be necessary to assess progress, take advantage of emerging opportunities, and re-evaluate priorities.

As areas of the freight network are improved and/or constructed, new technologies are adopted, and Seattle continues to grow in jobs and population, freight demand may increase on particular corridors or between specific locations. Priorities will shift and new opportunities will emerge. These changes will be reflected in regular updates to the implementation plan.

In addition to updating the plan, SDOT and other city departments will be accountable for implementing the plan in a strategic manner that will involve ongoing review by the Seattle Freight Advisory Board and the City Council. This is addressed in Chapter 5, Developing Solutions and Chapter 6, Implementation Strategy.

ORGANIZATION OF THE SEATTLE FMP

The FMP is organized into 6 chapters, including this introductory chapter.

Chapter 2, Seattle Freight Context, describes the existing environment in which freight operates, including land use, population, employment, and economic growth. It also provides an assessment of existing and anticipated future conditions. An overview of how freight operates in 2 Seattle neighborhoods is documented.

Chapter 3, Policy Framework, provides the overall planning and policy context and further explores the vision and goals briefly described in the introduction.

Chapter 4, Seattle's Freight Network, presents the freight network developed through analysis of existing freight trends and likely future needs. This chapter describes how the network was identified and presents the freight network map. In addition, this chapter evaluates the network's ability to handle projected freight needs. It identifies safety and bottlenecks issues based on future freight trends.

Chapter 5, Developing Solutions, assesses the freight network and identifies solutions to ensure it will continue to serve freight users into the future. Solutions include strategies, actions, and capital investments that are needed to keep freight moving.

Chapter 6, Implementation Strategy, lays out the path forward for executing the FMP. Priorities, a funding strategy, and performance measures are described.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CHAPTER 2: GOODS MOVEMENT IN SEATTLE

IN THIS CHAPTER:

Washington is the most trade-dependent state in the nation, and Seattle sits at the center of this economy.

POPULATION, EMPLOYMENT, AND ECONOMIC GROWTH

In 2015, Seattle was home to an estimated 640,500[1] people and nearly 515,000[2] jobs. By 2035, it is anticipated that the city will grow by another 120,000 people and 115,000 jobs.[3] This is a portion of the Puget Sound region's anticipated employment growth from 2.1 million in 2014 to 3 million in 2040.[4]

The regional metropolitan planning organization, Puget Sound Regional Council (PSRC), has designated 2 Manufacturing/Industrial Centers (MICs) in Seattle, where manufacturing and industrial uses could be clustered away from residential and other commercial land uses. The MICs are supported by a well-developed intermodal transport system to accommodate marine, truck, and rail freight critical to the success and continuing job growth of manufacturing and industrial activities.

The magnitude of employment matters as it is a principal measure of regional economic activity. Overall population growth and related regional businesses and consumption generates both employment and industry growth. As population and employment grows, so will the need for goods to be delivered in an efficient manner for personal and business use.

Seattle's history and development as a major deep-water port has shaped the city and our economy. The Port of Seattle (Port) has a profound effect on freight movement in Seattle. Due to the Port and associated industries, Seattle's economy is particularly tied to freight and trade. In fact, the Port's activities reflect 443,000 jobs in the state when factoring in the farmers and manufacturers who ship products through the ports.[5]

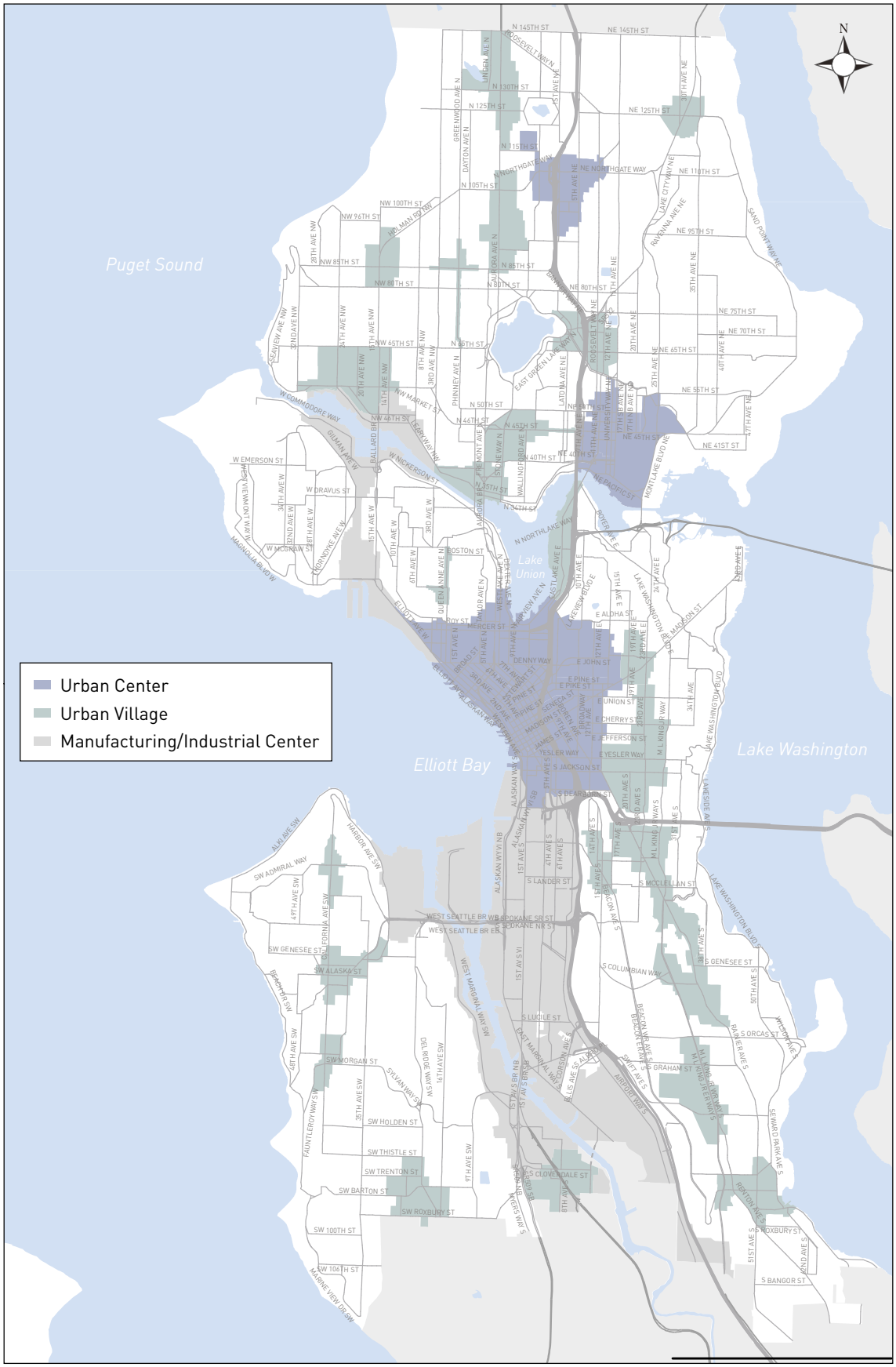
Regional economic sectors, such as manufacturing and retail, are also important drivers of freight transportation in and through Seattle. Goods delivery allows retail stores to meet consumer needs and supplies local businesses with the goods they need to manufacture and develop products and services for their customers.

Influence of Land Use on Freight

The City's Comprehensive Plan establishes the city's vision for land use, transportation, and growth management policy issues.[6] Through the Comprehensive Plan, the City manages and promotes growth in specific areas: regionally-significant urban centers and MICs and, at a more local scale, urban villages, where existing neighborhood business districts are located. These geographies are shown in Figure 2-1.

[1]City of Seattle. July 8, 2015. A Comprehensive Plan for Managing Growth 2015-2035 | Draft.
[2]Puget Sound Regional Council. 2014 Covered Employment Estimates by Jurisdictions.
[3]City of Seattle. July 8, 2015. A Comprehensive Plan for Managing Growth 2015-2035 | Draft.
[4]Puget Sound Regional Council. 2014 Regional Forecast. www.psrc.org/data/forecasts.
[5]NWSA. Economic Impact. https://www.nwseaportalliance.com/stats-stories/economic-impact.
[6]City of Seattle Comprehensive Plan: Toward a Sustainable Seattle, updated 2015, www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web_informational/dpdd016610.pdf

FIGURE 2-1: SEATTLE'S URBAN VILLAGE STRATEGY



The growth strategy to focus most future jobs and housing growth in specific areas serves several purposes:

- Accommodate Seattle's expected growth in an orderly and predictable way
- Strengthen business districts, including MICs
- Promote the best and most efficient use of public investments, including transportation infrastructure
- Preserve Seattle's distinctive natural features
- Contribute to the vibrancy of our neighborhoods

The growth strategy influences our transportation system, as well as freight distribution patterns and goods movement throughout the city. It requires a multimodal transportation system that provides travel options for all trips throughout the day, evenings, and weekends.

Manufacturing/Industrial Centers

Seattle has 2 of the Puget Sound Regional Council's (PSRC) 8 regionally-designated MICs: Ballard-Interbay-Northend (BINMIC) and Duwamish MIC, which are also specifically identified in Seattle's Comprehensive Plan.

The MICs were established to ensure that adequate accessible industrial land is available to promote a diversified employment base and sustain Seattle's contribution to regional living wage job growth.

Activities on industrial lands, such as manufacturing, make significant revenue contributions to the local and regional economy. This is due in large part to these activities being net exporters of products to the U.S. and the world, and net importers of income.

In 2012, workers employed in industrial activities were paid an average annual wage of $80,000, more than 34% above other jobs in the four county area. A large share of these higher wages is spent throughout the local and regional economy, supporting additional economic activity, or what is commonly referred to as "induced" impacts.

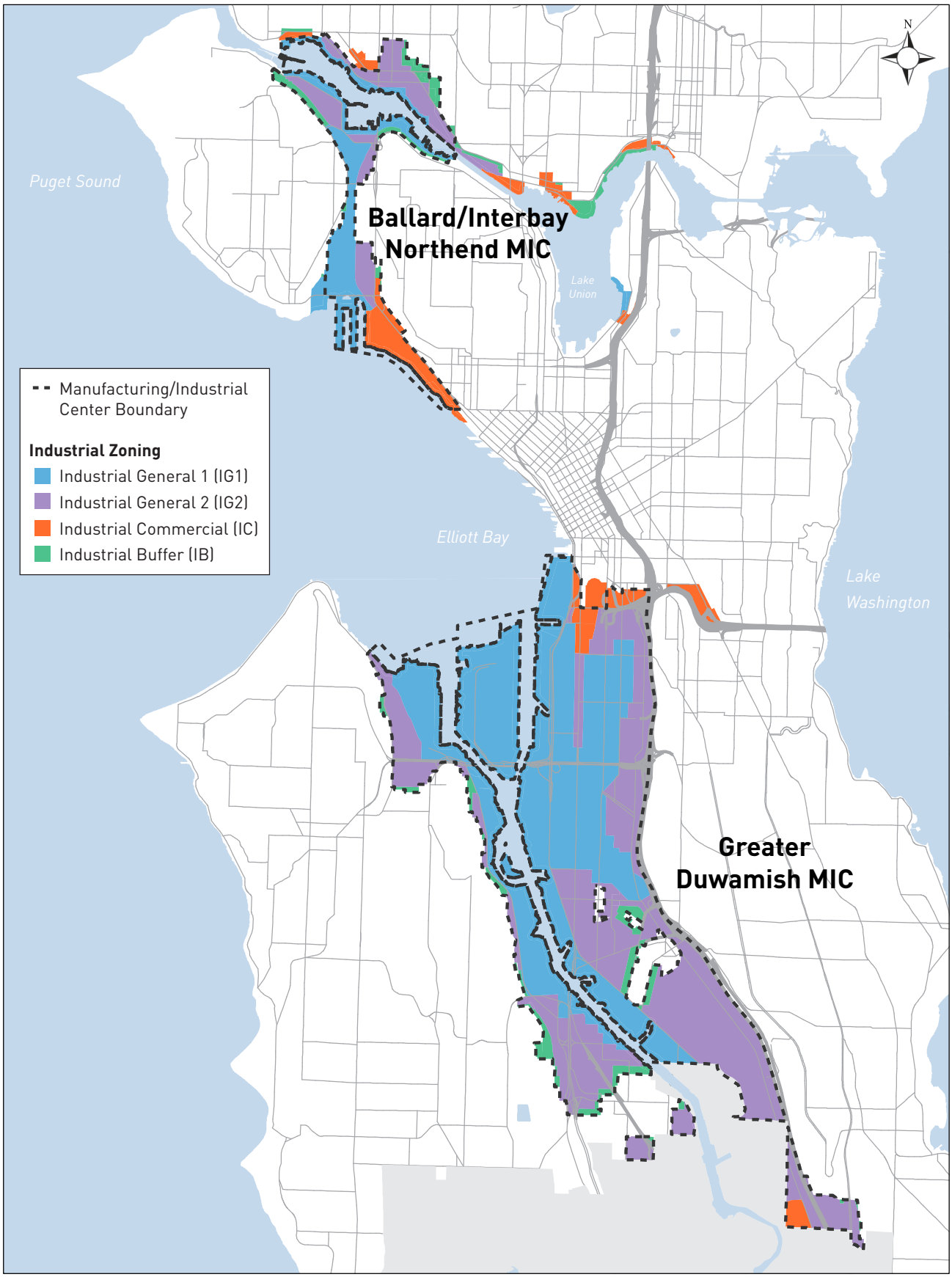
Industry has concentrated in the MICs due to:

- relatively large, flat sites
- access to highways, rail, waterways and port facilities
- proximity to similar uses, customers and labor force

This also explains why the majority of the nearly 6,000 acres of industrially-zoned land in Seattle is within the MIC designations, shown in Figure 2-2.

[6]City of Seattle Department of Planning and Development. November 2013. Existing Comprehensive Plan and Duwamish M/IC Policy and Land Use Study. www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web_informational/p1903847.pdf.

FIGURE 2-2: SEATTLE'S MANUFACTURING/INDUSTRIAL CENTERS



The **BINMIC** is the region's smallest MIC at 932 acres. It has a generally smaller parcel size with a finer mix of diverse uses than other MICs. These uses span light manufacturing, maritime, food processing, warehouse uses, a rail yard, and several Port of Seattle facilities.

Port facilities in the BINMIC include Fishermen's Terminal, its largest cruise ship terminal, and a grain elevator, among other uses.

The BINMIC contains 14,200 jobs, including many that are living-wage.

The **Duwamish MIC** is the oldest and largest of the 8 designated MICs spread across the Puget Sound Region. It's siting was driven by access to the Duwamish Waterway and Elliott Bay.

It covers 4,928 acres of marine and industrial lands, containing nearly 84% of total industrial-zoned land in Seattle.

The Duwamish MIC functions as a focal point for international industrial activity and is the center of the Port's primary marine shipping area, with deep-water berths, piers, shipyards, drydocks, container terminal cranes, on-dock rail, container support yards, cargo distribution and warehousing, oil and petroleum storage facilities, major railroad yards, and the King County International Airport (also known as Boeing Field).

This area contained more than 50,000 jobs in 2010.

Freight Generators

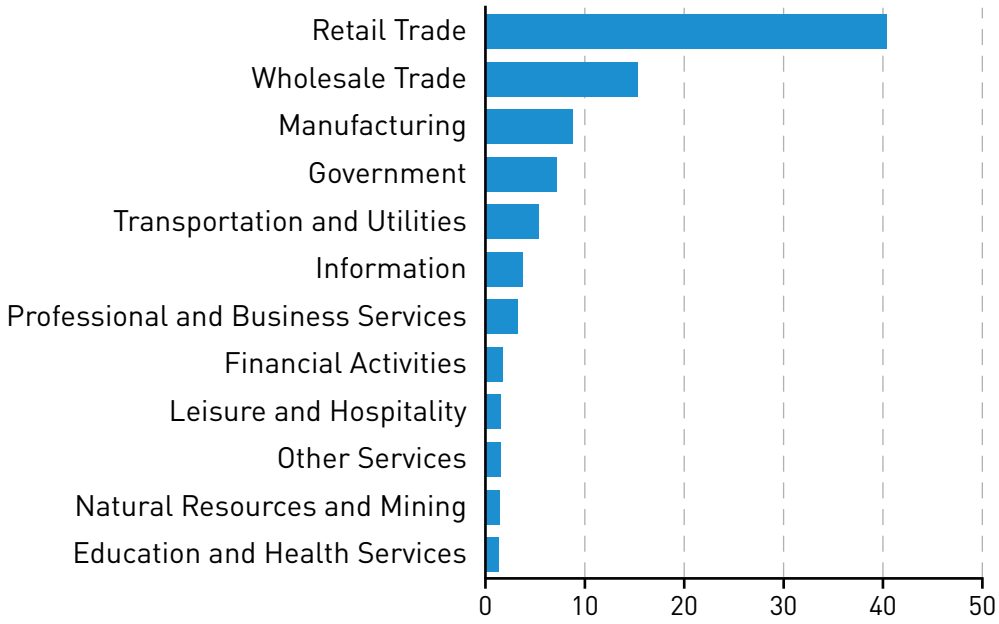
In Seattle and nationally, retail trade, wholesale trade, and manufacturing sectors (in that order) spend the most on freight movement and generate the most trucks, shown in Figure 2-3. They are also the top 3 employment sectors for freight-generation.

Total employment in these 3 employment sectors grew by about 10% between 2009 and 2013 (from 80,000 to 88,000 employees), mostly due to growth in the retail trade sector. A notable difference, though, is that while wholesale trade is heavily reliant on freight to supply its customers, it takes third place behind retail trade and manufacturing in terms of number of persons employed in Seattle. Figure 2-4 shows the employment trends of these three employment categories between 2000 and 2013.

Retail trade is Seattle's largest economic sector, with more than 45,000 employees in 2013 and it generates the most freight. Most retail stores are interspersed throughout the city's urban centers and villages, and rely almost completely on trucks to get goods to and from distribution centers and warehouses.

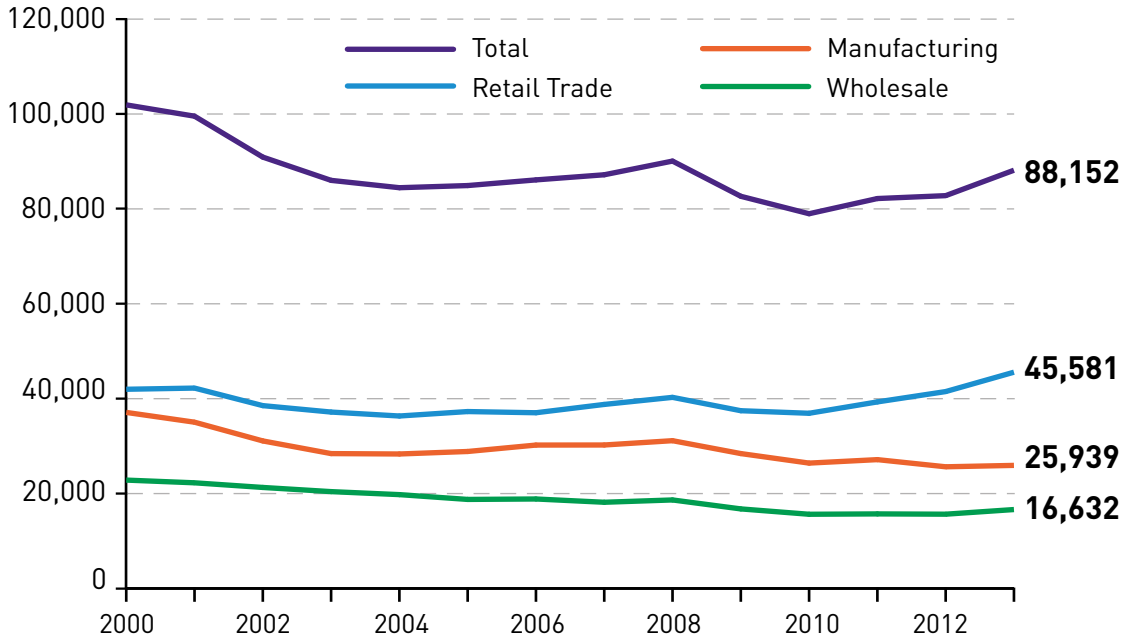
Wholesale trade, which generates the second most freight of any employment sector, had 17,000 employees in 2013. Wholesale merchants supply products across a broad spectrum of durable and nondurable consumer and industrial products. Durable goods, such as motor vehicles

FIGURE 2-3: U.S. INDUSTRY USE OF TRUCKING AND WAREHOUSING SERVICES ($ BILLIONS)



Source: US Bureau of Labor Statistics and WSP | Parsons Brinckerhoff analysis. December 2014. The Role of Freight in Seattle's Economy.

FIGURE 2-4: SEATTLE EMPLOYMENT IN FREIGHT-RELATED INDUSTRIES



Source: US Bureau of Labor Statistics and WSP | Parsons Brinckerhoff analysis. December 2014. The Role of Freight in Seattle's Economy.

and parts, appliances and industrial materials, and non-durable goods, such as food, apparel and gasoline, are delivered to retail stores and other businesses.[7]

Manufacturing, which generates the third most freight of any industry, is also well represented in Seattle. In 2013, the manufacturing industry provided nearly 26,000 jobs in Seattle, making it second to retail in terms of employment in high freight-generating industries in the city. Outputs of manufacturing processes range from industrial materials, such as primary metals; to intermediate products, like fabricated metals; to final goods, including airplanes, food, and apparel. Each of these products is transported to local markets and regional markets or is exported. Transportation equipment (produced by businesses such as Boeing and its local suppliers, Paccar, and local shipyards) is the largest manufacturing sector in the Seattle area.

Final goods that are manufactured, from airplanes to seafood, are more likely to be destined to markets in the U.S. or overseas than headed for local consumption. Along with many service industries, manufacturing represents the direct "exports" to the U.S. and overseas that help drive Seattle's economy and jobs

[7]US Bureau of Labor Statistics and WSP | Parsons Brinckerhoff analysis. December 2014. The Role of Freight in Seattle's Economy.

Freight in Neighborhoods

One often overlooked aspect of freight movement is the need for, and the effects of, freight movement in city neighborhoods. To shed more light on freight operations and effects in residential areas, and to help inform the development of the FMP, we conducted case studies of 2 Seattle neighborhoods. While every neighborhood is unique, each needs some level of freight activity related to local retail businesses and residential deliveries.

Ballard and South Lake Union are fast growing and changing neighborhoods that include commercial and residential uses adjacent to deep-rooted manufacturing and industrial uses. Both neighborhoods have recently experienced rapid residential growth, and office and retail development. This growth has intensified the conflicts for limited street space as on-street parking and loading zone availability have become increasingly scarce, and travel congestion has worsened.

The growth in these neighborhoods has increased the demand for goods movement to and from them, while at the same time reducing the ability for freight providers to efficiently access and serve the businesses within the neighborhoods. In addition, an increase in freight can result in actual or perceived quality of life issues for residents. Specific issues identified in the case studies for neighborhood residents and businesses include:

- **Safety:** Neighborhood residents are concerned about safety associated with increased truck volumes and speeds. The high volume of pedestrian and truck activity in South Lake Union, specifically, could increase the potential for adverse interaction and may require additional education and operational changes.
- **Noise:** Some neighbors and businesses expressed interest in shifting more deliveries to off-peak hours to keep trucks out of peak-hour traffic; however, evening noise ordinances that limit nighttime deliveries near residential areas make this challenging.
- **Loading Zones:** Available on-street loading zone capacity is extremely scarce and was cited as an issue for trucks. Enforcement of parking regulations and designation of additional truck-sized loading zones are needed in both neighborhoods.
- **Congestion:** Businesses have had to change their business practices to allow additional travel time for making and receiving deliveries.

To address these concerns, the case studies include the following recommendations:

- Parking and loading zone issues merit further evaluation and discussion
- Current data on truck volumes, use, and connectivity should be used to develop the network

In response to these concerns, the FMP includes strategies and actions intended to improve safety, the parking and loading of goods, and congestion (described in Chapter 5), and an updated freight network map provide better access to neighborhood business districts (shown in Chapter 4).

SEATTLE'S FREIGHT ASSETS

Seattle's freight infrastructure is key to maintaining economic and locational competitive advantage in the region, the nation, and the world. Keeping goods moving efficiently is not just vital for Seattle's economy, but also for the region, Washington state, and other parts of the country, specifically, Alaska. Our waterway, rail, air, pipeline, and roadway infrastructure is critical to support freight logistics and shipping.

As stated in the introduction, the FMP focuses on goods movement by truck, as that is the mode the City has the most ability to influence. However, our ability to provide reliable truck travel to and from the region's port facilities, airports, and intermodal terminals is critical to the city's livability and economic health. Our freight assets are detailed in this section, and include:

- Seattle's roadway network
- Waterways and the Port of Seattle
- Railroads and intermodal facilities
- The Olympic Pipeline

Seattle's Freight Roadway Network

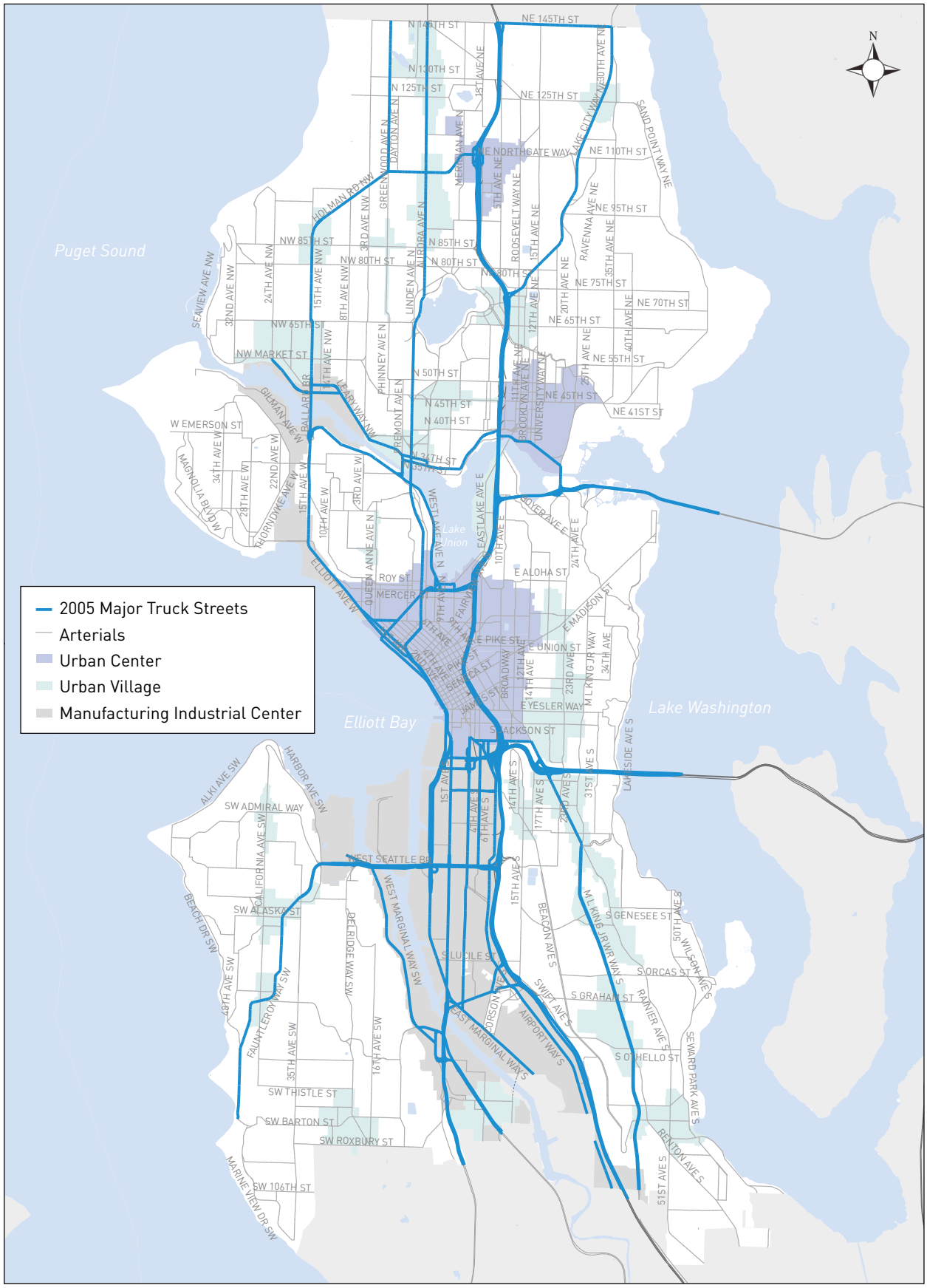
Nearly all of the streets under the City's jurisdiction, whether designated for freight or not, are used by trucks picking up and delivering goods. As part of Seattle's 2005 *Transportation Strategic Plan* (TSP) we adopted a Major Truck Street (MTS) network that was incorporated into the city's Comprehensive Plan. This 2005 MTS network is shown in Figure 2-5.

The Olympic Pipeline

The Olympic Pipeline is a 400-mile interstate pipeline system that transports gasoline, diesel, and jet fuel from 4 Puget Sound refineries to Seattle's Harbor Island, Seattle-Tacoma International Airport, Renton, Tacoma, and Vancouver, Washington, and Portland, Oregon.

Source: www.olympicpipeline.com/

FIGURE 2-5: 2005 MAJOR TRUCK STREET NETWORK



The MTS network was adopted as part of Seattle's 2005 *Transportation Strategic Plan* (TSP), and as such, is incorporated into the city's Comprehensive Plan. As described in the TSP, an MTS is defined as an "arterial street that accommodates significant freight movement through the City, and connects to and from major freight traffic generators." State routes and highways are also included in the network, as is the Washington State Ferry System, which is an important extension of the freight roadway network.

Over-Legal and Heavy Haul networks

Supplementing the MTS, and distributed throughout the city, are specific routes that provide for oversized and overweight trucks, referred to as "over-legal." Permits are required to operate these vehicles on designated over-legal streets.

The over-legal network is shown on Figure 2-6. In general, these routes can accommodate trucks with larger loads that require a 20-foot-wide by 20-foot-high envelope, although specific segments may not handle both excess width and height dimensions.

Every vehicle that meets the over-legal specifications, which includes an exceedance of the maximum weight, height, width, and/or length (as specified by state and city laws) is required to obtain a permit to transport goods using the city's street network.

In October 2015, the City of Seattle approved legislation (Ordinance 124890) that established a Heavy Haul network of city streets to allow heavier cargo containers to be transported between the Port of Seattle, industrial businesses, and rail yards with appropriate permits. This new network is shown on Figure 2-7.

Heavy Haul Legislation

The heavy haul legislation comes with more than just roadway designations. The measure also provides a framework and funding to repair and build roadways within the network, calls for semi-annual safety inspections of heavy haul trucks, and aligns city weight regulations with those of the state and other municipalities across the country. The over-legal permitting system was difficult for freight providers to adhere to, and it resulted in many violations. While there is also a permitting process to use the heavy haul network, and weight restrictions still apply, the process is greatly simplified and the amount of violations has noticeably decreased. Costs of the measure will be shared by the City and the Port of Seattle.

FIGURE 2-6: OVER-LEGAL NETWORK

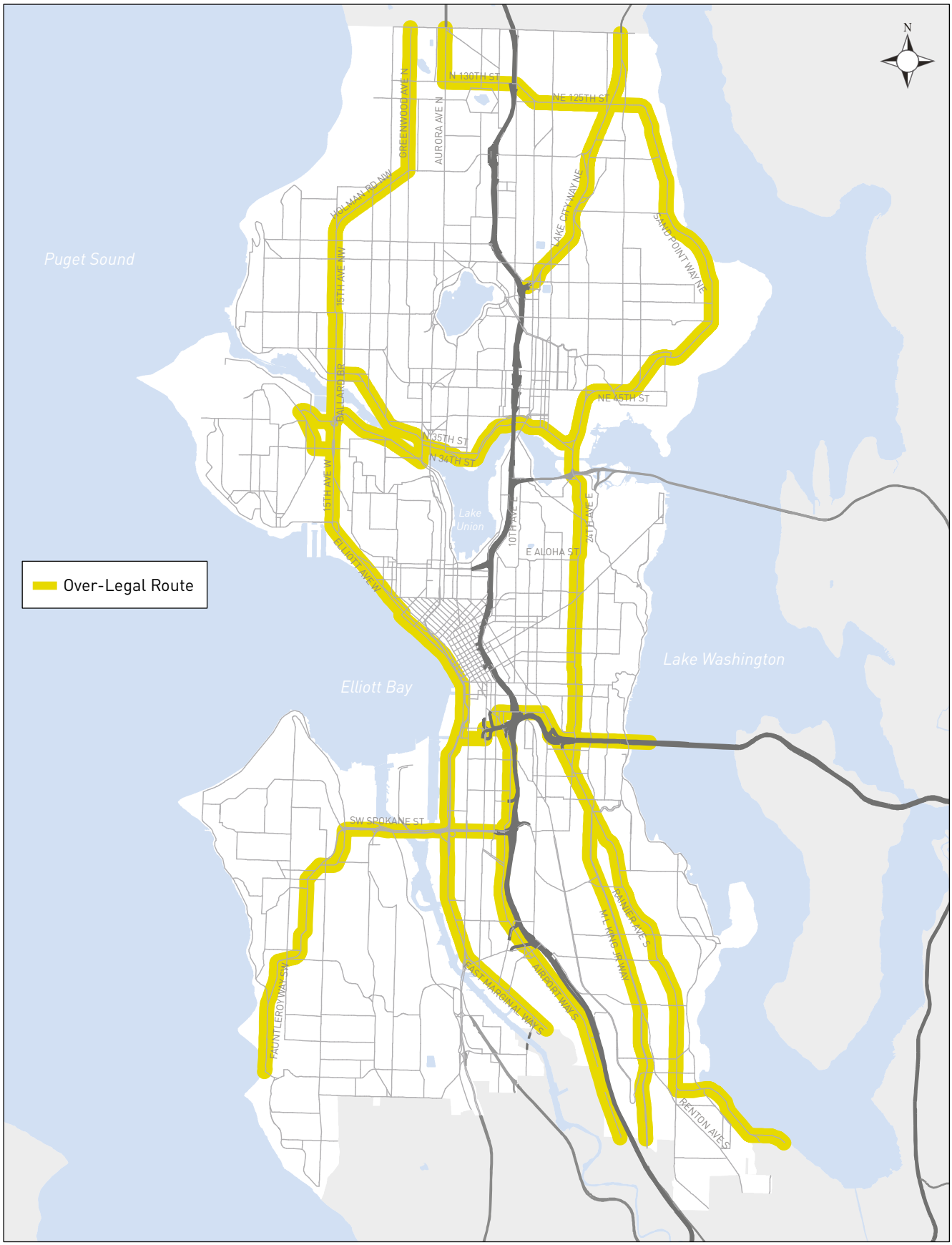


FIGURE 2-7: HEAVY HAUL NETWORK

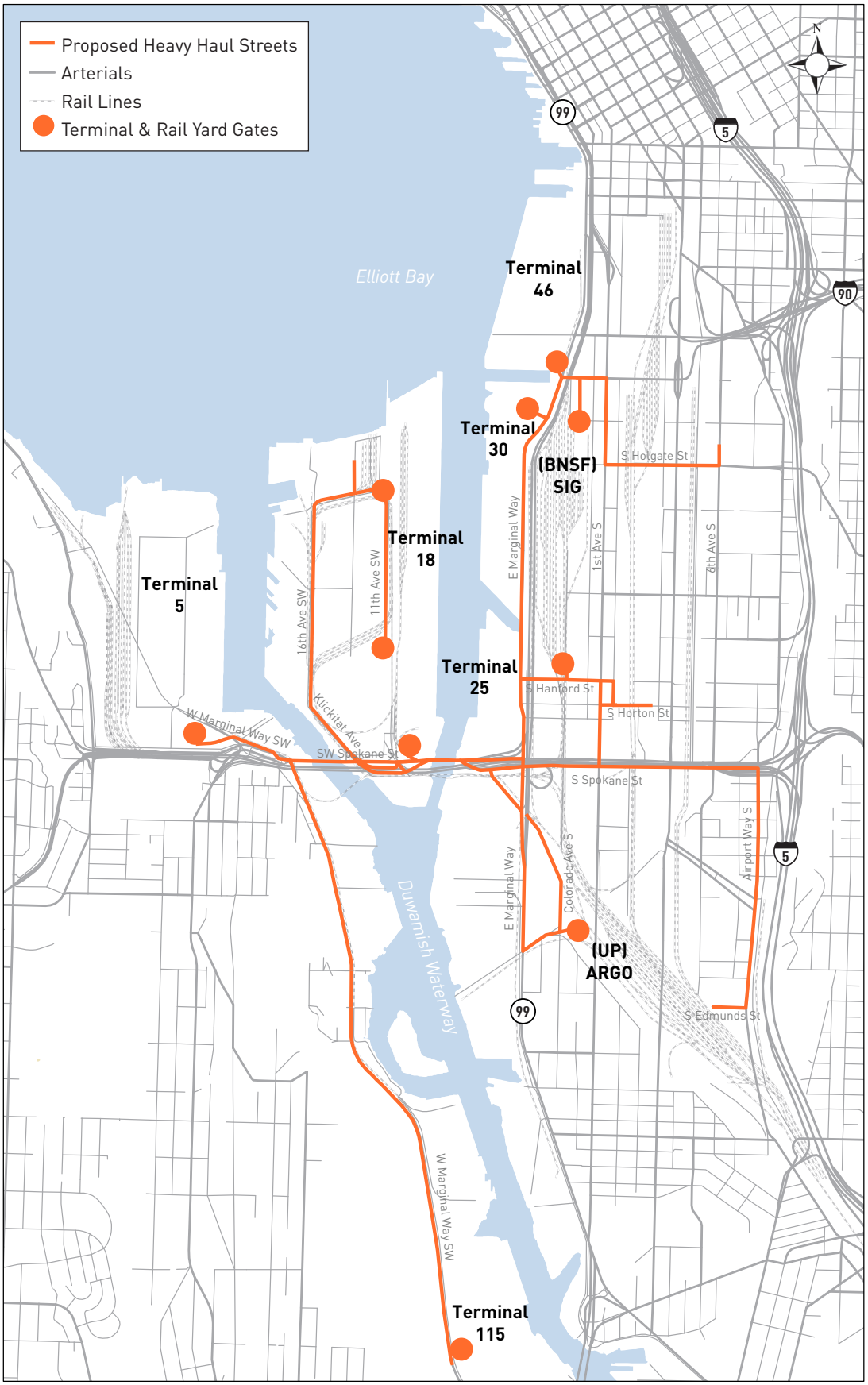
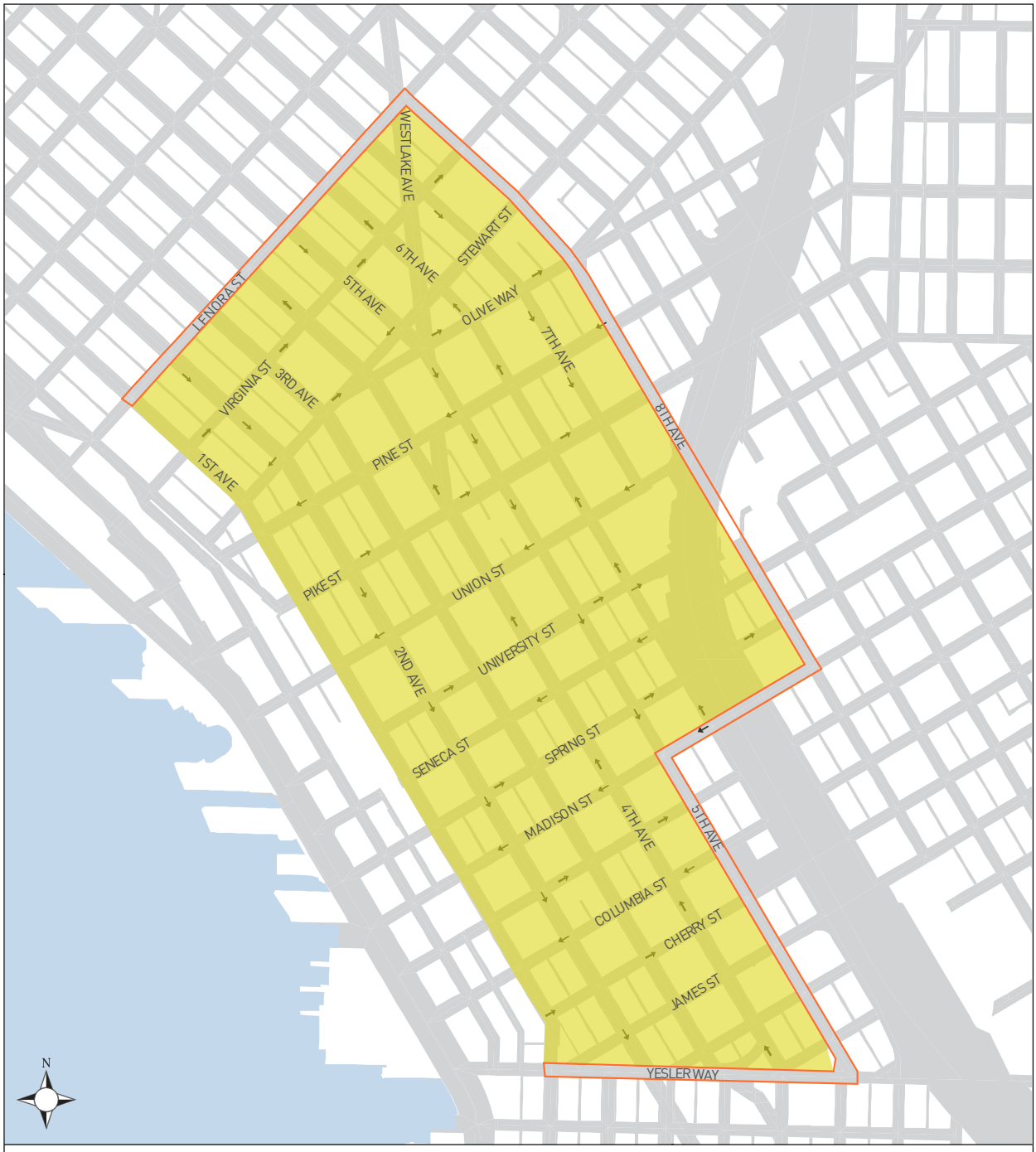


FIGURE 2-8: DOWNTOWN TRAFFIC CONTROL ZONE



The Downtown Traffic Control Zone is depicted by the area shaded in yellow. Freight restrictions in this highly- congested area are necessary for traffic management (per Seattle Municipal Code 11.14.165).

Restrictions include:

- Vehicles over 30 feet in length are restricted Monday through Saturday between the hours of 6:00 AM and 7:00 PM Special permission is required.
- Over-legal loads are not permitted in the Downtown Traffic Control Zone between the hours of 6:00 AM and 7:00 PM, Monday through Friday.
- Special permits must be obtained for any movement in this area.
- State permitted over-legal loads and vehicles must also obtain a special one-day permit for movement in the Downtown Traffic Control Zone.

Downtown Traffic Control Zone

Due to heavy congestion, the movement of large trucks is restricted in the core of the city. In the Downtown Traffic Control Zone (shown in Figure 2-8), vehicles of 30 feet or longer may operate by permit on weekdays between 9 AM and 3 PM, and without a permit from 7 PM to 6 AM. Curfews are in effect from during weekday peak traffic periods (6 AM to 9 AM, and from 3 PM to 7 PM). With a permit, oversized loads may travel in the zone from 7 PM to 6 AM.

Waterways and the Port

Historically, water transport has been the largest carrier of freight, as virtually any material can be moved by water.

Seattle is set along Elliott Bay, a natural deep-water port that has facilitated maritime activities throughout Seattle's existence. The Duwamish Waterway, at the south end of Elliott Bay, is a hub of activity that supports cargo handling and storage, marine construction, ship and boat manufacturing, concrete manufacturing, paper and metals fabrication, food processing, and other industrial uses.

The 8-mile Lake Washington Ship Canal connects the freshwaters of Lake Union and Lake Washington with the saltwater inland sea of Puget Sound through the Hiram Chittenden Locks. The locks accommodate a 20-foot water difference between the 2 bodies of water and are the largest and most heavily used on the West Coast.

The Port has numerous facilities throughout the city that are located on Puget Sound and other navigable waterways, as shown on Figure 2-9. Facilities include container terminals, general-purpose marine/cargo terminals, commercial and recreational moorage, industrial and commercial properties, a grain terminal, and cruise ship terminals. The Port also operates Fishermen's Terminal and the Maritime Industrial Center along the Lake Washington Ship Canal. Fishermen's Terminal provides freshwater moorage to the Northwest commercial fishing fleet.[8]

[8]Port of Seattle. Commercial Marine. www.portseattle.org/Commercial-Marine/Pages/default.aspx.

The Seattle region's deep-water ports are an international gateway for imports and exports from the state's agricultural and manufacturing businesses. Cargo destined for, or originating in, the Pacific Northwest, including agricultural products and supplies or products from manufacturing businesses, is mostly transported to the Port by truck. Goods traveling longer distances, such as agricultural products from the Midwest, predominantly come by rail.[9]

THE NORTHWEST SEAPORT ALLIANCE

In August 2015, the ports of Seattle and Tacoma joined forces to unify their management of marine cargo facilities and business to strengthen the Puget Sound gateway and attract more marine cargo and jobs for the region. Their combined operations are now referred to as the Northwest Seaport Alliance (NWSA).

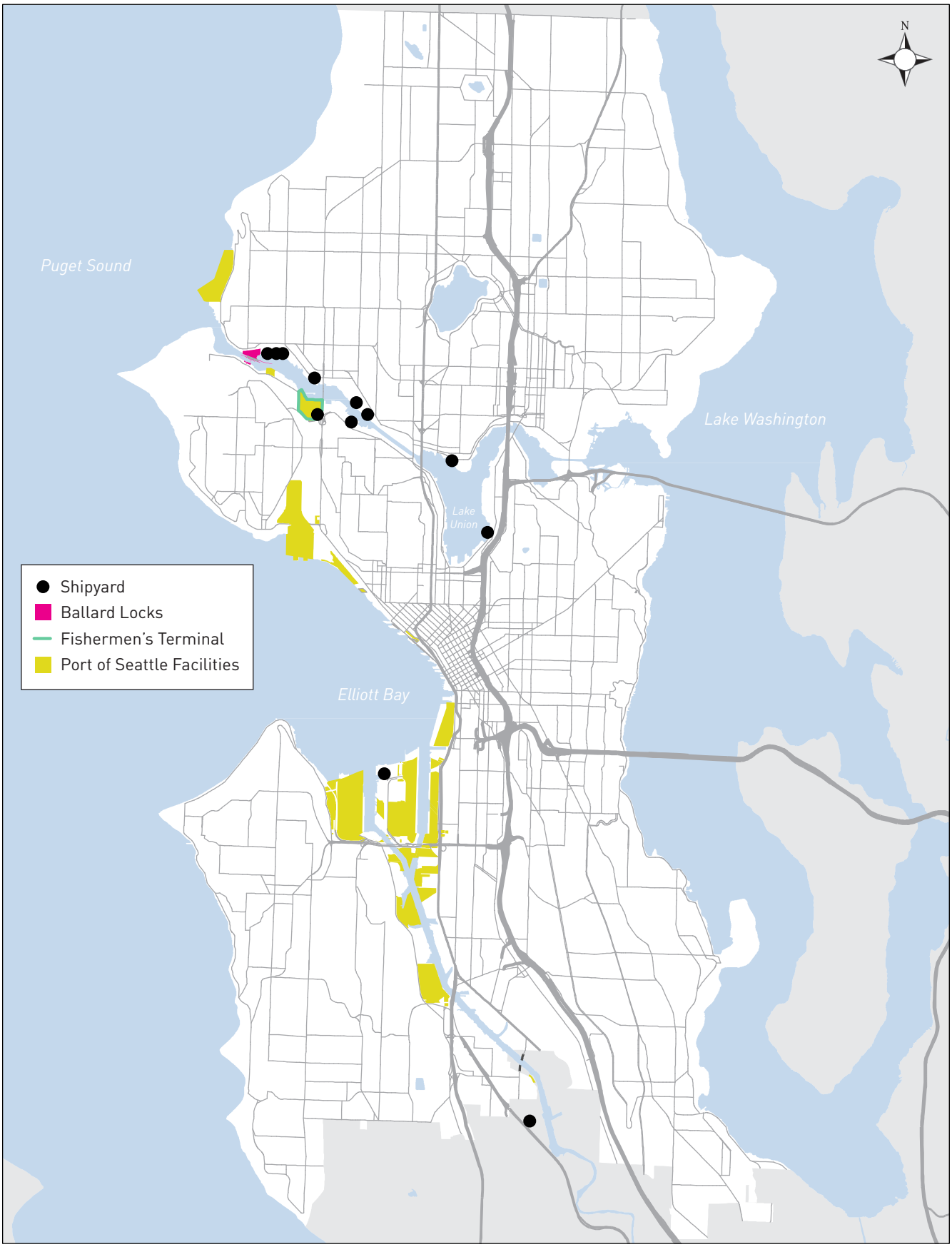
The NWSA promotes economic development of marine cargo terminal operations with unified business retention and recruitment, coordinated marine terminal planning and operations, and the ability for coordinated capital investments, which will help to improve utilization of terminal capabilities and the opportunity to reduce operating costs. Much of the containerized cargo imported through these ports is transferred to and from rail at or near the port terminals for transport to the U.S. interior. This import system provides for infrastructure and lowers the cost of Washington state exports to the world.

Source: The Northwest Seaport Alliance. www.nwseaportalliance.com/about.

Note: The 2 ports continue to own their own facilities. We refer to the Port of Seattle in this document, as we are focusing on the history and effects within the City of Seattle.

[9]FHWA Freight Analysis Framework Database and WSP | Parsons Brinckerhoff analysis. September 2014. The Role of Freight in Seattle's Economy. p. 27-28.

FIGURE 2-9: SEATTLE'S MARITIME ASSETS



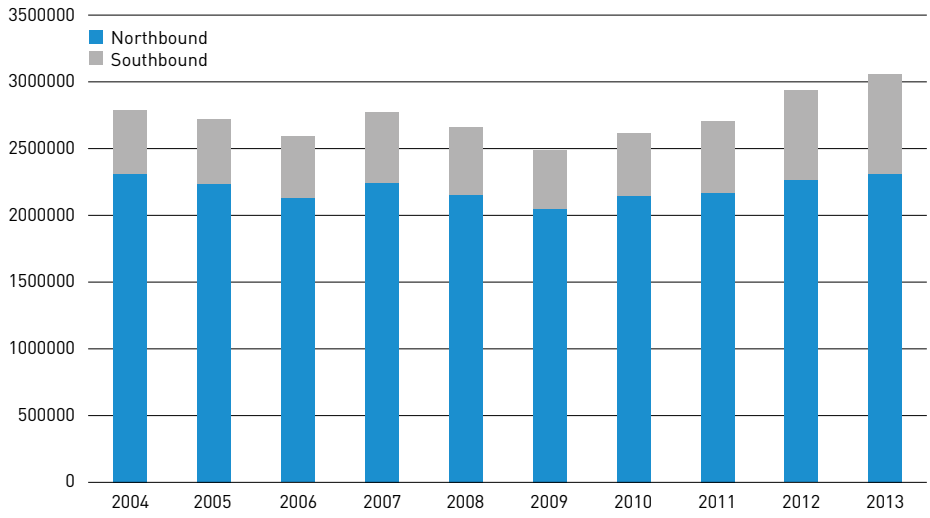
Seattle-Alaska Freight and Port Connection

Alaska's distant-water commercial fishing fleet is based in Puget Sound, which has a significant local economic impact. Many ships are serviced and provisioned along the Lake Washington Ship Canal and at the Port of Seattle's Terminal 91. Alaska relies on Seattle-area barges to bring products and necessities to allow for Alaskan west coast livelihood. Many of the barge operations that service Alaska are located along the Duwamish River.

Shipments to Alaska from the Puget Sound include household and other consumer goods, construction materials, and a broad range of supplies and materials to support business and industry in Alaska. Figure 2-10 shows waterborne cargo between Alaska and Washington over the last 10 years. (While Puget Sound-specific data is not available, it can be assumed that the vast majority of waterborne cargo transported between the 2 states moved through Puget Sound.) As shown, northbound cargo is 4 to 5 times higher than domestic imports from Alaska. Seafood accounts for the bulk of these southbound shipments, with lesser amounts of household goods, recyclables, and scrap materials comprising the remainder. Innovation in environmental sustainable practices by the local maritime industry has allowed the Washington and Alaskan fisheries to go from nearly endangered to some of the best managed in the world.

The fishing industry is not the only industry benefiting from the Seattle-Alaska connection. Cruise facilities located at Bell Street Pier and Smith Cove serve nearly 1 million passengers each year for cruises to Alaska. In total, each vessel call generates almost $2.5 million for the local economy (Port of Seattle. 2015).

FIGURE 2-10: TOTAL ALASKA-WASHINGTON WATERBORNE CARGO, 2004-2013



Source: McDowell Group. February 2015. Ties that Bind: The Enduring Economic Impact of Alaska on the Puget Sound Region, p. 14. www.seattlechamber.com/docs/default-source/Events-and-Programs-Documents/ties-that-bind-report-feb-2015.pdf?sfvrsn=2.

Railroads and Intermodal Facilities

Intermodal facilities are locations where freight transfers between travel modes, including port facilities, rail yards, and airports. Freight can transfer at these locations between ship and truck or railcar; between truck and plane; between truck and railcar; or sometimes from one rail carrier to another. Transfers between rail and plane can also happen, but are rare.

Within Seattle there are on-dock intermodal facilities at Port terminals, as well as facilities involved in rail intermodal shipments. These facilities are shown in Figure 2-11.

Railroads

Railroads cooperate closely with marine/maritime-going freight. They are most competitive with long-distance trucking and barge transport.

Two Class I railroads have railroad track networks in Seattle: the Burlington Northern Santa Fe Railway (BNSF) and the Union Pacific Railroad (UP). Class I railroads have a yearly operating revenue of $475.75 million or more.

BNSF operates two intermodal terminals in Seattle, the Balmer Yard and the Seattle International Gateway (SIG), as well as the South Seattle terminal in Tukwila. The BNSF mainline extends north-south through Seattle, and is in a doubled- tracked tunnel built in 1905 through downtown.

UP operates the Seattle Argo Terminal. The UP mainline only operates south of downtown and parallels BNSF.

There are also local rail spurs throughout Seattle's MICs that provide direct rail service for businesses. One of these is the Ballard Terminal Railroad (BTRR), a Class III short-line terminal railroad that operates a 3-mile spur in Ballard and the BINMIC. BTRR also operates transloading facilities where goods and freight are transferred from railcars to trucks for delivery to local and regional businesses.

Several container ship terminals, such as Terminal 5 and Terminal 18, have on-dock rail. This helps expedite intermodal transfers and reduces truck trips from port terminals to rail yards.

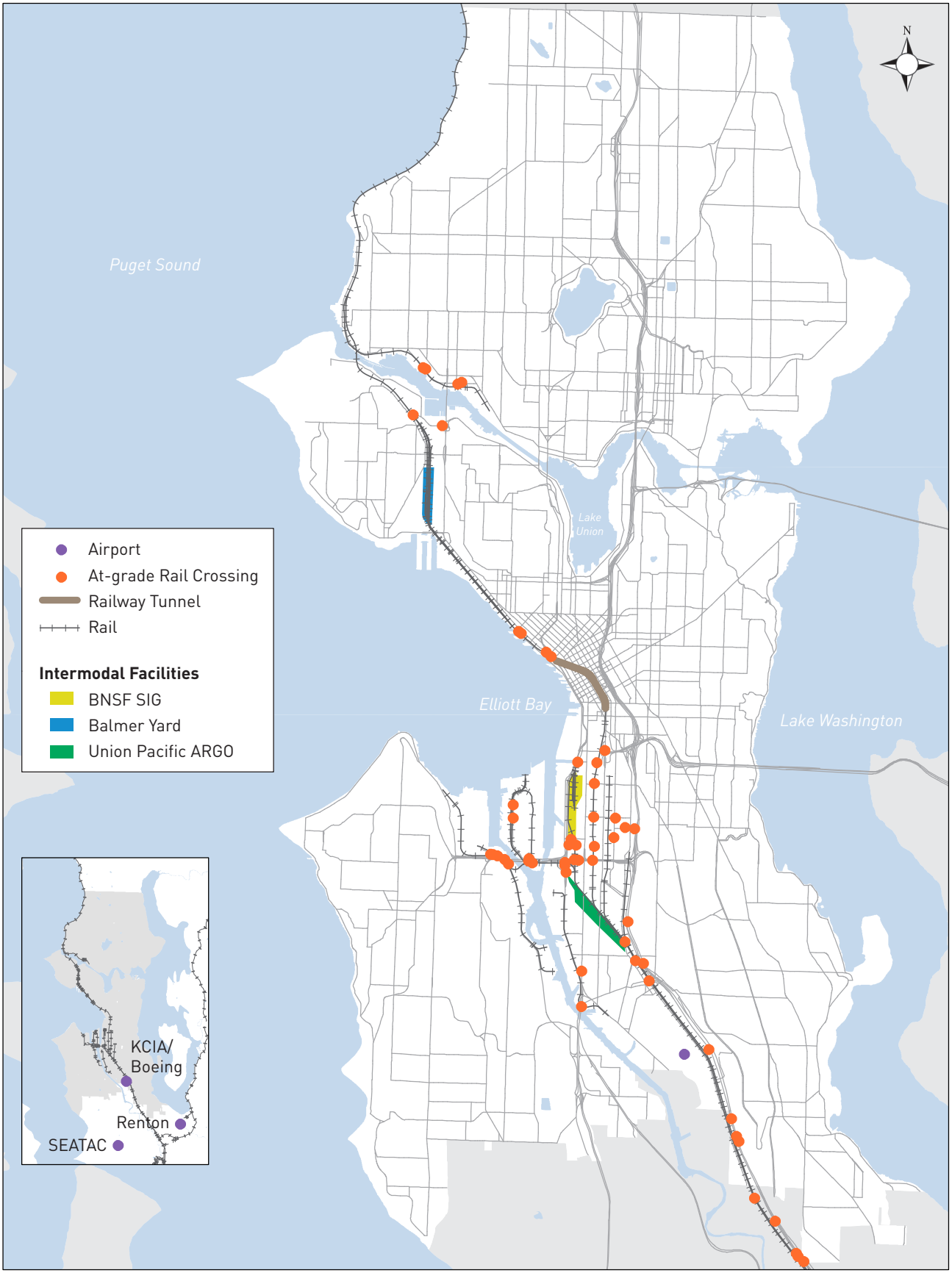
Airports

The King County International Airport (KCIA, or Boeing Field) is the only airport within the city's boundary. KCIA is the third-largest airport in the Pacific Northwest and the 29th ranking national airport for cargo. KCIA is a major economic center and supports significant economic activity in terms of direct (5,100) and indirect (16,000) jobs with 150 companies located at the airport. The Boeing Company has been a central part of both KCIA's operations and the regional economy, and its presence attracts a significant number of auxiliary manufacturing businesses.[10] Several large air cargo carriers, including UPS and FedEx, also have facilities at or near the KCIA.

Two other airports, the Renton Municipal Airport and the Seattle-Tacoma (Sea-Tac) International Airport, are nearby to Seattle. In 2013, Sea-Tac was 21st in the nation in terms of total cargo volume, shipping 293,000 metric tons. High-value exports include commercial aerospace, high-tech manufacturing, fresh seafood products, and certain agricultural products (such as cherries and red raspberries to Asia).

[10]King County Department of Transportation and King County International Airport - Boeing Field. August 2014. King County International Airport Strategic Plan 2014-2020.

FIGURE 2-11: RAIL, INTERMODAL AND AIRPORT FACILITIES



EXISTING FREIGHT TRENDS

Trucks carried $334 billion of Washington State's total freight volumes, according to data released by the Federal Highway Administration (FHWA).[11]

How Truck Freight Moves Today

A significant proportion of the freight industry is reliant on our road network to transport goods. In 2011, 68.5% of freight tonnage and 80.7% of freight-related revenue in Washington was transported by truck.[12]

Further, nearly half of all goods exported from Seattle-region ports originate in Washington. Most of these goods travel to the ports via truck (44.2%) or rail (41.6%). The remaining 14.2% corresponds to pipeline, barge or ship, and mainly reflects crude petroleum activity. The Midwest accounts for the next largest origin of Seattle port exports and, given the longer distances, most of these arrive by rail.[13]

With so much of the Seattle economy reliant upon truck movements, our roadway infrastructure is critical to the local, regional, and state economy.

Types of trucks

There are a variety of types of freight trucks traveling on our roadways, each with their own unique design characteristics. Truck characteristics that most influence the design of roads and other transportation facilities are weight and distribution over axles, dimensions (width and height), and turning radius.

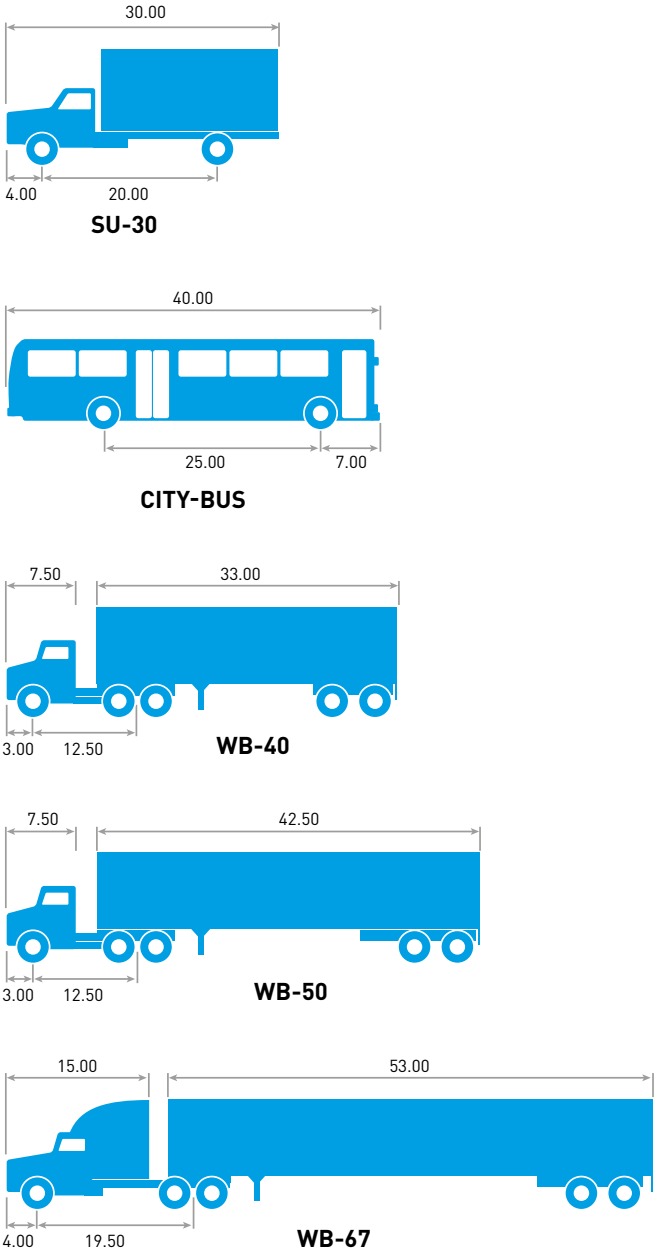
The American Association of State Highway and Transportation Officials (AASHTO) has classified the most common sized trucks on U.S. roadways based either on the overall length of the vehicle (buses and single unit trucks) or vehicle wheel base (tractor-trailers). The classifications include:

- SU-30: 30-foot wheelbase, single-unit vehicles typical of most local delivery vehicles
- WB-40 and WB-50: small tractor trailers with wheelbases in the 40-foot and 50-foot range
- WB-67: 67-foot wheelbase long-haul trucks, sometimes called the interstate design vehicle, which have an overall length on the order of 74-feet

Figure 2-12 shows the typical dimensions of the most commonly used AASHTO design vehicles.

[11]Bob Costello, Chief Economist, American Trucking Association. Washington State Freight Advisory Committee. May 2014. Washington State Freight Trends & Policy Recommendations or Air Cargo, Freight Rail, Ports & Inland Waterways, & Trucking. www.fmsib.wa.gov/fac/20140602-FINALComplete%20Folio_for%20printer5-7-14.pdf.
[12]Washington State Freight Advisory Committee. May 2014. Washington State Freight Trends & Policy Recommendations. www.fmsib.wa.gov/fac/20140602-FINALComplete%20Folio_for%20printer5-7-14.pdf
[13]FHWA Freight Analysis Framework Database and WSP | Parsons Brinckerhoff analysis. September 2014. The Role of Freight in Seattle's Economy. p. 27-28.

FIGURE 2-12: TYPICAL VEHICLE DESIGNS[14]



Existing truck volumes

SDOT has collected truck volume data at more than 620 locations on certain arterials for the past 4 years. This data has been instrumental in the development of the FMP network, and also used to create the City's first truck volume map, shown in Figure 2-13. The map shows existing average daily truck volumes. Roadways with higher truck volumes have a correspondingly thicker line weight. All major roads in Seattle carry some trucks, and many of them carry high volumes.

Numerous streets on the 2005 MTS network carry more than 1,500 trucks a day, which is considered a very high volume within the city. Examples include:

- East Marginal Way S in Duwamish MIC area
- Lower Spokane St
- N 145th Street west of I-5
- 4th Avenue S in Duwamish MIC area
- West Marginal Way SW
- 1st Avenue S in Duwamish MIC area
- 15th Avenue W, south of the Ballard Bridge

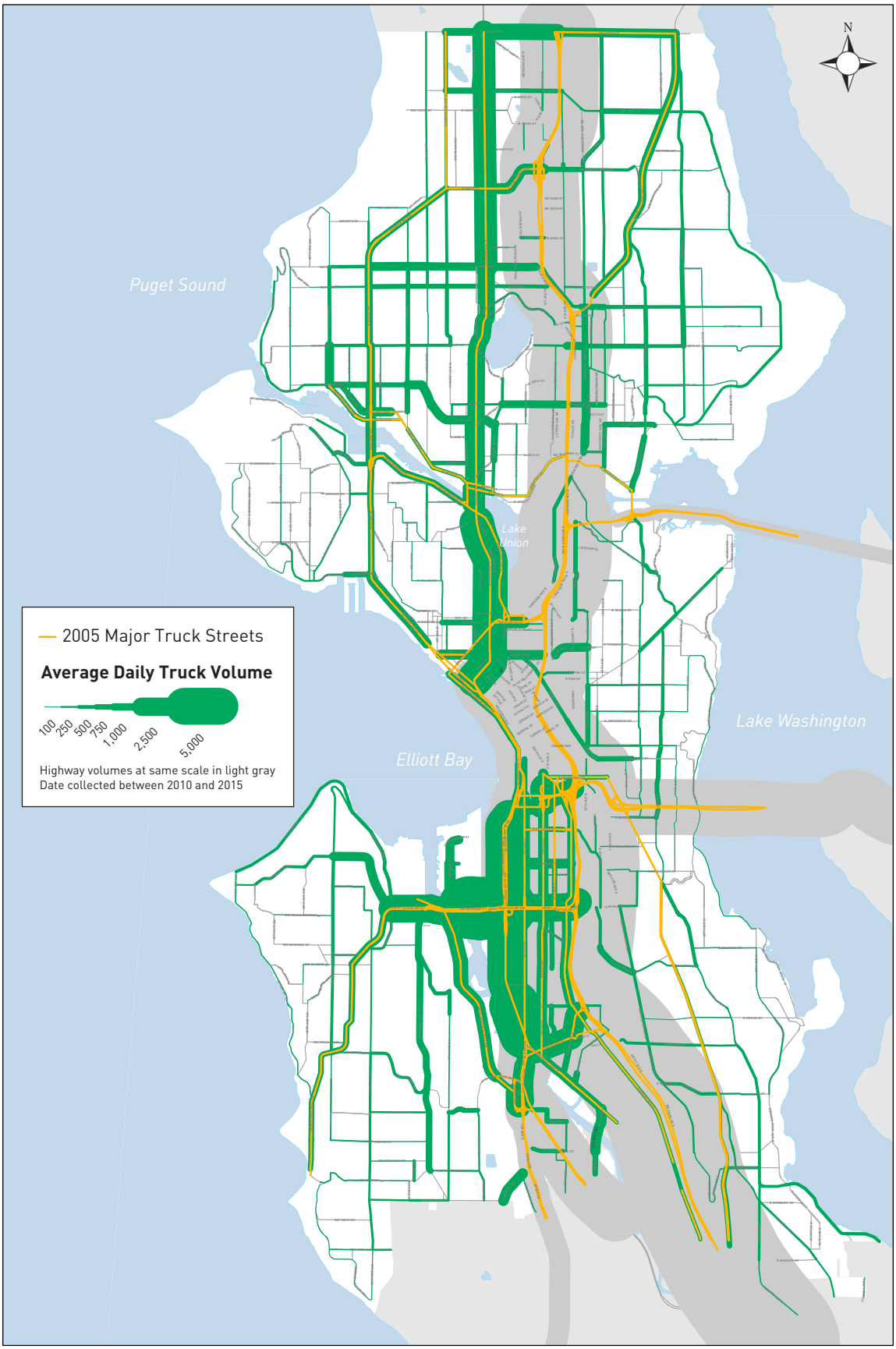
There are also a large number of streets that carry more than 1,000 trucks a day, which constitutes a high volume. Many of these connect logical freight destinations but are not on the 2005 MTS network, for example:

- N 85th Street between SR 99 and 15th Avenue NW
- Fremont Avenue N, north of the Fremont Bridge
- E Olive Way, east of I-5
- N 50th Street, west of I-5

This mismatch between the volumes of freight and the 2005 MTS network designation suggested that this network was in need of an update. The updated network and its rationale are described in Chapter 4.

[14]American Association of State Highway Transportation Officials. FHWA Freight Analysis Framework Database and WSP | Parsons Brinckerhoff analysis. September 2014. The Role of Freight in Seattle's Economy. p. 27-28.

FIGURE 2-13: 2014 AVERAGE DAILY TRUCK VOLUMES ON SEATTLE'S ROADWAY NETWORK



City streets and residential neighborhoods with high volumes of truck size WB-40 and above experience a higher ratio of environmental and quality of life impacts. In dense, compact urban environments, large trucks can be intimidating for people walking and riding bicycles. Truck size and volumes were both considered when developing the freight network.

Time of day is also an important factor when considering truck volumes. Truck volumes typically peak in the morning between 8 AM and 9 AM and stay relatively constant until the end of the evening rush hour period around 7 PM, as shown in Figure 2-14. This varies from non-truck volumes, which typically have a distinct morning and afternoon peak. The generally high overall truck traffic throughout the day is likely a result of trucks taking advantage of lower mid-day congestion levels combined with the large number and variety of freight-generating industries in Seattle that operate throughout the day.

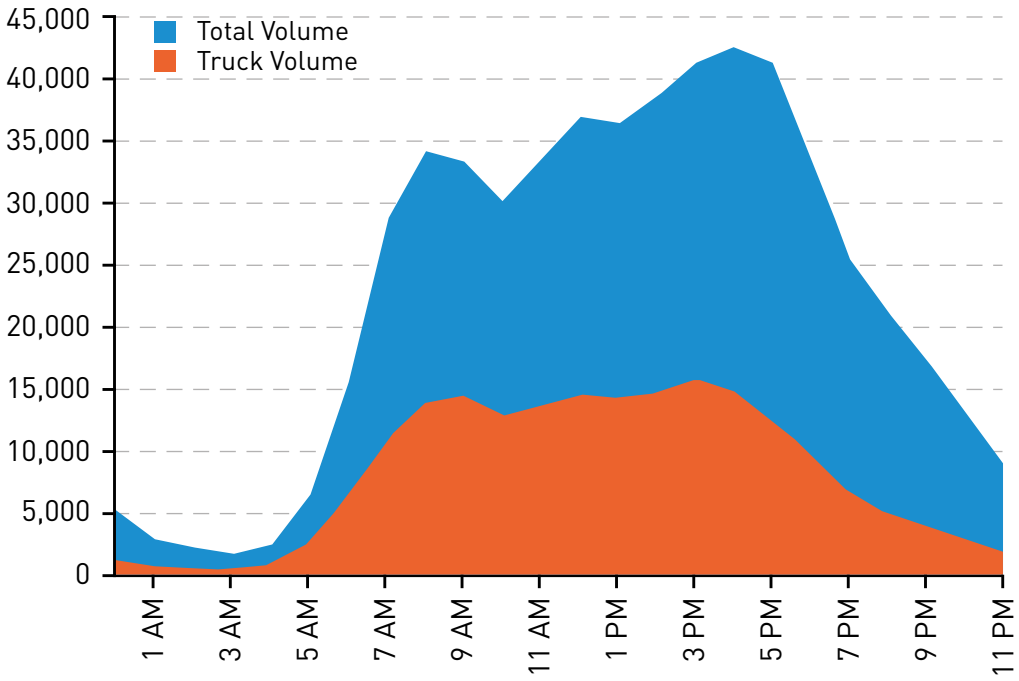
Seattle-area shippers and receivers depend on trucks to provide timely, reliable service. As described, most roadways in the metro area experience some level of congestion, particularly in the morning and evening peak travel periods. This congestion increases cost and decreases reliability of truck freight service.

How Rail, Water and Air Freight Moves Today

Freight traveling to or from railyards, seaports, and airports is often transported by truck, making effective integration between these other freight modes and trucks important in the overall logistics chain. Understanding the demands and needs of these other freight modes allows us to better provide truck access and focus key infrastructure investments toward projects that facilitate mutual intermodal benefits.

Railroad freight transportation is typically used for longer-distance movements. For instance, rail is the principal mode of transportation for agricultural products originating in Minnesota and Illinois destined for export from Seattle's Port facilities. Rail is used to carry the majority

FIGURE 2-14: SEATTLE TRAFFIC PATTERNS BY TIME OF DAY



of international imports from the Port facilities to other states.[15]

Rail spurs facilitate short-distance trips off main rail lines to local companies throughout Seattle's MICs. An example is the 3-mile spur operated by the Ballard Terminal Railroad. At its transload facilities, goods (like grains and minerals) are transferred from railcars to trucks for delivery to nearby businesses.

Ports provide a gateway for national and regional goods movement, especially to and from Asian countries. Imports flow into the region and feed both local wholesale and retail trade portions of the supply chain, helping meet consumer and business demand. A significant share of waterborne imports is destined to U.S. inland regions. Whether to local regions or more distant locations, the cargo is moved by the local transportation service industry with employment and incomes contributing to the local economy.[16]

In 2013, the Port of Seattle handled a total of 1.6 million 20-foot equivalent unit (TEU) containers. In the past 10 years, the ratio of TEUs per container has remained relatively steady at 1.74; therefore, the 2013 volume translates to roughly 900,000 full and empty containers.

Port of Seattle, 1st Quarter, Annual Operations Report. May 2014

Keeping discretionary cargo moving through the Port of Seattle is not only important for global commerce, but it also benefits Washington's agriculture industry. For example, ships bringing in imports from Asia provide capacity for agricultural products from Eastern Washington to be shipped back to Asia on the return trip. This activity translates to a substantial volume of freight trucks accessing the Port of Seattle facilities. In 2013, an average day at the Port of Seattle had about 2,700 trucks entering the 4 container terminals, which generated a total of 5,400 one-way truck trips per day.[17] Container terminals with on-dock rail, such as T-5 and T-18, can help expedite intermodal transfers and reduce truck trips from port terminals to rail yards.

As discussed, virtually any material can be moved by water, but water transport becomes impractical when materials need to be delivered quickly. The use of air freight can create competitive advantages, such as much shorter transit times. Air freight carriers provide shipping for commodities that usually have high values per unit or are very time-sensitive. In 2010, 60,000 tons of air cargo were imported through the Seattle region.[18]

FUTURE FREIGHT TRENDS

This section explores freight industry trends and how growth will affect reliability of our roadway and other freight networks. How people shop, new technologies, and how we are responding to climate change are all radically transforming how freight moves. We need to understand these trends in order to plan an effective transportation system.

[15]2012 FHWA Freight Analysis Framework Database and WSP | Parsons Brinckerhoff analysis. December 2014. The Role of Freight in Seattle's Economy.
[16]2012 FHWA Freight Analysis Framework Database and WSP | Parsons Brinckerhoff analysis. December 2014. The Role of Freight in Seattle's Economy.
[17]Port of Seattle, 1st Quarter, Annual Operations Report. May 2014.
[18]FHWA. 2015. Freight Management and Operations. Freight Analysis Framework. http://ops.fhwa.dot.gov/FREIGHT/freight_analysis/faf/index.htm.

Speed to Market

Speed to market is one of the most important factors in supply chain design and execution, as it influences mode selection by commodity type. There are profound changes occurring in the supply chains and logistics systems used to get goods to consumers, including electronic markets and direct delivery.

Urban delivery services have been challenged by just-in-time (JIT) deliveries, which have led freight business deliveries to make more efficient trips with smaller shipments and vehicles to dense mixed-use areas.[19] The costs of a missed delivery due to congestion, road closures, or other reasons are high given the JIT nature of production. Any delay slows the entire assembly process or can leave store shelves without stock.

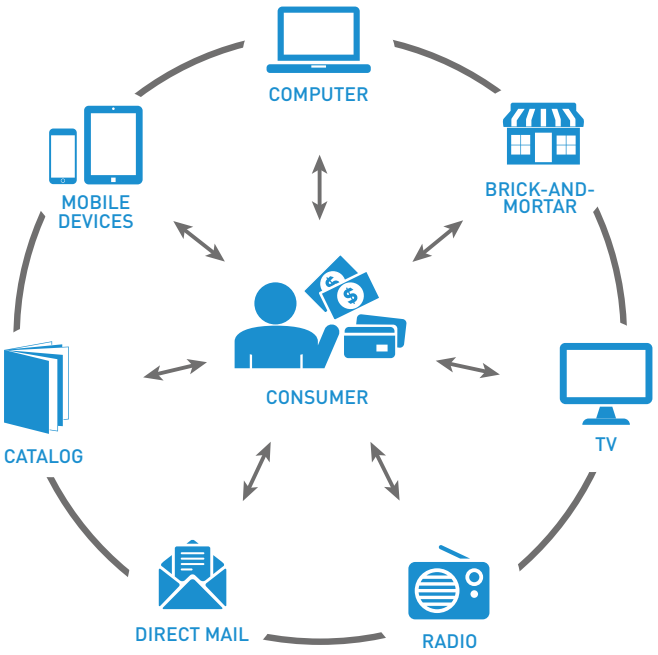
Retail Trends

The way retail goods are transported is shifting as online shopping, also known as e-commerce, has changed how people are buying goods and services and searching for the best price. People increasingly purchase online and have goods delivered directly to their home, rather than buying from a traditional brick-and-mortar store. The competition between traditional and online retailers has resulted in a further trend called "omni-channel" retail. Omni-channel retail provides the consumer with the ability to shop through many possible methods, including mobile devices, computers, brick-and-mortar, television, radio, direct mail and catalog. This shift is intensifying the trend to smaller shipments throughout the city.

E-commerce is influencing logistics approaches for goods providers, such as Macy's and Home Depot. Macy's, for example, has begun operating 500 of its stores as mini-distribution centers for e-commerce.[20] These storefronts not only provide goods for those shopping on location, but also serve as a mini-warehouse for goods purchased online by consumers for delivery. Combined distribution approaches and merging of the fulfillment cycle can be used to maximize customer flexibility and offer a competitive advantage. Already customers can order products online and pick them up in stores. Alternatively, a customer might view and purchase a product in store, then have the product delivered to their home on the same day.

Other potential future trends could contribute to an increase in the types of delivery vehicles. Transportation network companies (e.g., Uber and Lyft) that move people also have an interest in transporting goods as their vehicles move about cities. In addition, the advent of driverless vehicles could result in an increase in delivery trips if total costs decline as a result of reductions in labor

OMNI-CHANNEL RETAIL



[19]National Cooperative Freight Research Program. January 2012. Report 14. Understanding Urban Goods Movement. http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_014.pdf.
[20]Antonio Regalado. November 2013. MIT Technology Review. It's all e-commerce now. www.technologyreview.com/news/520786/its-all-e-commerce-now/.

(driver) costs. Delivery of products using bicycle fleets has also increased in cities, allowing fast and reliable service where vehicle congestion hinders truck movement.

As a result, truck transportation patterns and truck size and type are likely to change, while the total volume of goods moved will likely rise along with increasing consumer demands for goods. Distribution centers may shift from national or larger regions to smaller geographies. This could reduce the proportion of long distance trips and increase the proportion of shorter trips. In any case, we are likely to see more small trucks or other vehicles making deliveries in our neighborhoods.

Fuel Costs and Advances in Vehicle Technology

The cost of fuel is a significant proportion of many freight provider's operating costs. With increasing variability and spikes in fuel costs, there have been significant advances in vehicle technology.

Rising fuel costs and new technologies are affecting modal decisions today, and these trends are anticipated to continue into the future.

About half the annual cost of operating an aircraft is attributed to the cost of fuel. Therefore, as oil prices increase, which they are anticipated to do over the next few decades, air cargo freight will likely grow at a slower rate than other freight modes. Also, there will likely be a shift to air freight increasingly incorporated into multimodal supply chains that offer a better balance between cost and time. Still, according to Boeing's forecast of air cargo freight for the Seattle area, air freight is expected to continue to grow at rate of 3% to 5% (tripling) over the next two decades.[21]

Both rail and truck freight providers are seeking ways to make their fleets more efficient. UPS is making substantial financial and operational investments in liquid natural gas (LNG) vehicles and infrastructure in the United States. The company Freewheel uses a bicycle fleet to

UPS CARGO CRUISER, SOUCE: WWW.FLEETSANDFUELS.COM

[21]Washington State Freight Advisory Committee. May 2014. Washington State Freight Trends & Policy Recommendations or Air Cargo, Freight Rail, Ports & Inland Waterways, & Trucking. www.fmsib.wa.gov/fac/20140602-FINALComplete%20Folio_for%20printer5-7-14.pdf.

deliver goods to local businesses in Seattle, and partnered with Amazon to pilot bike delivery within a day and within an hour in urban centers. Amazon is also testing drones, and submitted an official request to the Federal Aviation Administration (FAA) for their use.

Seaport Truck Scrappage and Replacements for Air in Puget Sound (ScRAPS) is the Northwest Seaport Alliance's ongoing program to reduce emissions from trucks serving their container terminals. Currently, trucks entering container terminals must have a model year 1994 or newer engine, have a valid radio frequency identification tag, and be registered in the Port of Seattle Drayage Truck Registry. For the next phase of the program, drayage trucks will need to have model year 2007 or newer engines by January 1, 2018.[22]

BNSF and UP railways recently invested in locomotives that are more fuel efficient. BNSF has also invested in fuel-efficient technology at its intermodal facilities.[23] These investments lower their day-to-day operational costs, which in turn, allows them to reduce transporting costs. It is possible that, as the rail industry becomes more efficient, it may become an even more prominent long-distance transport alternative to trucking or barging.

The emergence of connected and automated freight vehicle technology will increase the safety and, to a smaller degree, the efficiency of trucking in the short term. For safety and reliability reasons, these technologies are expected to be in wide use in the freight industry soon. Technologies available today include automatic and emergency braking, evasive steering support, and traffic jam assist. Other technologies are in testing and their release is anticipated in the near future.

Climate Change

Seattle will be affected by climate change. The most significant changes projected in the Pacific Northwest will be to temperature, precipitation, and sea level.[24] The 2012 Seattle Community Greenhouse Gas Emissions Inventory found that road transportation contributed the largest share of Seattle's core emissions at 64%. Of that percentage, freight contributed 19%.[25] Seattle's Climate Action Plan offers recommendations to reduce freight emissions by increasing the efficiency of the roadway, minimizing congestion, decreasing passenger vehicle trips, and supporting programs that promote cleaner trucks.[26]

The support of alternative freight modes, such as bicycle delivery, may increase to deliver goods in dense, congested areas of the City. Bicycle deliveries produce zero emissions, are nimble, accommodate loads of up to 300 pounds per unit, and have few parking challenges during delivery. The maintenance and operational costs of bicycle delivery fleets are also lower than for trucks.

The need for a resilient transportation system and infrastructure will be crucial to allow for disaster relief and response to extreme events. If an extreme event were to occur and damage a major roadway, traffic would shift to already overloaded infrastructure. There are more than 900 bridges within the city of Seattle. Over 149 of them are maintained by the City. Damage to these would impair emergency services and the economy. As

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[22]Port of Seattle. August 2016. Clean Truck Program. www.portseattle.org/Environmental/Air/Seaport-Air-Quality/Pages/Clean-Trucks.aspx
[23]BNSF. BNSF and the Environment. www.bnsf.com/communities/bnsf-and-the-environment/.
[24]City of Seattle. Office of Sustainability and the Environment. Adaptation Planning. www.seattle.gov/environment/climate-change/adaptation-planning.
[25]City of Seattle. April 2014. 2012 Seattle Community Greenhouse Gas Emissions Inventory. www.seattle.gov/Documents/Departments/OSE/2012%20GHG%20inventory%20report_final.pdf.
[26]City of Seattle. June 2013. Climate Action Plan. www.seattle.gov/Documents/Departments/OSE/2013_CAP_20130612.pdf.

it is, during high-heat times, steel expands, which can damage some older structures, and SDOT must cool its 3 bascule bridges to ensure that they can be opened and closed.

Climate change considerations will weigh in our planning for freight facilities and infrastructure, and will help us address effects on communities impacted by higher freight volumes.

Future Truck Freight Volumes

As stated earlier, the number of people and jobs in Seattle is expected to grow substantially by 2035. Forecasts indicate an anticipated 22% increase in total citywide employment between 2014 and 2035.

Growth in population and employment suggests that we can expect a corresponding increase in demand for goods movement within Seattle. In fact, employment in high freight-generating sectors of wholesale and retail trade are expected to grow even faster than other industries, or 64%, during the same period. These local employment trends translate into a compounded annual growth rate of slightly less than 2% for freight within the region between now and 2035.[27] National and international trade forecasts project total freight tonnage from, to, and within the Seattle region to grow 2.2% per year through 2040.[28]

Considering local and global trends together, this plan assumes a 2% average annual growth in freight volumes on Seattle streets. We developed different growth rates for various areas within Seattle based on the location of employment in freight-generating industries. Depending on their location, this approach assigned growth between 1.0% and 2.5% to most streets within the city. Streets within the immediate vicinity of Port terminal facilities were assigned a 3.5% a year growth rate and regional roadways were assigned growth based on the PSRC regional travel model. Future volumes are shown in Figure 2-15.

The majority of highways and major arterials in the city experience congestion in the morning and evening peak periods today. Current travel forecasts show traffic congestion worsening throughout the city in the future. Additional roadways will exceed capacity in the future, and traffic delays will spread to other times of day and parts of the city. As congestion worsens citywide, goods movement will become more challenging, both in terms of mobility and travel time reliability.

Future Rail, Maritime and Air Volumes

Like truck freight, rail, maritime, and air freight will also continue to grow into the future.[29] Increased oil prices could slow the growth in air cargo freight. However, a tripling of air freight is anticipated in the Seattle area over the next 20 years.[30]

Rail and truck freight movements are the most competitive of modes. While rail freight is expected to grow in the future, an increasing share of the volume of imports and exports through the Seattle area transported by rail is projected to shift to truck.[31] Figure 2-16 shows that freight imported or exported through our ports will triple between 2012 and 2040. During that same timeframe, the shares of freight transported by truck will increase in relation

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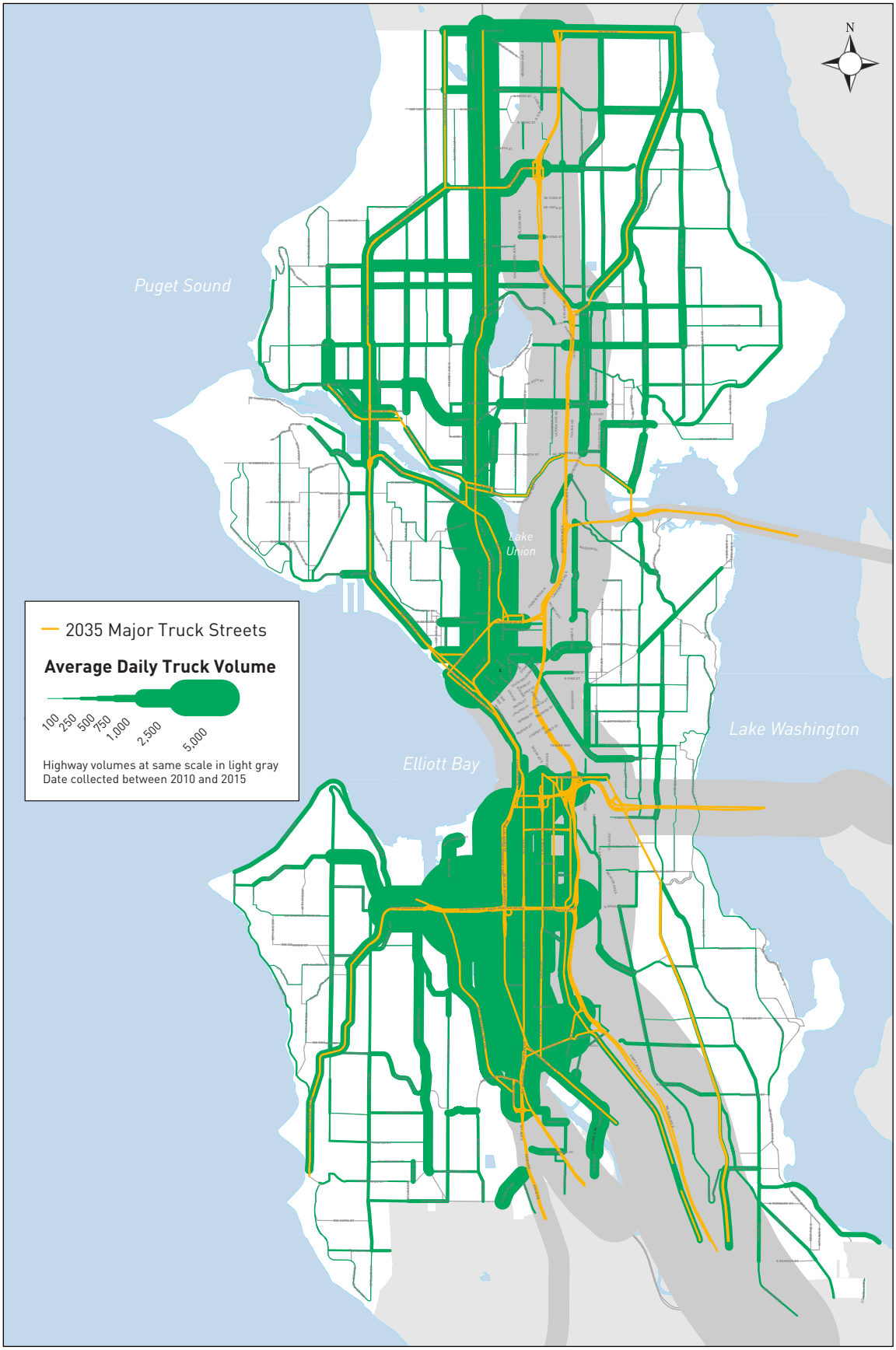
[27]WSP | Parsons Brinckerhoff. December 2014. The Role of Freight in Seattle's Economy.
[28]FHWA. 2015. Freight Management and Operations, Freight Analysis Framework. http://ops.fhwa.dot.gov/FREIGHT/freight_analysis/faf/index.htm.
[29]FHWA Freight Analysis Framework data.
[30]Washington State Freight Advisory Committee. May 2014. Washington State Freight Trends & Policy Recommendations or Air Cargo, Freight Rail, Ports & Inland Waterways, & Trucking. www.fmsib.wa.gov/fac/20140602-FINALComplete%20Folio_for%20printer5-7-14.pdf.
[31]FHWA Freight Analysis Framework data and WSP | Parsons Brinckerhoff analysis. December 2014. The Role of Freight in Seattle's Economy.

FIGURE 2-15: 2035 AVERAGE DAILY TRUCK VOLUMES ON SEATTLE'S ROADWAY NETWORK



to rail. However, while the share of total freight imports and exports that is handled by rail will decrease, rail is still projected to carry more than double the amount of freight in absolute volume by 2040 than it carries today.

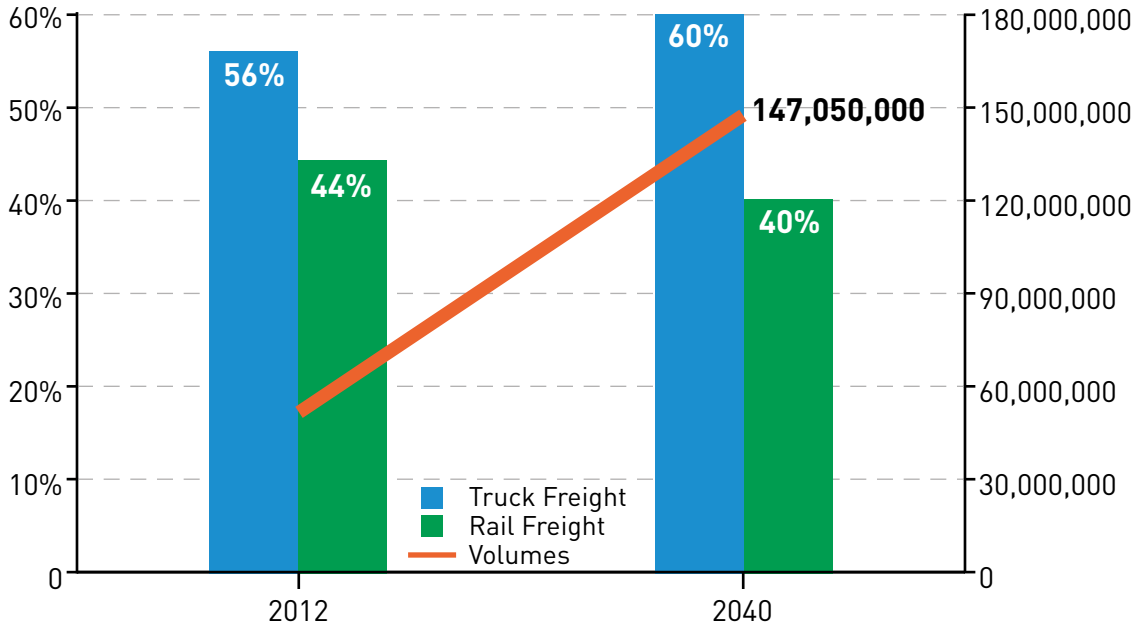
With freight rail use increasing, at-grade rail crossings will be closed more and more frequently. In January 2016, we observed between 65 and 85 freight and passenger rail movements each week day on the BNSF mainline at-grade rail crossings in the South Downtown (SODO) neighborhood.[32] Based on expected growth in rail freight, one can easily assume that this number could double by 2040.

CONCLUSION

Seattle's expected population and employment growth and the associated demand for freight and goods movements will put additional stress on our transportation system and the relevance of sustaining freight mobility. With the substantial growth in truck volumes projected in the coming years, traffic congestion experienced today during the peak periods will worsen and spread into other times of day. With a vast truck freight network (including intermodal facilities) within the city limits, the City has the ability to enhance the local and regional network performance with targeted investments in the truck freight system.

Global climate change is also a real threat to the city's transportation system. The ability of the freight industry to respond and adjust to environmental changes will be critical to economic stability. Further, the continued innovation within the transportation industry toward more sustainable technologies and less reliance upon fossil fuels will help Seattle reduce its overall impact on the environment.

FIGURE 2-16: FREIGHT VOLUMES ASSOCIATED WITH INTERNATIONAL TRADE, 2012 AND 2040



Source: FHWA Freight Analysis Framework data and WSP | Parsons Brinckerhoff analysis. December 2014. The Role of Freight in Seattle's Economy.

[32]SDOT Lander St Video. January 2016. www.youtube.com/watch?v=ccYP2m7AZ1Y

CHAPTER 3: POLICY FRAMEWORK

IN THIS CHAPTER:

The Freight Master Plan (FMP) exists on a foundation of local, state, and federal policies relating to freight mobility and industrial lands.

FREIGHT MASTER PLAN VISION AND GOALS

The FMP is organized around an overall vision statement and 6 goals. The goals help describe what the plan is trying to achieve and shape its development. The vision and goals are informed by a broader policy framework of city, state, and federal transportation plans, primarily the Comprehensive Plan – the City's blueprint for how growth will be accommodated over the next 20 years.

Vision

The vision for the plan expresses the desired end state, or result, of implementing this plan. The vision of the FMP is:

"A vibrant city and thriving economy connecting people and products within Seattle and to regional and international markets."

Efficient and reliable goods movement is essential to maintain the city's economic health and vibrancy. The vision statement makes it clear that the FMP is focused on supporting Seattle's industrial areas (and their important family-wage jobs), and ensuring Seattle is well connected to other freight networks in the region, state, and international markets. Seattle's industrial areas are an important part of its history and economy, and a reason why the city is a hub for the state and national economies. The vision also highlights the importance of supporting a vibrant city by ensuring goods can reach retail outlets, commercial centers and home deliveries.

Goals

The vision statement is supported by six main goals that address:

- Economy
- Safety
- Mobility
- State of Good Repair
- Equity
- Environment

The goals articulate what the plan seeks to achieve over time in order to meet the vision, and also set the basis for the plan's strategies, actions, performance measures, and prioritization framework, which are outlined in Chapters 5 and 6.

Economy – Provide a freight network that supports a thriving and diverse economy for Seattle and the region.

Like the city's other modal master plans, the FMP is largely about supporting the city's land use and growth strategy. The freight network developed in this plan is focused on providing connections to and within Seattle's 2 manufacturing/industrial centers, its urban villages, and the regional freight network. By improving and maintaining an efficient freight network, Seattle can keep its competitive place in the regional and world economies for freight- related jobs.

Safety – Improve safety and the predictable movement of goods and people.

Safety is SDOT's highest priority, and promoting a safer city is one of the department's core values. While trucks represent a minority of vehicles on the road, their size requires thoughtful attention to the way the city's roads are designed and managed. Trucks also need to share space in the public right-of-way with general purpose traffic, transit, and people walking and riding bicycles, so the FMP identifies design guidelines and considerations for freight movement that will help trucks travel safely and predictably with other users of the roadway.

Mobility – Reliably connect manufacturing/ industrial centers and business districts within the Seattle, regional, and international freight networks

It is important to have a defined freight network that provides good connections from the regional transportation system to the city's 2 manufacturing/industrial centers, convenient access to the industrial areas, and connections to business districts and commercial centers.

State of Good Repair - Maintain and improve the freight transportation network to ensure safe and efficient operations.

Since trucks are heavy vehicles operating on city streets, maintaining and improving the condition of those streets is fundamentally important to ensure reliable freight movement. This is particularly true of streets on the identified freight network. Keeping freight routes well maintained is also a focus of federal legislation, and is a policy priority in the State's freight plan.

Equity – Benefit residents and businesses of Seattle through equity in freight investments and improve the health of communities impacted by goods movement.

We know that the movement of goods and services provide many benefits to our community. Employment linked to the city's industrial areas and Port provides family-wage jobs in the region. However, we also know that our most highly impacted communities – situated near our most trafficked roadways – are more likely to be populated by those who are of color, foreign born, more linguistically isolated, and/or who live in lower-income households. Across the nation, race is the most significant predictor of a person living near contaminated air, soil, or water. As we continue to develop and enhance the freight network, it is important to ensure that we are not exacerbating this issue.

We can help mitigate and improve air quality, water quality, and, potential noise impacts on communities near key freight corridors by providing additional green infrastructure (like trees and vegetation) when constructing projects, and updating truck fleets with new technologies or vehicle types to be more efficient. A more detailed list of strategies and actions to address equity can be found in Chapter 5.

Environment – Improve freight operations in Seattle and the region by making goods movement more efficient and reducing its environmental footprint.

Seattle has a long history of environmental stewardship and, through the 2013 Climate Action Plan, the City is committed to reach zero net greenhouse gas emissions (GHE) by 2050. As outlined in this plan, we can take actions to ensure better operations along key freight corridors and improve street conditions to reduce water and air quality impacts. In 2016, Seattle released an Equity & Environment Agenda to call on the entire community to advance equity in our environmental work across the city. Freight operators can also help Seattle reach these goals by continuing to modernize freight fleets, exploring alternative freight vehicles (e.g., bicycles and electric vehicles), and reducing engine idling. The City can mitigate impacts on communities through investments that support freight mobility, community health, and our environment.

PLANNING CONTEXT

The FMP is part of a broader set of policy documents that discuss freight mobility. This section of the plan summarizes several of these policy documents and outlines how the plan is consistent with the broader themes in them.

Federal and State Freight Planning

Freight planning has received heightened focus at the federal and state levels in recent years. This is great news, as it provides a wealth of information and a strong foundation on which to base the City's first FMP. The federal and state efforts are highlighted below.

The FAST Act and the National Freight Strategic Plan

The 2015 federal surface transportation reauthorization legislation, the Fixing America's Surface Transportation (FAST) Act, includes freight planning and project delivery provisions. It establishes for the first time a national highway freight program with funding dedicated to a new National Highway Freight Network (NHFN).

Among the goals of the freight program are to:[1]

- Invest in infrastructure and operational improvements to strengthen economic competitiveness; reduce congestion and bottlenecks; reduce the cost of freight transportation and improve its year-round reliability; and increase productivity, especially for domestic industries that create high-value jobs
- Improve the safety, security, efficiency, and resiliency of freight transportation in urban and rural areas
- Improve the efficiency and productivity of the NHFN, its state of good repair, and its use of innovation and advanced technology for safety, efficiency, and reliability
- Reduce the environmental impacts of freight movements on the NHFN

Dedicated freight funding (described further in Chapter 6) may be used mainly on the NHFN, with up to 10% available for freight rail and ports. In the state of Washington, the NHFN has three components:

- A Primary Freight System totaling 817 centerline miles of existing roadways, consisting chiefly of interstate highways and intermodal connectors
- Critical Urban Freight Corridors to be defined by the State and regional metropolitan planning organizations (MPOs) up to a maximum of 82 miles
- Critical Rural Freight Corridors to be defined by the State up to a maximum of 163 miles

The FAST Act encourages development of State Freight Advisory committees and requires the creation of State Freight Plans to improve coordination of freight transportation planning. Washington State updated its freight mobility plan in 2014. The FAST Act also establishes a National Multimodal Freight Network (NMFN, including the NHFN, rail lines, and major sea and air ports) and mandates that the U.S. Department of Transportation (USDOT) produce a National Freight Strategic Plan (NFSP).

The NFSP must:

- Assess the condition and performance of the NMFN, forecast future demands, and identify bottlenecks
- Identify major corridors and trade gateways, encompassing access to manufacturing, agriculture, energy, and other natural resources
- Encourage multijurisdictional collaboration
- Assess physical, institutional, and financial barriers to improvement
- Define strategies for intermodal freight connectivity
- Specify best practices for enhancing the system

Washington State Freight Mobility Plan

The Washington State Department of Transportation (WSDOT) has led development of the State Freight Mobility Plan to ensure that the transportation system in Washington state supports and enhances trade and sustainable economic growth. As one of the most trade-dependent states in the nation, Washington relies on an efficient freight transportation network.

The Washington State Freight Plan was completed in 2014 and the plan's three objectives are to:

- Develop an urban goods movement system that supports jobs, the economy, and clean air for all, and provides goods delivery to residents and businesses

[1]Fixing America's Surface Transportation Act. Page 92. December 2015 www.congress.gov/114/bills/hr22/BILLS-114hr22enr.pdf

- Maintain Washington's competitive position as a Global Gateway with a robust freight system able to serve the multimodal needs of trade and international and interstate commerce, as well as state and national export initiatives
- Support rural economies' farm-to-market, manufacturing, and resource industry sectors

Local Planning

A number of local planning efforts also contribute to the development of the FMP. The most noteworthy is Seattle's Comprehensive Plan. In addition, other city plans, policies, and design manuals influenced the development of the FMP, and in turn may be influenced by the FMP in their future updates. These include:

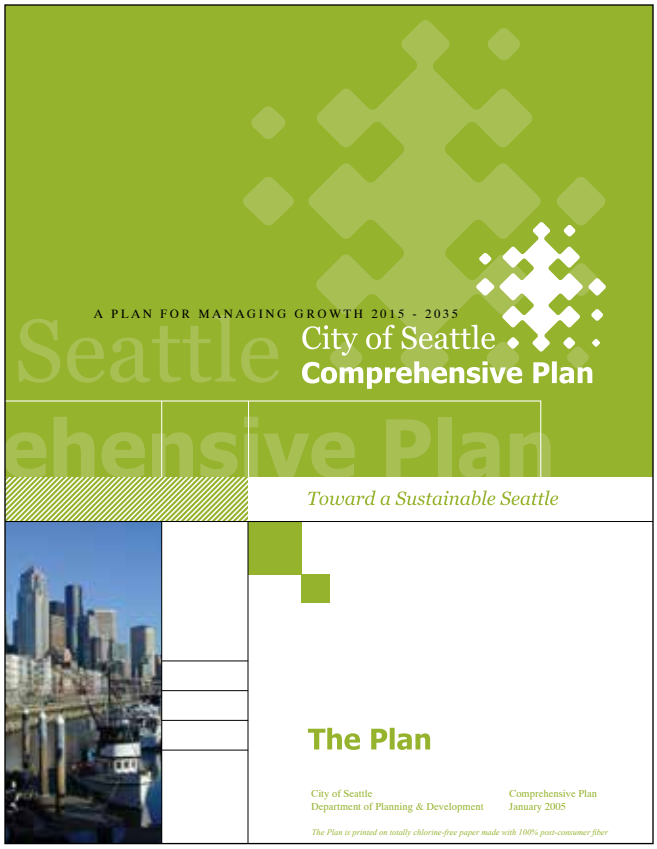
- Comprehensive Plan
- Move Seattle 10-year strategic vision
- Modal master plans for transit, pedestrians, and bicycles
- Complete Streets policy
- Climate Action Plan
- Industrial Areas Freight Access Project
- Right-of-Way Improvements Manual

Seattle's Comprehensive Plan

Seattle's Comprehensive plan governs land use and transportation policy issues. The 2015 Comprehensive Plan, *Toward a Sustainable Seattle*, is in the process of being updated, with *Seattle 2035* anticipated to be adopted in 2016. The Comprehensive Plan is organized around a set of 4 core values:

- Community
- Environmental Stewardship
- Economic Opportunity and Security
- Race and Social Equity

The Comprehensive Plan's primary strategy for accommodating future growth in Seattle is to concentrate growth in centers, including the City's 2 Manufacturing/Industrial Centers.



Additionally, Seattle's Comprehensive Plan contains several elements, or chapters, with goals and policies that speak to the importance of industrial lands and the importance of industrial businesses to the city's overall economy. These elements include:

- Growth Strategy (Urban Village) Element
- Land Use Element
- Container Port Element
- Transportation Element

Many of the goals in the FMP are consistent with the broader core values of the Comprehensive Plan (environment, economic opportunity, and equity). While the FMP primarily deals with transportation issues around freight mobility, it is consistent with and supports the City's overall growth strategy, which includes promoting and protecting industrial lands.

The following sections highlight policies relevant to the FMP from *Toward a Sustainable Seattle*. Relevant policies from the update, *Seattle 2035*, are included in Appendix H.

Urban Village Element

The plan's Urban Village Element has several goals and policies that summarize the importance of Seattle's industrial lands:

UVG19 Ensure that adequate accessible industrial land remains available to promote a diversified employment base and sustain Seattle's contribution to regional high-wage job growth.

UVG21 Encourage economic activity and development in Seattle's industrial areas by supporting the retention and expansion of existing industrial businesses and by providing opportunities for the creation of new businesses consistent with the character of industrial areas.

UV20 Designate the following locations as manufacturing/industrial centers:

1. The Ballard Interbay Northend Manufacturing/Industrial Center
2. The Duwamish Manufacturing/ Industrial Center

UV21 Promote manufacturing and industrial employment growth, including manufacturing uses, advanced technology industries, and a wide range of industrial related commercial functions, such as warehouse and distribution activities, in manufacturing/industrial centers.

Land Use Element

One of the primary purposes of the manufacturing/industrial center designation (both in Seattle's Comprehensive Plan and the regional Vision 2040 plan) is to promote the retention and growth of industrial and warehouse land uses. The FMP is largely focused on ensuring that there is a connected, resilient freight network that can support these policies. The City's overall policies on industrial lands are contained in several policies in the Comprehensive Plan Land Use Element:

LUG22 Provide opportunities for industrial activity to thrive in Seattle.

LUG24 Preserve industrial land for industrial uses and protect viable marine and rail related industries from competing with non-industrial uses for scarce industrial land. Give special attention to preserving industrial land adjacent to rail and water dependent transportation facilities.

LUG25 Promote high-value-added economic development by supporting growth in the industrial and manufacturing employment base.

Container Port Element

The Comprehensive Plan also has a Container Port Element, which recognizes the importance of the Port of Seattle as a vital economic development entity and cargo gateway. The Container Port Element contains several goals and policies that support retention of this function, including:

> **CP**6 Monitor, maintain, and improve key freight corridors, networks, and intermodal connections that provide access to cargo container facilities and the industrial areas around them to address bottlenecks and other access constraints. Provide safe, reliable, efficient, and direct access between Port marine facilities and the state highway or interstate system, and between Port terminals and railroad intermodal facilities, recognizing that Port operations must address other transportation needs, such as pedestrian safety.
>
> **CP**8 Maintain the City's classification of "Major Truck Streets." Because freight is important to the basic economy of the City and has unique right-of-way needs to support that role, freight will be a major priority on streets classified as Major Truck Streets. Street improvements that are consistent with freight mobility but also support other modes may be considered on these streets.

Transportation Element

As required by the Growth Management Act, Seattle's Comprehensive Plan contains a Transportation Element. The Transportation Element is intended to be consistent with, and help implement, the land use vision for the City (articulated in the plan's Urban Village and Land Use Elements).

The Transportation Element of the Comprehensive Plan is written at a fairly high level, and is intended to help frame more specific goals, policies, and strategies in other documents, including all of the city's modal plans (Bicycle Master Plan, Pedestrian Master Plan, Transit Master Plan, and now the FMP).

In the Transportation Element of the Comprehensive Plan, there are several goals and policies that relate to freight mobility (several of which may be revised in the planned Comprehensive Plan update). These goals and policies include:

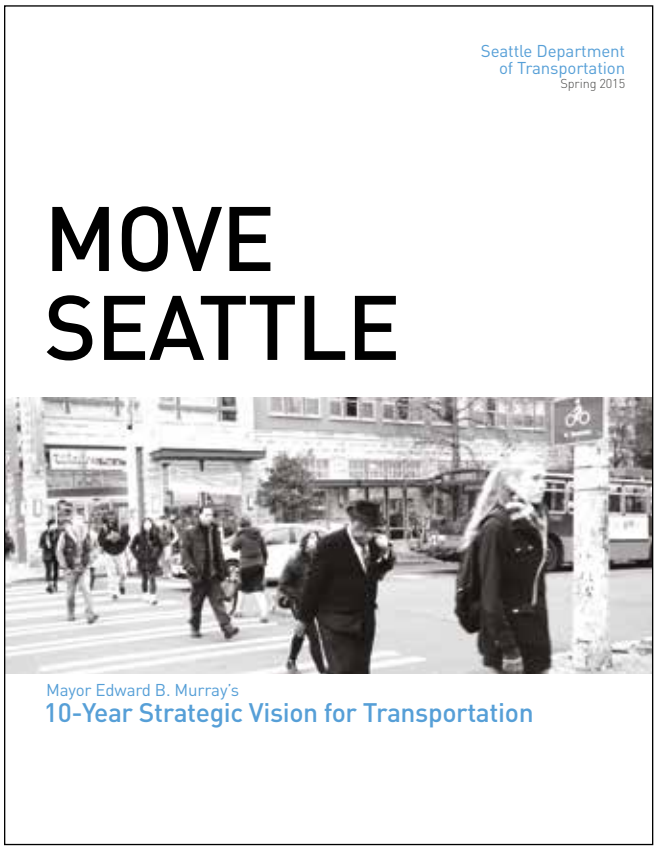
> **T**10 Designate, in a freight master plan, a truck street classification network to accommodate trucks and to preserve and improve commercial transportation mobility and access.
>
> **T**G18 Preserve and improve mobility and access for the transport of goods and services.
>
> **T**G19 Maintain Seattle as the hub for regional goods movement and as a gateway to national and international suppliers and markets.
>
> **T**48 Recognize the importance of the freight network to the city's economic health when making decisions that affect Major Truck streets as well as other parts of the region's roadway system. Complete Street improvements supporting freight mobility along with other modes of travel may be considered on Major Truck Streets.
>
> **T**51 Consider the needs for local delivery and collection of goods at businesses by truck when making street operational decisions and when developing and implementing projects and programs for highways, streets and bridges.

The vision and goals of the FMP are very consistent with and help add specificity to these Comprehensive Plan goals and policies. The policies make reference to "Major Truck Streets," which is a freight designation that was developed many years ago. This FMP has a new, more comprehensive freight network discussed in Chapter 4 with a number of freight designations, and it preserves the use of the "Major Truck Streets" designation.

Move Seattle Strategic Plan

In 2014, the City produced Move Seattle: Mayor Murray's 10-Year Strategic Vision for Transportation. The document summarized SDOT's (and the City's) core values for the transportation system, which are:

- A Safe City: Our goal is to eliminate serious and fatal crashes in Seattle
- An Interconnected City: Our goal is to provide an easy-to-use, reliable transportation system that gives you the options you want when you need them
- A Vibrant City: Our goal is to use Seattle's streets and sidewalks to improve the city's health, prosperity, and happiness
- An Affordable City: Our goal is to give people high-quality and low-cost transportation options that allow them to spend money on things other than transportation
- An Innovative City: Our goal is to understand and plan for the changes of tomorrow, while delivering great service today



The goals in the FMP align with these Move Seattle core values. One Move Seattle section in particular, the Vibrant City section, lists a number of actions to improve mobility for freight and delivery vehicles. These actions include completing the FMP, making spot improvements for trucks, implementing pilot freight-only lanes in the Duwamish MIC, and collecting better data about truck volumes on Seattle's streets.

In addition to laying out specific actions, Move Seattle also includes a 10-year capital project priority list for multimodal improvements around the city. Several of these projects would improve the movement of goods, including:

- East Marginal Way Corridor Improvements
- South Lander Street Grade Separation/ Railroad Crossing
- 1st Avenue South Corridor Improvements
- Delridge Avenue SW Corridor Improvements

Move Seattle also emphasizes the need for all of the modal master plans to be considered together, in an integrated fashion, to ensure that Seattle has a fully interconnected transportation system to move people and goods.

Modal Master Plans

In addition to the FMP, the City has 3 other citywide modal master plans: the Transit Master Plan, the Bicycle Master Plan, and the Pedestrian Master Plan. Each of these plans is somewhat similar in that they identify policies, projects, programs, performance measures, and priorities to advance their respective modes of transportation.

Many of the modal plans identify needs on the same streets and corridors. When implementing projects identified in one modal master plan, SDOT staff need to consult all other master plans to understand the demands on specific streets and corridors. At times, they must try to reconcile different needs identified in the respective master plans. This is one reason for the importance of the new right-of-way allocation policy developed

as part of the Comprehensive Plan update anticipated in 2016.

SDOT not only develops modal master plans, but has dedicated funding to implement these plans. In the recent Move Seattle levy, there is $1.5 million annually allocated for freight spot improvements. The FMP will provide guidance for how this funding is allocated.

Right-of-Way Allocation Policies

As part of the anticipated 2016 major update of the Comprehensive Plan, there are a series of new policies relating to right-of-way allocation and how decisions are made with regard to using street space. The policies establish 6 essential functions of the street right-of-way:

- Mobility (moving people and goods)
- Access for people (e.g., bus stops and short-term passenger vehicle parking)
- Access for commerce (e.g., loading spaces for trucks)
- Activation (e.g., parklets)
- Greening (street trees, green stormwater infrastructure, etc.)
- Storage (longer-term storage of vehicles)

The policies state that, in making right-of-way decisions, SDOT should accommodate as many of these functions as possible and look to the modal master plans to identify modal needs on individual streets and corridors. This is one reason why having a comprehensive, connected freight network designated in the FMP is so important.

Complete Streets Ordinance

The Seattle City Council adopted a Complete Streets ordinance in 2007. The ordinance articulates the City's commitment to:

- Plan for, design, and construct all new City transportation improvement projects to provide appropriate accommodation for pedestrians, bicyclists, transit riders, and persons of all abilities, while promoting the safe operation for all users

The Complete Streets ordinance defines the Major Truck Street network within Ordinance 122386 Section 3:

"Because freight is important to the basic economy of the City and has unique right-of-way needs to support that role, freight will be the major priority on streets classified as Major Truck Streets. Complete Street improvements that are consistent with freight mobility but also support other modes may be considered on these streets."

The City's Complete Streets ordinance recognizes the unique demands of Major Truck Streets in moving freight. SDOT implements the Complete Streets policy through an assessment tool (a checklist) that evaluates projects against the policy. The Complete Streets assessment helps identify improvements that can be incorporated into the project to balance the needs of all users. As the FMP replaces the Major Truck Street network with an expanded freight network, the Complete Streets checklist will be revised as needed to reflect the updated network and reference any applicable design guidelines in the updated Right-of-Way Improvements Manual.

Climate Action Plan

In 2013, the City Council adopted a major update to the City's Climate Action Plan (CAP). The updated CAP was developed to help implement the Council's goals (as established in Resolution 31312) of being "climate neutral" (producing zero net greenhouse gas emissions) by 2050. The CAP articulates a comprehensive strategy for reaching this goal over time, and contains a number of actions for both the near term (2015) and longer term (2030).

As noted in the CAP, approximately 40% of all greenhouse gas emissions in Seattle are generated by the road transportation sector. The 2012 Seattle Community Greenhouse Gas Emissions Inventory (published April 2014) states that, in 2012, road transportation (especially passenger travel) accounted for the largest share (64%) of Seattle's core emissions – those emissions that the city has the greatest opportunity to control. Of that percentage, freight contributes 19% and passengers contribute 45%. The interesting trend is that, while Seattle's population has grown 23% from 1990 to 2012 and jobs have increased 14% over that same time period, core greenhouse gas emissions have actually declined by 4%. Emissions have also decreased on a per person basis.[2]

The CAP included a near-term (2015) action to:

- Develop an FMP that includes goals to make freight movement more efficient and reduce its impact on greenhouse gas emissions

In addition to near-term actions, the Climate Action Plan includes two longer-term (2030) actions that relate to freight mobility. These are:

- Support programs that help heavy duty truck owners and operators transition to more efficient vehicles and cleaner fuels
- Continue efforts to preserve Seattle's industrial lands, which provide local jobs and have efficient access to a deep water port, rail lines, and highways

Based on this direction, the FMP includes analysis of sustainable freight practices for incorporation into the plan. Improving the environment is also one of the six main goals of the FMP.

Industrial Areas Freight Access Project

The Seattle Industrial Areas Freight Access Project (FAP) was a targeted look at Seattle's 2 MICs – the Greater Duwamish and the Ballard/ Interbay Northend. The FAP was developed jointly by SDOT and the Port of Seattle and was completed in 2015. The project focused on the

[2]City of Seattle. 2012 Seattle Community Greenhouse Gas Emissions Inventory. April 2014. www.seattle.gov/Documents/Departments/OSE/2012%20GHG%20inventory%20report_final.pdf

connections within and between the MICs, as well as to the regional and state transportation networks. It identified truck -freight transportation infrastructure investments needed over the next 20 years to keep Seattle's industrial lands vibrant and productive.

Projects identified in the FAP have been incorporated into the FMP. The FAP also served as a building block for the key policy, programmatic, and technical issues examined in the FMP.

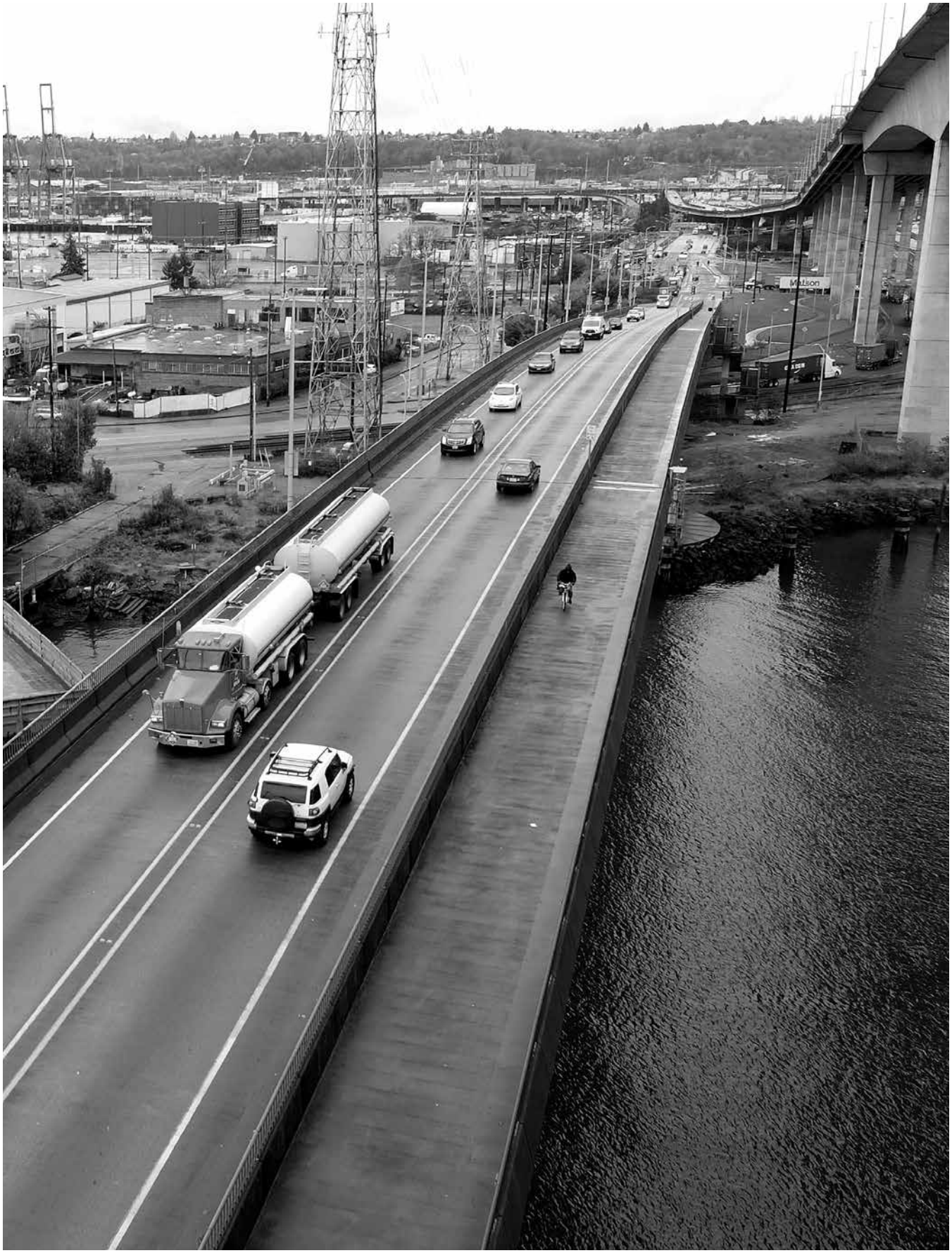
Right-of-Way improvements Manual

The Right-of-Way Improvements Manual (ROWIM) is an online resource developed by the City of Seattle to help property owners, developers, architects, landscape architects, and engineers involved with the design, permitting, and construction of improvements to Seattle's street right-of-way. It serves as a link between high-level city transportation goals and policies in the Comprehensive Plan and specific design standards articulated in the city's Standard Specifications for Road, Bridge, and Municipal Construction. This latter document ensures consistent construction methods, materials, and final products.

The ROWIM considers and attempts to balance the access and mobility needs of all users of the street right-of-way: pedestrians, non-motorized vehicles, automobiles, transit, and freight. Procedures and design criteria consider the critical balance among safety, preservation and maintenance of roadway infrastructure and utility services, and preservation of our environment.

Knowing that all projects have site-specific opportunities and constraints, the ROWIM articulates the City's design standards and guidance for street right-of-way improvements and describes a deviation process to achieve flexibility when practical.

The ROWIM is updated, as necessary, to reflect the City's growth and vision for the future. The 2016 update will contain specific information on turning radii, lane widths, and other design elements that will be used when designing projects, including freight projects.


Madison

CHAPTER 4: SEATTLE'S FREIGHT NETWORK

IN THIS CHAPTER:

A defined freight network helps guide roadway design, operations and maintenance, and it can direct freight improvements and investments.

Freight transportation facilities provide access for local, regional, national, and international distributers, wholesalers, manufacturers, and retailers to get their goods to and from markets. A reliable freight network is vital to:

- Serve the public by safely and dependably delivering goods
- Inspire confidence in existing business and industry sectors
- Encourage diverse businesses to locate in Seattle
- Generate additional jobs, businesses, and tax revenue

Designating a freight network helps guide freight-related traffic management, roadway design, and maintenance requirements; direct freight improvements and investments; and ensure freight projects can compete effectively for project development and construction funding. A street designated as part of the freight network will need to accommodate goods movement, but not necessarily see a change in its overall function, design, or character.

If an essential freight corridor is not formally designated as such, then it is difficult to identify the freight function of the roadway, or prioritize the type of infrastructure investments needed to safely accommodate the movement of goods now and into the future.

This chapter describes the process used to develop a more comprehensive freight network, which is critical to Seattle's economy, business environment, and the public as a whole.

FREIGHT CORRIDORS

While trucks are allowed on all arterial streets, many of Seattle's freight corridors have had formalized designations. The Major Truck Street (MTS) network was officially adopted via the 2005 Transportation Strategic Plan (TSP).[1] The MTS network focused on critical connections for freight movement through the city and to/from major freight traffic generators, including Port of Seattle (Port) terminals, inter-modal rail facilities, and the regional freeway network.[2]

In addition to the designated MTS network, the 2005 TSP also highlighted routes that acted as either seaport highway connectors or seaport intermodal connectors.[3] While not officially designated, these routes are on arterial streets, have a high frequency of use by freight, provide two-way travel and direct access between Port facilities, and provide road access to marine facilities and the regional interstate system. The seaport highway connectors, shown in Figure 4-1, are routes that provide safe, reliable, efficient, and direct access between a Port marine facility and the state highway or interstate system. Seaport intermodal connectors, shown in Figure 4-2, are routes that provide safe, reliable, efficient, and direct access between a Port terminal and a railroad intermodal facility located in Seattle or other area in King County.

WSDOT has also designated freight networks, which include the Freight and Goods Transportation System (FGTS), Washington State Freight Economic Corridors, and Critical Urban Freight Corridors (CUFC).

The classification of roadways under the FGTS system is based on the annual gross freight

[1]SDOT. Transportation Strategic Plan (TSP). Adopted October 21, 2005. www.seattle.gov/transportation/tsp_2005.htm.
[2]SDOT. June 27, 2005.Freight Mobility Strategic Action Plan (FMSAP). Page 10.
[3]SDOT. TSP. Adopted October 21, 2005. Page 33, 39.

FIGURE 4-1: SEAPORT HIGHWAY CONNECTORS

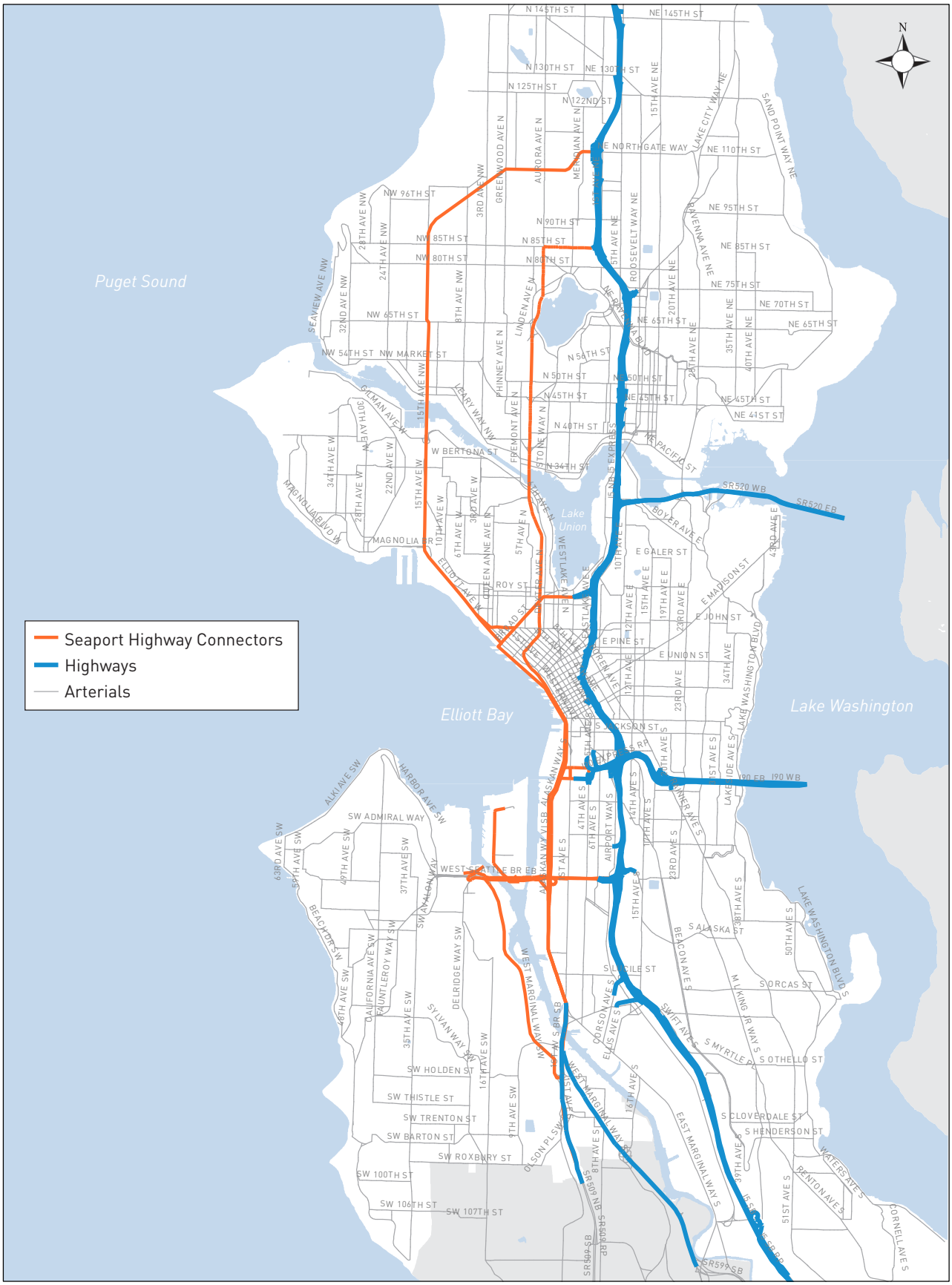
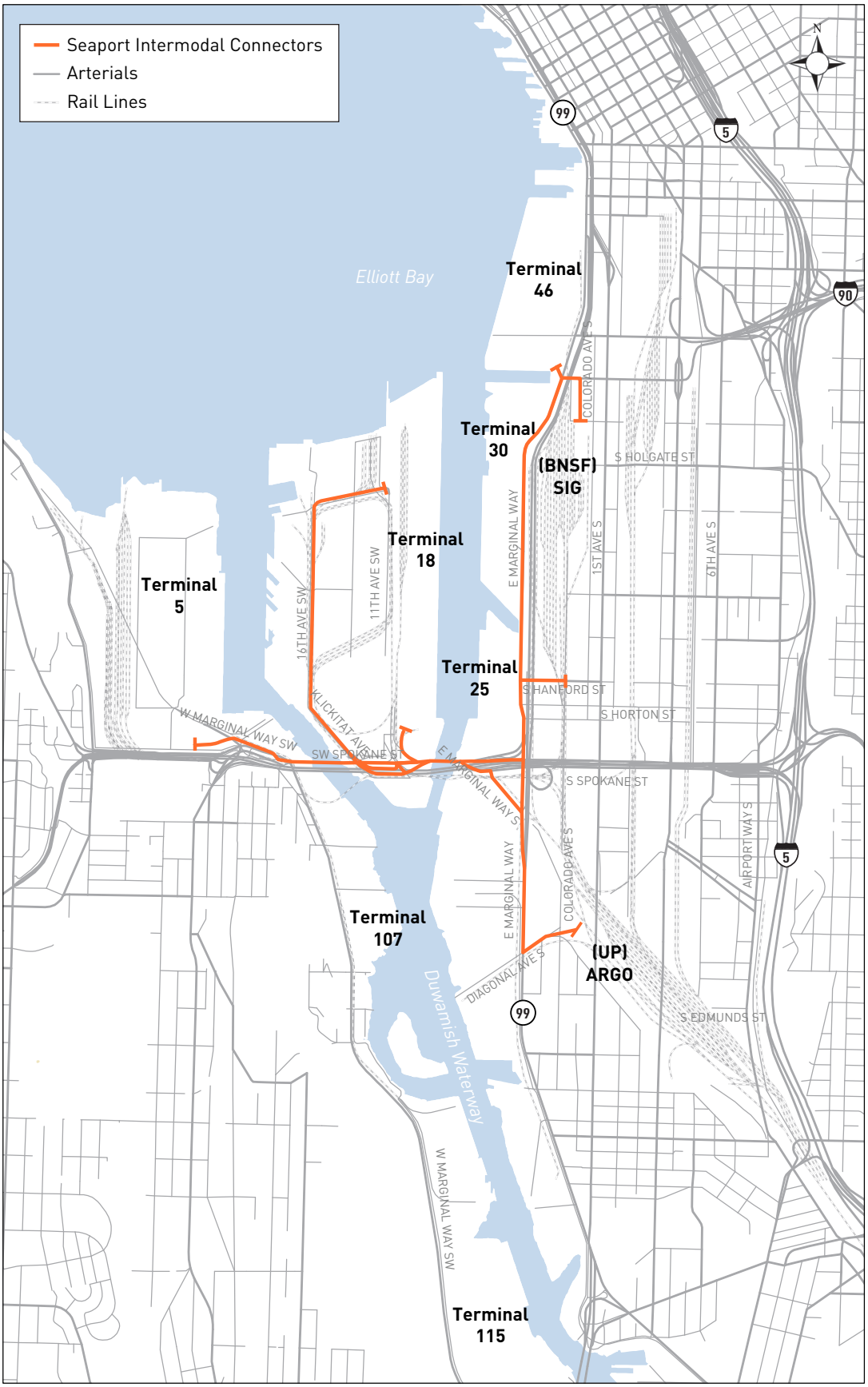


FIGURE 4-2: SEAPORT INTERMODAL CONNECTORS



tonnage they carry. WSDOT regularly updates the FGTS network in Seattle and the State with counts provided by SDOT and other jurisdictions.

Freight Economic Corridors are roadways, railways, and waterways important for the movement of commerce in Washington State. They are based on the FGTS classifications and, in the case of roadways, the corridor designations recognize the importance of system resiliency. The corridors are used by WSDOT to identify and map supply chains, identify system condition and capacity issues, and to develop performance measures to improve freight mobility.

The CUFC is a network developed by the state and our regional metropolitan planning agency to direct federal resources using the following criteria:

- High truck tonnage
- Close connectivity to the National Highway Freight Network, major freight intermodal facilities, and large industrial/warehouse centers

Although many of the segments in these state networks overlap with the city's freight network, the networks are not identical. This is because each network is developed for a specific purpose using relevant criteria. For the city network we considered local access needs.

The City also has 2 regulatory networks related to freight – the Heavy Haul network (HHN) and the over-legal routes. Both systems are mapped and described in detail in Chapter 2.

Most of the HHN and the majority of over-legal routes overlap with the freight network. Those segments that aren't on the network did not meet the criteria outlined in this chapter. However, they still play an important role in moving loads via permit throughout the city. While the over-legal routes are mapped, flexibility is required to choose appropriate routes depending on vehicle dimensions and local conditions.

DEVELOPING A COMPREHENSIVE FREIGHT NETWORK

Due to Seattle's rapid population growth and changing economy, there are differences between where and how goods currently move throughout the city, and the 2005 MTS network. Analysis conducted for the FMP identified several streets outside of the MTS network that have high truck volumes, as well as other segments in the 2005 MTS network where truck volumes are lower. Additionally, the MTS network designation does not recognize local freight movements to and from commercial centers, or provide alternate routes in some cases.

With logistics trends moving to smaller and more disbursed warehouse and distribution centers, as well as smaller and more efficient delivery vehicles, a multifaceted freight network with multiple designations was determined to better meet the city's freight mobility needs.

Based on freight planning best practices, and input from stakeholders and regional and national experts, the following 4 designations for Seattle's freight network were developed:

- **Limited Access Facility** – Limited access facilities support through movements and/or long-distance trips. These facilities include interstate and state highways, such as Interstate 5 (I-5) and State Route 99 (SR 99).
- **Major Truck Street** – This designation is now one of several elements in the overall freight network. As defined previously, a major truck street is an arterial street serving connections to the regional network, between and through industrial land uses (manufacturing/industrial centers and intermodal terminals), commercial districts, and urban centers.
- **Minor Truck Street** – Minor truck streets make connections for goods delivery to urban villages and neighborhood commercial districts. They also provide secondary connections to the major truck street network, thereby creating system redundancy and resiliency.

- **First/Last Mile Connector** – These are defined as locations where short truck movements are required for access to/from key freight activity centers, such as Port facilities and intermodal terminals. These connections are all within the designated manufacturing/ industrial centers (MICs).

As noted earlier, designating a street as part of the freight network will not necessarily change its overall function, design, or character. Rather, the designation underscores the importance of ensuring that goods movement can be accommodated on that street in a safe manner. Figure 4-3 shows the 4 network designations and the criteria for each.

IDENTIFYING THE FREIGHT NETWORK

A series of network analyses and reviews were conducted to assign the 4 facility types to roadways. The following steps were used in the process:

- Evaluate current and future truck volumes
- Establish land use connections
- Provide connectivity within the network
- Review roadway classifications
- Assess resiliency of the network
- Incorporate public input
- Consider other modal priorities

Evaluate truck volumes

The daily volume and type of trucks on any given roadway is a good indicator of the role that street plays in the freight distribution system. Truck volumes were collected throughout Seattle and projected to volumes for year 2035.[4] A minimum weekday level of truck volumes appropriate with each of the 4 truck network designations was developed, as shown in Table 4-1. The thresholds

FIGURE 4-3: SEATTLE'S FREIGHT NETWORK DESIGNATIONS AND CRITERIA

LIMITED ACCESS

Purpose: Long distance trips

Land use: Connections between the city and the rest of the region

Roadway classification: Highway

Truck volumes: All

MAJOR TRUCK STREET

Purpose: Through trips

Land use: Connections to MICs, intermodal facilities, Urban Centers, and the regional system

Roadway classification: Minor arterial or higher

Truck volumes: 500+ trucks per day

MINOR TRUCK STREET

Purpose: To/from trips

Land use: Connections to and from urban villages and commercial districts; provides secondary through routes for network resiliency

Roadway classification: Collector arterial or higher

Truck volumes: 500+ trucks per day

FIRST/LAST MILE CONNECTORS

Purpose: Industrial trips

Land use: Connections within the Manufacturing and Industrial Centers (MICs)

Roadway classification: Minor arterial or lower, including non-arterial streets

Truck volumes: 250+ trucks per day

[4]The data from these analyses are detailed in Chapter 2, which includes sections on existing truck freight trends and future freight flows and anticipated trends.

are based on freight planning practices and reflect Seattle's truck volume conditions.[5]

Both the major truck street and minor truck street designations have the same minimum threshold for truck volumes. These designations were differentiated by using the other criteria in the process.

While the minimum threshold for first/last mile connectors is 250 trucks, these segments often see the highest truck volumes in the city.

TABLE 4-1: FREIGHT NETWORK MINIMUM DAILY TRUCK VOLUMES

Freight Network Designation	Truck Volume
Limited Access Facility	All volumes
Major Truck Street	500+ trucks per day
Minor Truck Street	500+ trucks per day
First/Last Mile Connectors	250+ trucks per day

Establish land use connections

An important consideration in differentiating the various types of truck street designations is how a roadway provides access to surrounding land uses. Table 4-2. Freight Network Land Use Connection describes the considerations given to roadways based on the types of land uses they serve by providing connections to businesses in the MICs and throughout Seattle.

Provide connectivity within the network

Our freight street system serves many purposes, from long-distance freight trips traveling through the city to local deliveries going to/from neighborhood commercial districts. Freight relies on both through and local access. Each freight network designation was identified by the primary nature of trips they are intended to serve, as shown in Table 4-3. Freight Network Functional Purpose Designation.

TABLE 4-3: FREIGHT NETWORK FUNCTIONAL PURPOSE DESIGNATION

Freight Network Designation	Functional Purpose
Limited Access Facility	Long-distance trips
Major Truck Street	Through trips
Minor Truck Street	To/from trips
First/Last Mile Connectors	Short trips to/from key industrial locations

TABLE 4-2: FREIGHT NETWORK LAND USE CONNECTION

Freight Network Designation	Supports Freight-Generating Land Uses
Limited Access Facility	All types of freight through the region and to/from manufacturing/industrial centers and urban centers
Major Truck Street	All types of freight to/from and through MICs, intermodal terminals, and urban centers
Minor Truck Street	Primarily goods and service delivery to/from urban villages, and neighborhood commercial districts
First/Last Mile Connectors	Primarily heavy freight to/from industrial locations within manufacturing/industrial centers

[5]SDOT and WSP | Parsons Brinckerhoff analysis. August 2015. SFMP Existing and Future Truck Mobility and Access.

Review roadway classifications

Seattle's roads are classified according to different levels of emphasis on traffic movement according to the following hierarchy:[6]

- Interstate/state route
- Principal arterial
- Minor arterial
- Collector arterial
- Non-arterial

While trucks are allowed on all arterials in the city, roadway classifications were reviewed to ensure the appropriate level was being used for each freight network category. This criterion established the minimum (or maximum) level of functional classification for each designation, as shown in Table 4-4. Freight Network Roadway Classification.

Almost all of the freight network is designated on arterial streets. The only non-arterial segments on the freight network are first/last mile connectors that are within the MICs. They often connect to places where trips are starting or ending. While these roads may not have high enough traffic volumes to be classified as arterials, the percentage of trucks they carry and their access to the Port and industrial lands make them important to the overall freight network.

TABLE 4-4: FREIGHT NETWORK ROADWAY CLASSIFICATION

Freight Network Designation	Roadway Classification
Limited Access Facility	Interstate Freeways
Major Truck Street	Minor arterial or higher
Minor Truck Street	Collector arterial or higher
First/Last Mile Connectors	Minor arterial or lower

Assess redundancy and resiliency of the network

An effective freight network requires redundancy in order to mitigate the risk of everyday unplanned or temporary disruptions (such as traffic incidents or roadway construction) that can affect freight delivery performance. A redundant system reduces the risk that deliveries will fail to meet scheduled deadlines by providing a network that is comprehensive enough to provide alternative routes as needed. Providing adequate network redundancy is an overarching consideration in developing the freight network.

In addition to creating redundancy for everyday freight movements, another key consideration is to provide a network that will be resilient under more severe circumstances. It is critical to identify facilities that provide alternative routes to navigate the city during major events, such as natural catastrophes like a flood or earthquake, in order to ensure a rapid economic recovery.

During this step, the network was reviewed to provide sufficient alternative routes both north/south and east/west connecting the city. In many cases, the major truck streets provide this function for the limited access roadways, and the minor truck streets serve as alternatives for the major truck streets.

Public Review

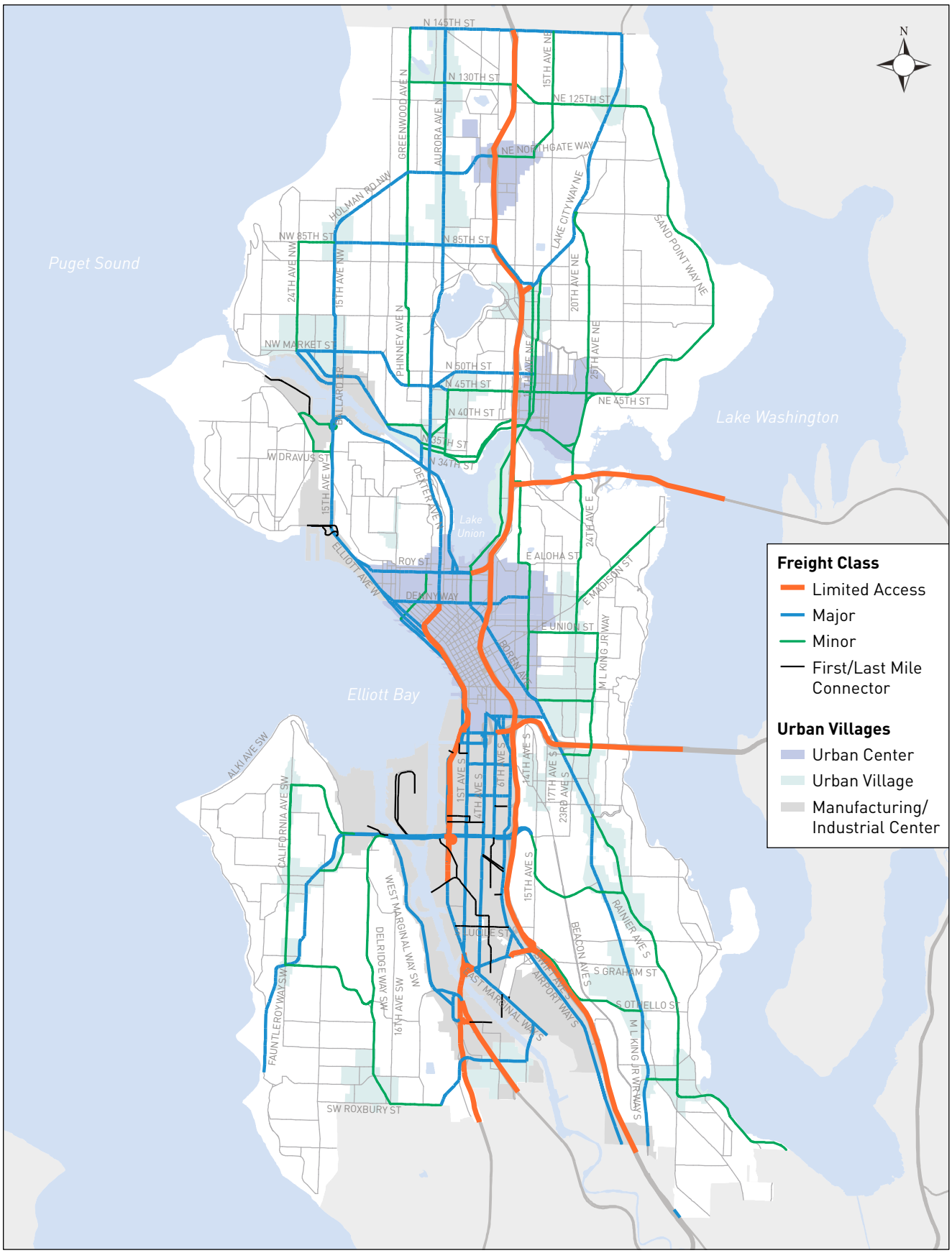
The project Advisory Committee provided initial input into the development and application of the freight network category designations. Comments from a series of public meetings with neighborhood and business organizations and 2 public open houses in the fall of 2015 resulted in further refinements to the network.

THE FREIGHT NETWORK

The freight network map is shown in Figure 4-4. The freight network designations are shown in different colors to easily illustrate how the network functions as a whole. In general, limited access facilities are accessed by major truck streets and, to a lesser degree, by minor truck streets. First/last mile connectors are primarily accessed by major and minor truck streets and are located within the MICs.

[6]SDOT. July 2015. Seattle Comprehensive Plan, Transportation Appendix.

FIGURE 4-4: FREIGHT NETWORK



CHAPTER 5: DEVELOPING SOLUTIONS

IN THIS CHAPTER:

Freight stakeholders cited congestion as the number one challenge affecting urban goods delivery in the city.

The freight network is the backbone of our economic livelihood and goods movement throughout the city. As such, we need to ensure that it functions at its best today and into the future.

This chapter presents an assessment of the freight network, its current state of functionality, and issues that can cause network breakdowns. The assessment was integral to identifying infrastructure improvements for freight mobility and will allow us to ensure that transportation facilities are functioning at their highest level. We also present a compilation of intersection, corridor, and citywide projects, as well as other solutions to improve overall freight mobility.

Partnerships with other agencies will be critical to deliver on many of these solutions. An example of a successful partnership is the The Freight Action Strategy for the Everett-Seattle-Tacoma Corridor (FAST Corridor). It is a partnership of 26 local cities, counties, ports, federal, state and regional transportation agencies, railroads and trucking interests, intent on solving freight mobility problems with coordinated solutions.

ASSESSING THE NETWORK

We evaluated safety and mobility issues associated with the truck freight network identified in Chapter 4 to assess how it is likely to function today and into the future. This evaluation involved an analysis of truck collisions, mobility constraints, and roadway congestion affecting truck facilities.

Truck Collision Analysis

A key component of assessing the network was to identify safety issues. We did this by reviewing citywide truck collision trends beginning in January 2009 through May 2014, more than a 5-year period. Data included truck collisions with people walking, people bicycling, and people driving other vehicles or trucks. Collisions involving trucks are a greater concern than other collisions, since they can be disproportionately damaging due to the relative size of the vehicles. Collisions are also a source of congestion, particularly when they occur on a major corridor.

The collision data assessment identified likely site- and corridor-specific safety issues on the existing transportation network. Overall truck collision findings of note include:

- More than 60% of collisions involving trucks were associated with smaller, single-unit vehicles. This is consistent with the fact that smaller trucks account for approximately two-thirds of the truck vehicle miles traveled within Seattle.
- On average, trucks represent a higher proportion of fatal collisions than any other type of collision when compared to all traffic collisions. This is likely due to the often significant size difference between the vehicles involved in truck collisions.
- More than 60% of fatal truck collisions and nearly 35% of serious injury collisions were between trucks and bicyclists or pedestrians.
- While truck collisions occur throughout the city, incidents that involve people driving trucks and either people bicycling or people walking are particularly concentrated in the Center City, the University District, and other neighborhood centers such as Fremont, Belltown, and SODO. Generally, in these and other urban villages, there are many people walking and bicycling, as well as high truck volumes.

VISION ZERO

SAFER STREETS FOR SEATTLE

Seattle's Vision Zero

Vehicle collisions occur throughout the city and have a high cost for all roadway users. In 2014, the City initiated Vision Zero, a plan to end traffic deaths and serious injuries on our streets by the year 2030. Seattle's Vision Zero will use a comprehensive, data-driven approach to smarter street designs, paired with targeted education and enforcement – an approach that is already proving effective in cities committed to similar goals.

High Collision Locations

Truck collisions were compared with all-vehicle collisions to identify areas and corridors that have relatively high truck collision rates. Corridors or sub-areas experiencing a relatively high concentration of truck collisions (with 10 or more collisions within a half block) are listed in Table 5-1.

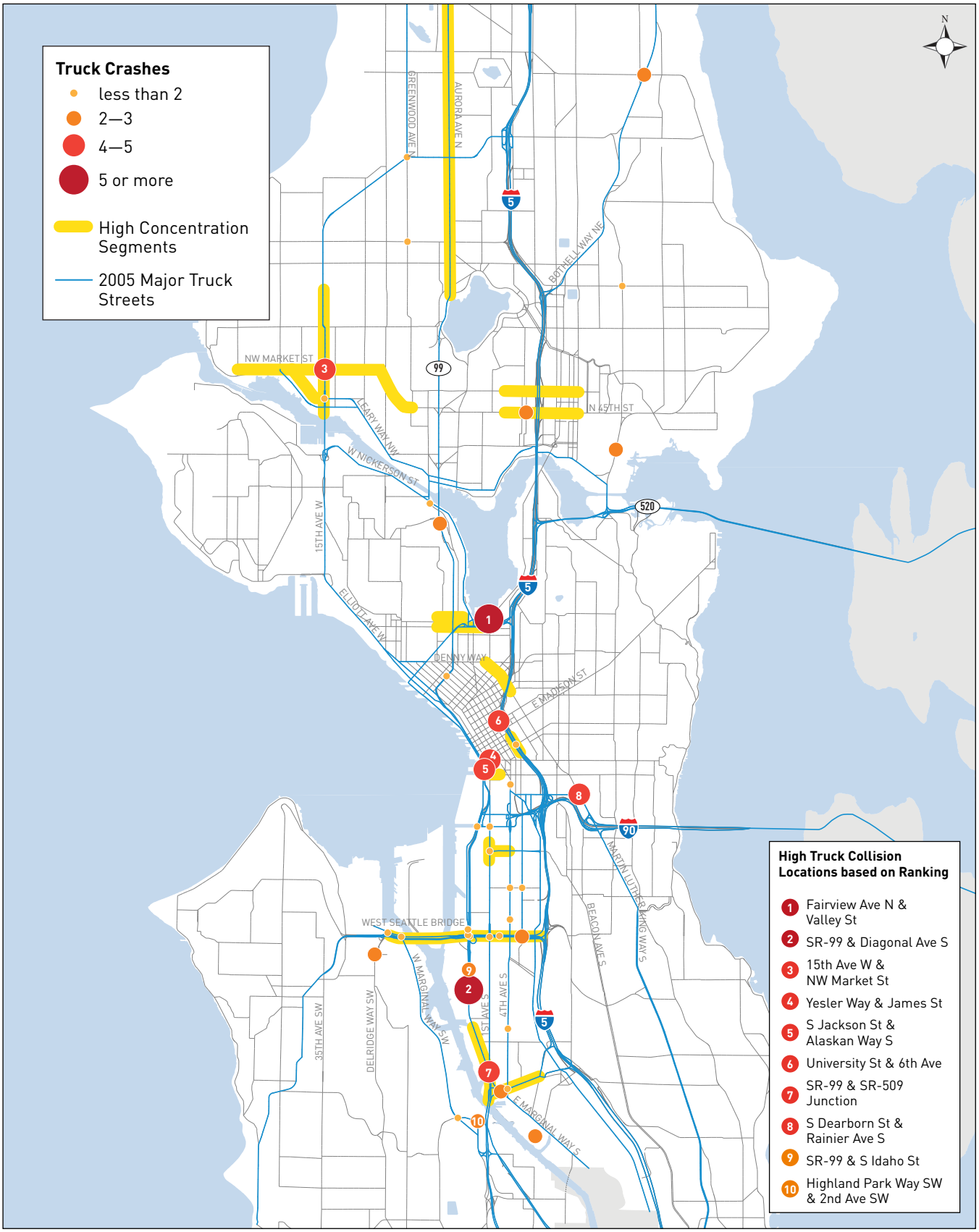
TABLE 5-1: TRUCK COLLISION – HIGH CONCENTRATION SEGMENTS (JANUARY 2009 – MAY 2014)

Segment
North
15th Ave NW*
NW Market St* and NW Leary Way northwest of Ballard Bridge
NE 50th and NE 45th streets near I-5
Aurora Ave north of Green Lake
Center City
Mercer*/Roy/Broad/Valley streets between 5th Ave N and Fairview Ave N
Boren Ave between Denny Way and Pike St
1st Ave S/Yesler Way
I-5 ramps/James St
South
S/SW Spokane St between Delridge Way SW and I-5
1st Ave S/S Holgate St
SR 99 between S Dawson St and 1st Ave S Bridge*
S Michigan St between SR 99 and I-5

*Segment includes a top ten crash location listed in Figure 5-1.

In general, locations with high truck collisions correspond to facilities that also have a high volume of trucks. A collision index was developed to identify locations that had both a high volume of trucks and a high crash rate. Figure 5-1 shows the resulting high-collision locations. The majority of high-collision locations are on the identified freight network. Note that improvements were made to the top two high truck collision locations (Fairview Ave N/Valley St, and SR 99/Diagonal Ave S) during the analysis period (2009-2014). We will continue to monitor these locations to determine if additional changes are needed to improve safety.

FIGURE 5-1: HIGH TRUCK COLLISION LOCATIONS (JANUARY 2009 – MAY 2014)



Mobility Constraints

Mobility constraints, including limitations or barriers on the transportation network, often inhibit efficient freight travel through the city. Some of these constraints are in locations that delay general traffic as well as freight, while others present specific challenges for large trucks, such as insufficient turning radii, tree type or locations, or lack of freight/commercial load zones.

Constraints (shown on Figure 5-2) that pose potential challenges for trucks delivering freight include:

- Insufficient wayfinding signage
- Movable bridges
- Downtown Traffic Control Zone
- Height or weight restrictions
- At-grade rail crossings
- Geometric constraints
- Shortage of on-street commercial vehicle load zones and inadequate off-street loading facilities

Bridge crossings on key freight corridors can create bottlenecks where a number of streets funnel into a single crossing point. Congestion at these locations has major upstream effects on both the primary roadway served by the bridge, as well as many additional side roads and interchanges. Bridge openings for marine traffic exacerbate this ripple effect. For example, congestion on the Ballard Bridge can cause backups on Nickerson Street, NW Market Street, and other urban arterials and local roads. Bridge openings can exacerbate this ripple effect. Because of their role in supporting interstate commerce, bridge openings for marine traffic are regulated by the federal government.

Seattle has over 100 at-grade railroad crossings.[1] At these locations, trucks are stopped at the tracks when trains that carry passengers, domestic cargo, or international cargo pass through, causing substantial delays for truck freight. The impact on vehicular traffic at the at-grade rail crossings depends on both the duration of the trains occupying the crossing and the frequency of trains. Particularly large impacts are experienced in high truck activity areas such as the Duwamish MIC. Creating grade separation between the conflicting modes is one way to enable both to move continuously without impacting the other. As with bridge openings, the federal government has a role in regulating rail operations in support of interstate commerce.

Freight stakeholders note the challenges of associated with making deliveries in or near downtown. The Downtown Traffic Control zone (shown previously in Figure 2-7) restricts the movements of larger trucks through much of the downtown area. Trucks longer than 30' are restricted during morning and evening peak travel periods and must obtain a permit to operate between 9 AM and 3 PM. Over-legal vehicles are allowed to operate by permit between 7 PM and 6 AM in this zone.

Another significant consideration for urban freight movement is the provision of adequate on-street commercial vehicle loading zones and other curbside spaces for loading and unloading of goods. Since anyone with a business license is able to obtain a Commercial Vehicle Load Zone permit regardless of the vehicle size, this increases competition for already limited parking spaces that can accommodate trucks. Drivers often circle the block looking for spaces to unload. Freight stakeholders have noted that this is a particular issue in downtown Seattle, the University District, and Capitol Hill.

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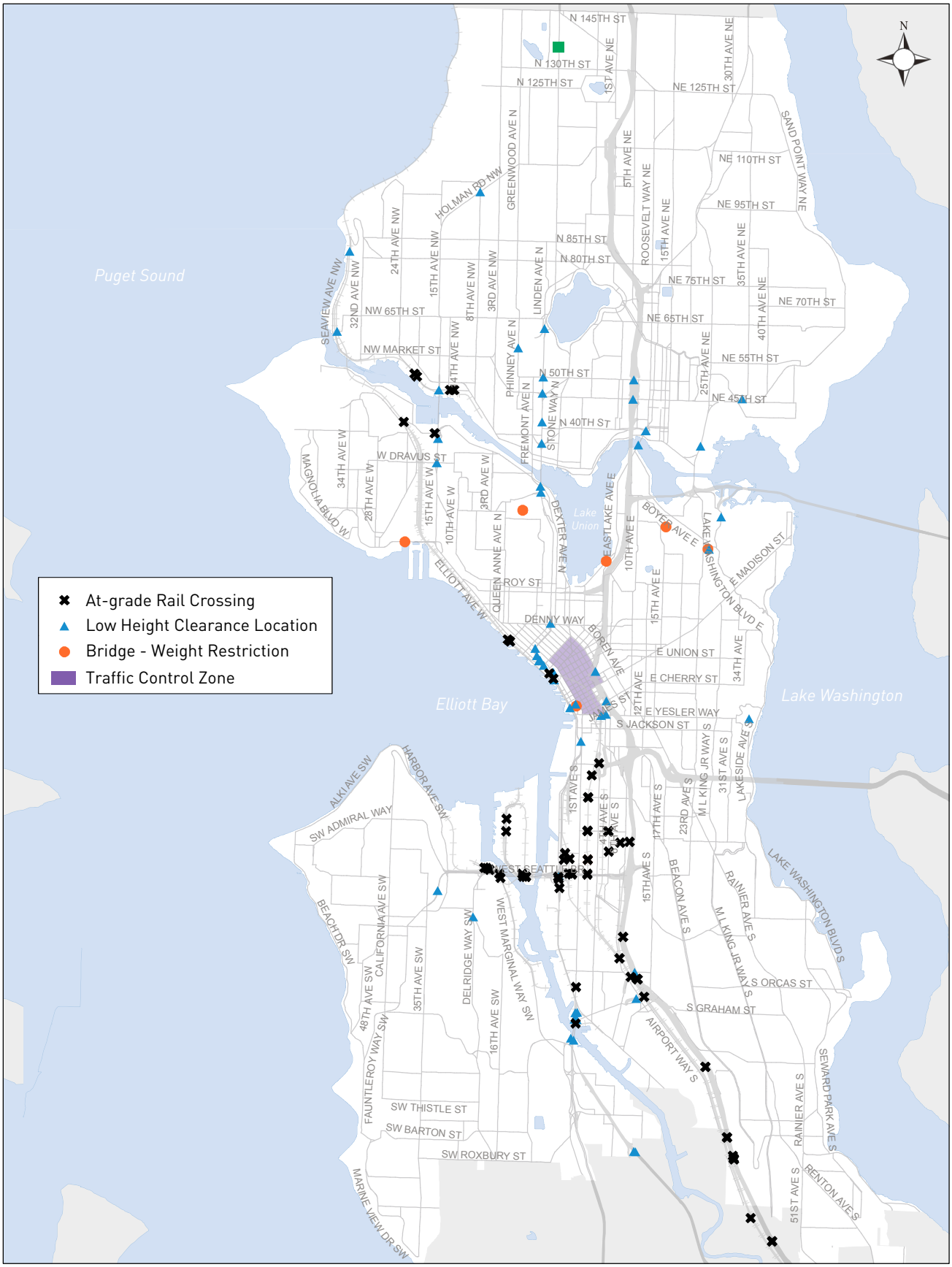
[1]PSRC. July 2014. Economic Evaluation of Regional Impacts for the Proposed Gateway Pacific Terminal at Cherry Point. Staff Summary and Supplemental Information.

FIGURE 5-2: SEATTLE'S FREIGHT MOBILITY CONSTRAINTS



Congestion

All major interstate and state highways in the Seattle area are at or near capacity for the peak periods.[2] This delays not only local traffic and truck mobility, but longer-distance through-trips as well. I-5, and to a lesser degree SR 99, are congested throughout the city during peak periods. Other key city roadways that carry high truck volumes and operate with high levels of peak-hour congestion include:

- Lake City Way (SR 522)
- Fauntleroy Way SW south of the Alaska Junction
- Fremont Ave N north of the Fremont Bridge
- Portions of Greenwood Ave N in north Seattle

The majority of high-congestion locations citywide are on roads that are part of the freight network, affecting reliability of service for trucks. As congestion worsens citywide, the movement of goods will become more challenging in terms of mobility, travel time, and reliability.

What is a Freight Bottleneck?

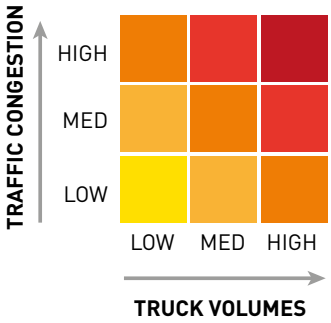
A freight bottleneck is a location where traffic flows are constrained to a point where they experience significant delay and can come to a complete halt. Typical bottlenecks include locations where multiple roadways funnel into one facility (e.g., at bridges), or where capacity on a facility is reduced (e.g., where 3 lanes taper down to 2 lanes in a given direction).

Bottleneck Analysis

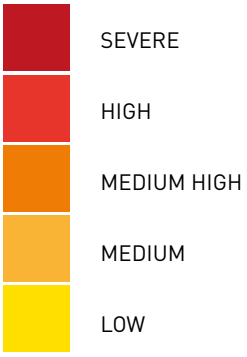
Because congestion is widespread during peak periods and will likely continue to worsen in the future, it is important to identify congested areas that have the most impact on truck travel. To do this, locations of projected future traffic congestion were identified and overlaid on a map of 2035 truck volumes.

Locations that had both high levels of congestion and high truck volumes were considered to be severe freight bottlenecks. Conversely, locations with low traffic congestion and low truck volumes were considered to be low freight bottlenecks (see Figure 5-3).

FIGURE 5-3: FREIGHT BOTTLENECK CLASSIFICATIONS



FREIGHT BOTTLENECK CLASSIFICATION



The graphics portray how the different freight bottlenecks were classified based on combined levels of traffic congestion and truck volumes on a given roadway.

[2]2010 Puget Sound Regional Council (PSRC) Travel Demand Model and WSP | Parsons Brinckerhoff analysis.

All bottlenecks were mapped in Figure 5-4. Corridor segments reflecting medium-high to severe freight bottlenecks are listed in Table 5-2.

This analysis was useful for two reasons:

1. It identified and ranked the severity of traffic conditions pertaining to goods movement throughout the city
2. It identified those areas with the greatest freight improvement need

To create a full picture of where freight improvements are most needed, high-truck collision index locations were mapped along with the freight bottleneck locations as shown in Figure 5-5. Presenting this information together indicated where the need for both freight mobility and safety improvements exist, and provided the basis for identifying where freight improvements are most needed.

More details on the freight bottleneck classifications can be found in Appendix B.

TABLE 5-2: BOTTLENECKS ON SEATTLE'S TRANSPORTATION NETWORK

Severity and Location	
Severe	
Fremont Bridge	1st Ave S Bridge
West Seattle Bridge	S Spokane St
High	
NW 15th Ave/Ballard Bridge (W Nickerson St to NW Market St)	Aurora Ave N (north City limits to Ship Canal)
Medium-High	
E Marginal Way	N 85th St
Airport Way S	N 46th St
Montlake Blvd NE	16th Ave S
Lake City Way NE	1st Ave S
4th Ave S	15th Ave W
Montlake Bridge	Aurora Avenue N (south of Ship Canal)

FIGURE 5-4: FREIGHT BOTTLENECKS

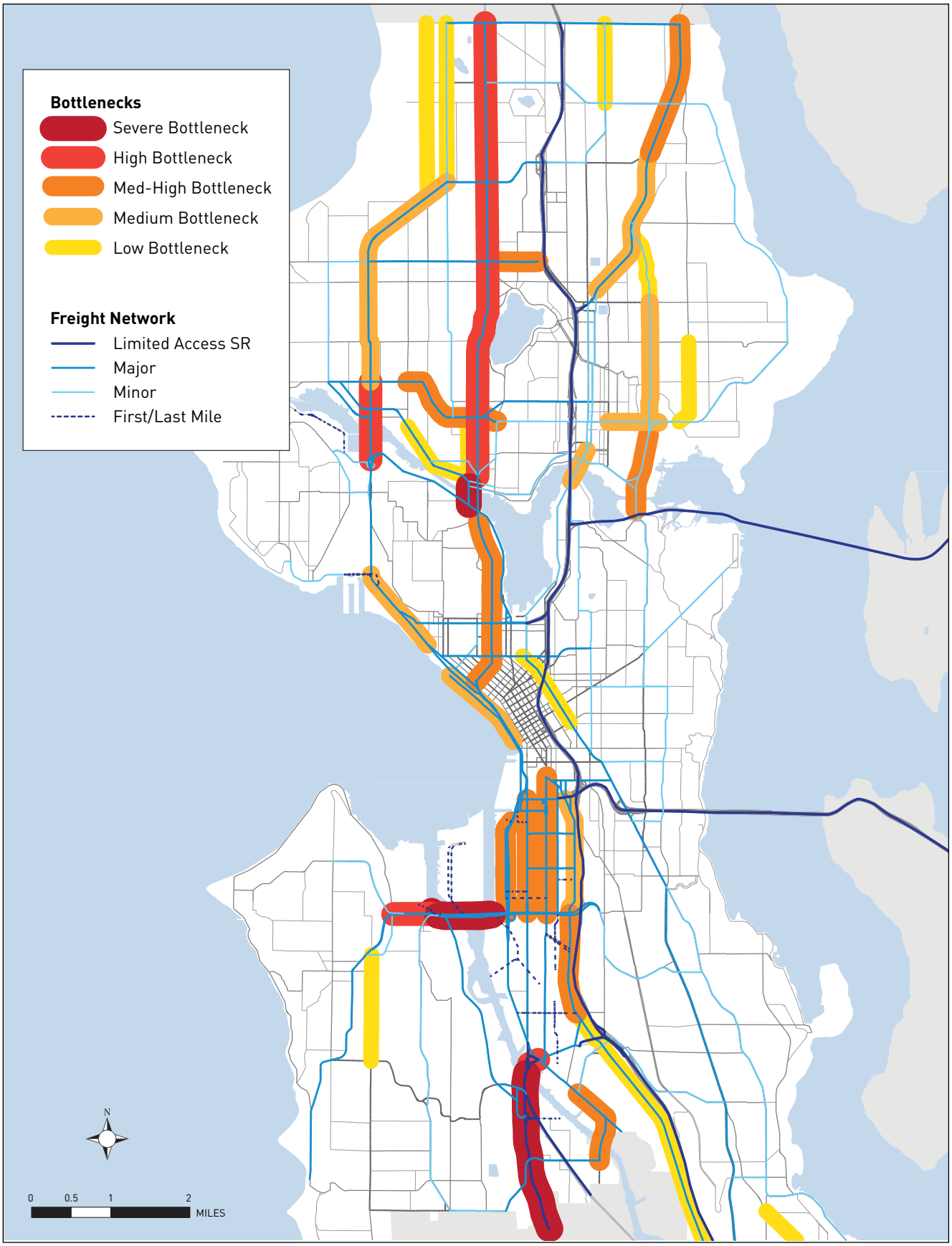
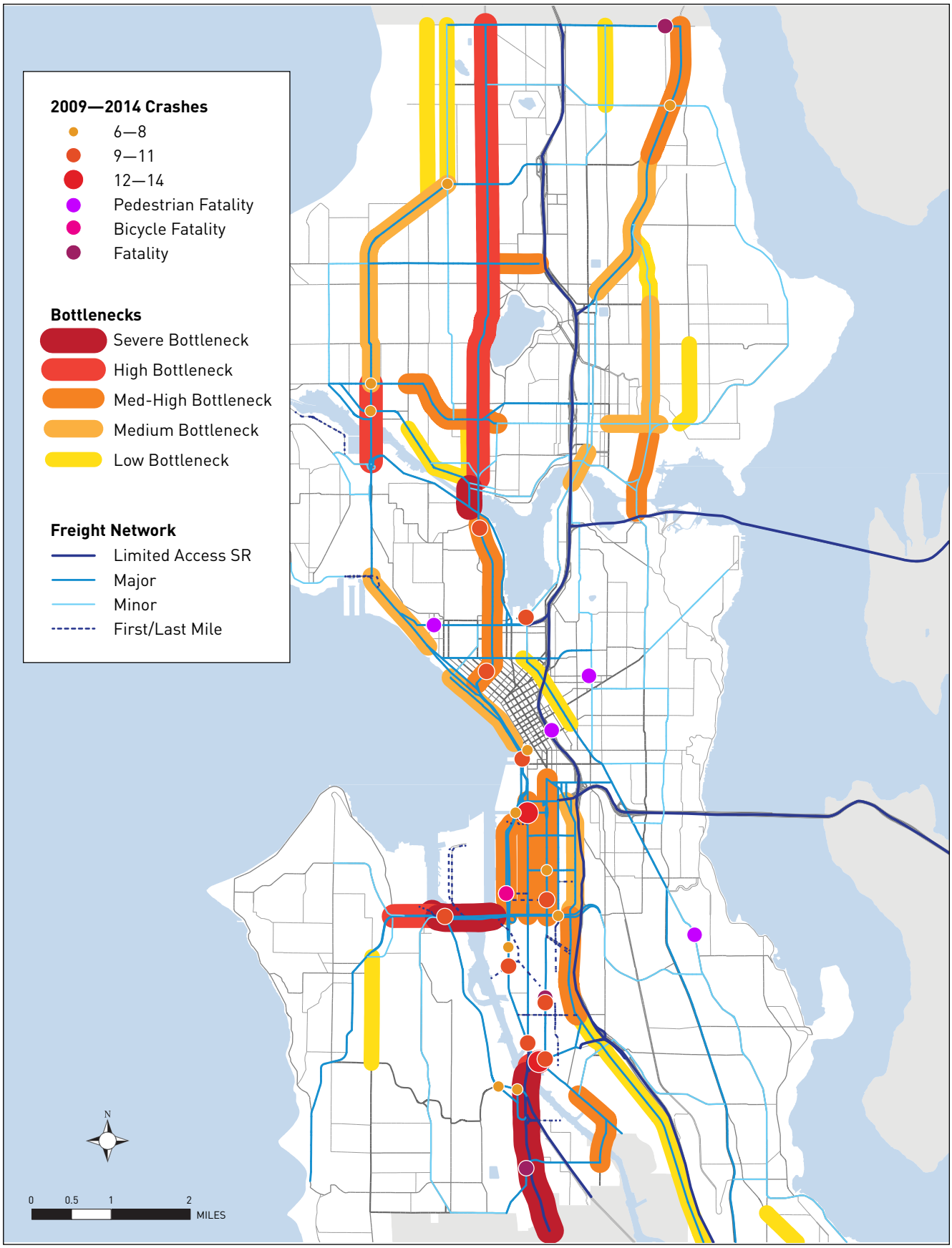


FIGURE 5-5: FREIGHT BOTTLENECK AND SAFETY LOCATIONS



FREIGHT TOOLBOX

There are several tools that can be used to address the identified bottleneck and safety locations. The following Freight Toolbox consists of a "menu" of options that represent the types of projects that could enhance freight movement and safety. The toolbox includes various improvement strategies from wayfinding, to operations and technology solutions, to geometric improvements.

Table 5-3 identifies the toolbox treatments and how they address the FMP goals. For some locations, application of a single tool may be sufficient to solve the issues. At other locations, a combination of different tools may be needed to improve freight mobility.

In addition to the freight toolbox, truck design guidelines were developed to assist in educating transportation professionals about mode-specific needs in the right-of-way for trucks. When identifying infrastructure projects for the freight network, it is important to consider relevant best design practices to ensure the design and implementation of the investments support freight movements while also considering the needs of other modes. The guidelines include discussion of the planning context for truck mobility, truck design considerations, elements to consider during project development, and best practices for providing safe and efficient truck mobility. The design guidelines can be found in Appendix C.

The following section describes each of the toolbox items in more detail.

TABLE 5-3: FREIGHT TOOLBOX OVERVIEW

List of Tools	Goals Addressed					
	Safety	Economy	Mobility	State of Good Repair	Equity	Environment
Maintenance and Preservation	x	x	x	x	x	x
Intelligent Transportation System (ITS) Applications	x	x	x			x
Wayfinding	x	x	x			x
Geometric Improvements	x		x			
Freight Operations Management	x		x		x	x
Capital Investments	x	x	x	x		x
Freight Mitigation	x			x	x	x

Maintenance and Preservation

Maintenance and preservation includes pavement and bridge investments, such as repaving roads in poor condition, paving unpaved roads and shoulders, and seismic upgrades of existing infrastructure. These projects are especially important on routes with high truck volumes, including the Heavy Haul Network. Information from the city's pavement management database was used to determine paving needs. Paving projects help preserve infrastructure investments and improve conditions for all roadway users.

ITS Applications

Intelligent transportation systems, or ITS, include a variety of technologies to improve travel across the city. ITS applications that address safety and mobility needs include:

- Closed-circuit television (CCTV) traffic cameras
- Dynamic message signs
- Portable changeable message signs
- Traveler's information website and apps
- Traffic signals, including detection, signal priority, and pedestrian count-down signals
- New technologies as they emerge

ITS provides for communications with the city's central Transportation Operations Center (TOC) and allows the TOC to provide real-time intervention to adapt signal timing to traffic conditions. This communication provides real-time traveler information on bottlenecks and current travel time to truck drivers and dispatchers. ITS projects offer decision-making tools for both system users and managers to improve mobility and operations. Implementation of ITS applications may require private and public collaboration to ensure that benefits are fully realized.

Intersection signal operations also fall under ITS applications. They can include a range of signal timing improvements on truck corridors, such as signal priority or adjusting signal timing to facilitate heavy truck movements. These signal improvement strategies can significantly improve truck mobility and access.

Wayfinding for Trucks

Something as simple as clear and legible wayfinding improves overall safety by indicating which streets are best suited for trucks. Wayfinding for trucks may include signs, and striping and roadway markings on city streets, at intermodal facilities, and on state highways to:

- Improve route decisions
- Reduce illegal movements

These are quick, low-cost strategies to help truck drivers identify truck routes and avoid routes with height and weight restrictions. Signs and maps, such as the South Seattle Truck Routes map[3], must be clear, intuitive and standardized.

Geometric Improvements

Improving constructed roadway geometry supports freight movement and allows truck traffic to blend in harmoniously and travel predictably with other roadway users. Small-scale geometric improvements for better truck mobility and access include:

- Adding left-turn lanes at critical intersections
- Adding truck-only lanes on highly used truck routes
- Repositioning utility poles
- Widening lanes
- Modifying curbs and/or providing recessed stop bars to allow long trucks to easily turn corners

A key concept in the design of a project is the "design for" versus "accommodation" of trucks, especially as they make turns at an intersection. With the safety of all users in mind, the goal is to allow truck movements for specific truck

[3]SDOT, South Seattle Truck Routes, www.seattle.gov/transportation/docs/SpokaneCorridorTruckRouteMap050707.pdf

types at specific locations (context-sensitive), while incorporating the smallest possible curb radius to limit pedestrian crossing distances at intersections and ensure pedestrian safety, following the city's Vision Zero goals.

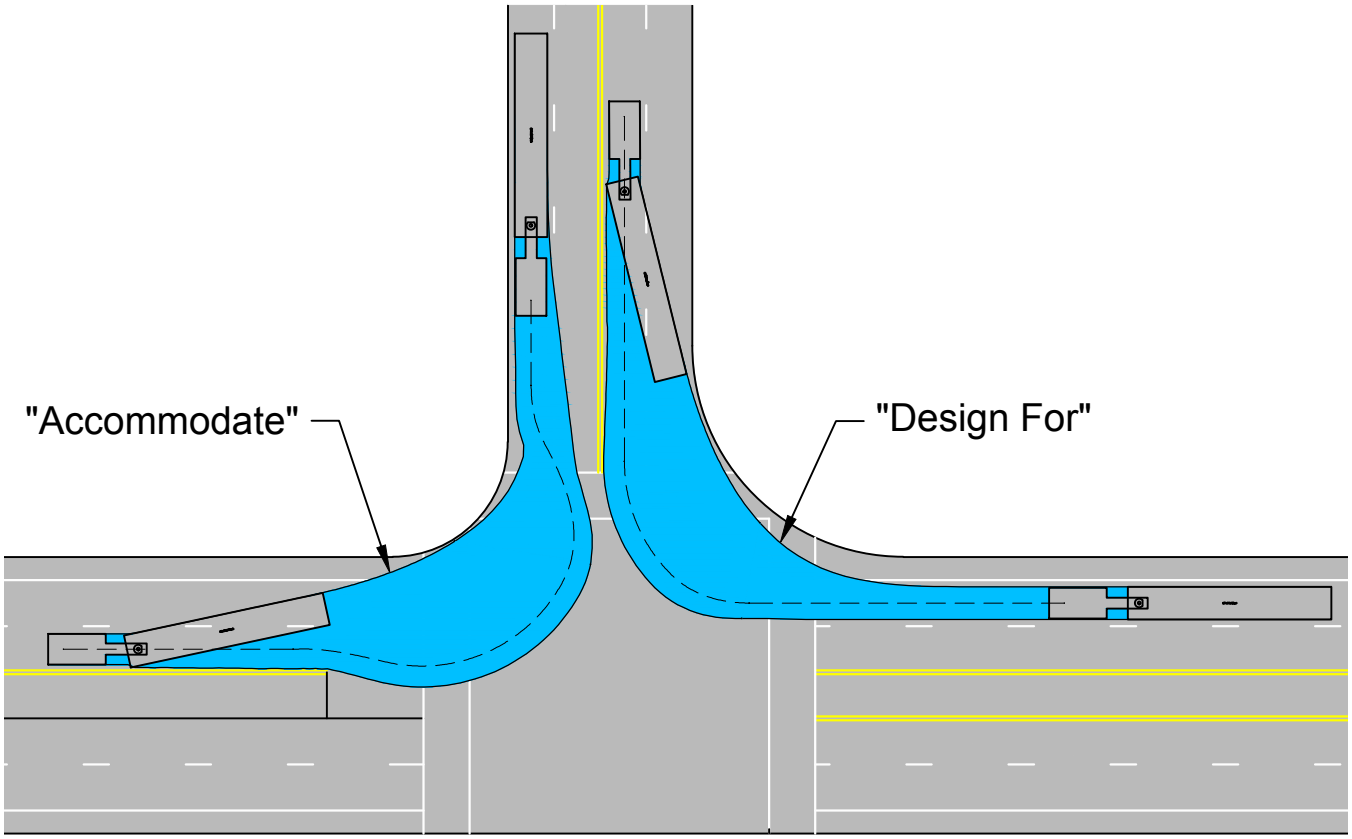
Accommodating for a vehicle allows encroachment of other lanes, shoulders, or other elements to complete the required maneuver. Designing for a vehicle does not require encroachment onto those elements. Typically, an intersection turn movement is considered "designed for" if the design vehicle is allowed to encroach on the lane adjacent to the typical receiving lane for the turn movement (right lane for right turns), provided that encroachment is not into opposing traffic. When accommodating truck turning movements, over-steering of the truck into adjacent lanes is generally assumed to occur within the intersection as shown on Figure 5-6. This may require a setback of the stop bar for opposing traffic.

In addition to turning radius and recessed stop bars, lane widths are another design feature that contributes to freight mobility. Both "design for" and "accommodate" have their place to enable safe mobility for all users in Seattle's constrained urban environment. The Seattle Freight Master Plan Design Guidelines in Appendix C provides more detail about these approaches and how to design for geometric improvements.

Freight Operations Management

Freight operations management includes a range of treatments such as truck restrictions, time-of-day variations, idling control, and loading zone control. Options include management of traffic to prioritize freight movements during certain times of the day or in certain areas or street segments, such as establishing delivery windows and off-peak delivery. These projects can reduce traffic congestion and improve parking conditions on congested urban streets with limited additional physical capacity or infrastructure.

FIGURE 5-6: DESIGN FOR VS. ACCOMMODATE



Capital Investments

Capital investments can address a range of mobility and connectivity needs. They may be large investments or smaller-scale spot improvements. Large capital investments typically have costs of $500,000 or more. These types of improvements include:

- Grade-separation of roadways
- Bridge replacement or retrofit
- New roadway connections
- Direct freeway access ramps
- Truck-only lanes

These projects are aimed at implementing large-scale truck mobility and access improvements that support investments in the freight network, the Heavy Haul Network, and over-legal routes. Large capital projects have significant costs, but may also consist of packages of smaller-scale projects that can be implemented in phases.

Spot improvements are small-scale projects that improve truck mobility through key bottleneck locations. They are typically under $500,000 and can be implemented in a relatively short timeframe. A dedicated spot improvement program allows the city to be more responsive to smaller, unforeseen needs as they arise.

Freight Mitigation

Freight projects can also include elements to mitigate the impacts that freight may have on the environment or surrounding neighborhoods. These projects may overlap with other toolbox items, like paving unpaved roads and shoulders, or incorporating stormwater management into a project. Additional strategies include increasing the tree canopy, reducing truck idling, and promoting use of cleaner running trucks in order to improve air quality in areas highly affected by freight.

Modal Conflict Resolution

Some locations may require improvements to alleviate conflicts with other modes and ensure safety. These conflicts may be with other freight modes, such as at-grade railroad crossings, or with transit and people walking or bicycling. Improvements could include grade separations at railroad crossings, or separated facilities (such as protected bike lanes where appropriate) to provide for the predictable movement of all users. The Truck Design Guidelines in Appendix C provide more detail on this topic.

FREIGHT STRATEGIES AND ACTIONS

Table 5-4 outlines several strategies developed to guide the City on how to achieve progress toward realizing the FMP goals. The plan also includes actions associated with these strategies that are specific tasks for plan implementation. Many of the strategies and actions relate to the Freight Toolbox outlined above. While each strategy is listed under a specific goal, it may help advance multiple goals in the plan.

During implementation of the strategies and actions, SDOT is committed to inclusive outreach efforts. We want to ensure that historically disadvantaged communities receive equitable benefits and are not disproportionately harmed by impacts.

TABLE 5-4: STRATEGIES AND ACTIONS

Safety - Improve safety and the predictable movement of goods and people.	
Strategies	**Actions**
1.1 Develop a comprehensive freight education program	1.1.1 Work with partners to develop and disseminate educational materials on freight mobility and safety issues
	1.1.2 Develop freight safety training for members of SDOT's modal advisory boards (e.g., take a ride in a truck, experience the roadway from a disabled pedestrian perspective)
	1.1.3 Work with partners to educate truck drivers on City regulations, the freight network, preferred routes, and online resources
	1.1.4 Work with partners to host truck rodeos to educate residents on freight design challenges, safety, truck blind spots, and the role of freight in an urban setting
	1.1.5 Use growth in home deliveries to heighten community awareness of freight performance requirements
1.2 Improve safety at railroad crossings	1.2.1 Document at-grade rail crossings and conditions using funding from the Levy to Move Seattle
	1.2.2 Work with partners to evaluate and make improvements at at-grade rail crossings
1.3 Support commercial vehicle enforcement efforts	1.3.1 Explore long-term funding opportunities for increased commercial vehicle enforcement efforts
	1.3.2 Continue to have SDOT Commercial Vehicle Enforcement Officers provide training to Seattle Police Department(SPD)
	1.3.3 Participate in Washington State Patrol (WSP) emphasis efforts
1.4 Employ Traffic Incident Management System practices	1.4.1 Follow established Traffic Incident Management System (TIMS) practices in collaboration with SPD and WSP to quickly address traffic incidents on the freight network, including incident clearing and alternate route identification
1.5 Assess landscaping in the right-of-way to reduce truck-specific sightline issues on the freight network	1.5.1 Identify additional funding for SDOT landscape maintenance crews
	1.5.2 Integrate the freight network into landscape maintenance management plans

TABLE 5-4: STRATEGIES AND ACTIONS (CONTINUED)

Safety - Improve safety and the predictable movement of goods and people.	
Strategies	**Actions**
1.6 Assess street trees in the right-of-way to reduce truck-specific sightline issues on the freight network	1.6.1 Evaluate overlap of the freight network with SDOT-maintained street trees and integrate the freight network in to tree maintenance plans
	1.6.2 Assess and enforce tree clearance issues along the freight network for trees that are privately owned and maintained
1.7 Explore programs to install truck side guards on city truck fleets	1.7.1 Determine program feasibility to install truck side guards on City-owned vehicles; include identification of retrofit costs, vehicle operations, and potential funding sources
	1.7.2 Explore feasibility to require freight vehicles operating under City contracts to have truck side guards installed, where appropriate
1.8 Integrate planning for freight with other modes	1.8.1 Use the multimodal right-of-way allocation process within the updated Comprehensive Plan to move people and goods as safely as possible
1.9 Assess conflicts between transit and freight mobility	1.9.1 Design transit waiting and boarding facilities to minimize conflicts with goods movement and deliveries
	1.9.2 Explore shared transit/freight-only lanes and their application
1.10 Assess conflicts between bicycle and freight mobility	1.10.1 Address freight delivery needs, including alley access and Commercial Vehicle Load Zone locations, when developing bicycle infrastructure projects to minimize conflicts with goods movement and deliveries
	1.10.2 Design bicycle facility treatments to provide predictable movement of people on bicycles and to minimize conflicts with goods movement and deliveries
1.11 Assess conflicts between pedestrian and freight mobility	1.11.1 Design pedestrian facility treatments to provide predictable movement of people and to minimize conflicts with goods movement and deliveries
	1.11.2 Review pedestrian crossing opportunities on streets in the freight network and provide controlled or pedestrian-activated crossings, where appropriate

TABLE 5-4: STRATEGIES AND ACTIONS (CONTINUED)

Economy - Provide a freight network that supports a thriving and diverse economy for Seattle and the region.	
Strategies	**Actions**
2.1 Develop an urban goods delivery strategy	2.1.1 Establish a minimum distance for loading opportunities from any business address, either in on-street, alley or off-street locations; maintain or reassign loading locations when designing transportation and private development projects
	2.1.2 When alleys are vacated, identify and address loading and circulation impacts to adjacent and nearby properties
	2.1.3 Improve enforcement of commercial vehicle load zones
	2.1.4 Expand commercial vehicle load zone hours to 24 hours a day, 7 days a week in select locations
	2.1.5 Review the commercial vehicle load zone permit process to consider more effective use of price to manage demand, access, and types of user
	2.1.6 Consider potential expansion of the Downtown Traffic Control Zone in a manner that improves daytime street network reliability but still provides sufficient urban good delivery access
	2.1.7 Evaluate and recommend on- and off-street tactics to enable bicycle, non-truck, and small truck deliveries in dense areas
	2.1.8 Evaluate new curb designs to increase flexibility and opportunities to share space
	2.1.9 Develop a pilot program for off-hours delivery in areas with a mix of residential and commercial land use to facilitate truck movement
	2.1.10 Explore freight demand management strategies to consolidate freight delivery trips and ensure vehicles are right-sized for an urban environment
	2.1.11 Identify and employ innovative uses of technology to guide urban good deliveries to destinations and manage access to loading locations
	2.1.12 Develop a data collection plan and seek funding to regularly monitor on-street and off-street commercial loading locations and gather user input
	2.1.13 Explore best off-street loading practices, including loading dock development and use standards
	2.1.14 Work with other city departments to reevaluate and update design requirements in new development to accommodate increased online delivery package storage

TABLE 5-4: STRATEGIES AND ACTIONS (CONTINUED)

Economy - Provide a freight network that supports a thriving and diverse economy for Seattle and the region.	
Strategies	**Actions**
2.2 Explore the implementation of urban consolidation centers, joint distribution centers, or local building logistics centers in Seattle	2.2.1 Work with other City departments and agencies to conduct a feasibility study to create urban consolidation centers, joint distribution centers, or local building logistics centers. Assess real estate opportunities, site development needs, and partner options, including third party logistics (3PL) firms
2.3 Coordinate freight efforts and improvements with partners	2.3.1 Continue to engage in regional and state freight forums through the Puget Sound Regional Council and other organizations
	2.3.2 Maintain a regular forum between SDOT, the Port of Seattle, and the Northwest Seaport Alliance to coordinate and collaborate on freight issues
	2.3.3 Provide the Freight Advisory Board with timely, accurate and appropriate information on plans, programs and projects affecting freight mobility in Seattle to ensure it can fulfill its responsibilities
	2.3.4 Improve coordination and collaboration among SDOT's modal advisory boards (freight, pedestrian, bicycle, and transit)
	2.3.5 Work with partners to educate stakeholders (including the public at large) about the importance of freight mobility to the local and regional economies in order to secure support for freight investments
2.4 Maintain and improve truck freight mobility and access between and within the city's MICs and to the regional highway system	2.4.1 Track and address the impact of at-grade-crossings with high volumes of trains and trucks within the Manufacturing/ Industrial Centers (MICs)
	2.4.2 Explore and test the use of truck-only lanes to improve freight mobility on city streets with high truck volumes
	2.4.3 Work with the Port of Seattle, the Northwest Seaport Alliance, and intermodal partners to provide efficient access to core intermodal facilities
	2.4.4 Address bottlenecks and other access constraints along key freight corridors, networks and intermodal connections
	2.4.5 Keep landscaping in MICs to a minimum to allow for flexibility for industrial activities, except along selected arterials where screening may be appropriate
	2.4.6 Conduct small area transportation analyses to identify and address localized circulation needs

TABLE 5-4: STRATEGIES AND ACTIONS (CONTINUED)

Mobility - Reliably connect manufacturing/industrial centers and business districts within Seattle, regional, and international freight networks.	
Strategies	**Actions**
3.1 Designate and enhance a freight network for the City	3.1.1 Establish a freight network to designate where freight movements are expected and planned to occur
	3.1.2 Prioritize freight investments on the designated freight network to support efficient freight mobility and address deficiencies in the network
	3.1.3 Improve roadway geometry to support goods movement using "design for" and "accommodate" approaches for freight vehicles, depending on the street function, location (street type), and truck volumes
3.2 Expand the city's freight data collection program	3.2.1 Improve the frequency of regular truck counts (e.g., annual)
	3.2.2 Install permanent truck count stations on key segments of the designated freight network
	3.2.3 Explore use of a length-based standard for determining vehicle types rather than the number of axles
	3.2.4 Develop an ongoing Commercial Vehicle Load Zone data collection and monitoring program
3.3 Implement improvements that benefit freight mobility	3.3.1 Seek partnerships to implement projects, initiatives, and programs
	3.3.2 Implement corridor improvements to reduce conflicts, increase safety, and enhance freight mobility
	3.3.3 Implement intelligent transportation system (ITS) projects to maximize efficient movement through corridors, prioritizing improvements along the freight network
	3.3.4 Implement intersection improvements that minimize site-specific obstacles to freight mobility
3.4 Provide tools to help the freight community navigate the city	3.4.1 Improve truck wayfinding, particularly along the designated Major Truck Streets
	3.4.2 Customize and consolidate tools to provide travel information and conditions on the designated freight network to aid truck drivers, such as maps, cameras, incident information, and congestion updates
3.5 Improve truck parking in industrial areas	3.5.1 Work with the Port of Seattle and other partners to determine suitable locations and technology to provide and manage additional truck parking
3.6 Update the Freight Master Plan	3.6.1 Update the plan every 5-7 years to take advantage of emerging opportunities, re-evaluate priorities, respond to industry changes, and maintain consistency with regional and state plans

TABLE 5-4: STRATEGIES AND ACTIONS (CONTINUED)

Mobility - Reliably connect manufacturing/industrial centers and business districts within Seattle, regional, and international freight networks.	
Strategies	**Actions**
3.7 Establish a broad-based funding approach	3.7.1 Fund high-priority projects, as identified in the plan's prioritization framework
	3.7.2 Continue to include freight projects in the city's Capital Investment Program (CIP)
	3.7.3 Continue to integrate freight needs into Complete Streets analysis
	3.7.4 Seek and secure public and private funding to implement freight projects
State of Good Repair - Maintain and improve the freight transportation network to ensure safe and efficient operations.	
Strategies	**Actions**
4.1 Address major maintenance and rehabilitation needs on the freight network	4.1.1 Work with Port of Seattle to develop pavement standards for the Heavy Haul Network
	4.1.2 Consider freight vehicle needs in pavement construction and reconstruction standards for roadway segments included in the freight network
	4.1.3 Continue to use truck count data in the citywide pavement prioritization process
	4.1.4 Explore opportunities, including public-private partnerships, to pave unpaved roads and shoulders and non-arterial streets in industrial areas to reduce particulate pollution
4.2 Address spot improvement needs to maintain freight mobility	4.2.1 Implement small- to mid-sized freight projects and programs through the annual freight spot improvement program to address mobility and safety needs

TABLE 5-4: STRATEGIES AND ACTIONS (CONTINUED)

Equity - Benefit residents and businesses of Seattle through equity in freight investments and improve the health of communities impacted by goods movement.	
Strategies	**Actions**
5.1 Maintain and improve the freight network necessary to support and grow freight-dependent family-wage jobs	5.1.1 Solicit input from freight stakeholders to identify freight safety and mobility needs that can be addressed through the spot improvement program
5.2 Work with communities impacted by goods movement	5.2.1 Mitigate freight impacts along the freight network in areas within incompatible land uses, and along segments with high truck volumes through integrated planning and project implementation
	5.2.2 Reduce long-term truck parking on residential streets through education and enforcement activities, and identify alternative truck parking locations
	5.2.3 Strengthen, maintain, and grow the city's tree canopy to improve air quality, especially in and adjacent to industrial areas
	5.2.4 Explore and implement opportunities to increase green buffers along the freight network during implementation of transportation projects
	5.2.5 Mitigate storm runoff in areas with incompatible land uses along the freight network through the use of green stormwater infrastructure
	5.2.6 Track the impacts of increased home delivery services in neighborhoods, including methods and safety, to determine if actions are needed to mitigate impacts

TABLE 5-4: STRATEGIES AND ACTIONS (CONTINUED)

TABLE 5-4: STRATEGIES AND ACTIONS (CONTINUED)

Environment – Improve freight operations in Seattle and the region by making goods movement more efficient and reducing its environmental footprint.	
Strategies	**Actions**
6.1 Advance freight-supportive technology improvements	6.1.1 Support the use of alternative fuel trucks
	6.1.2 Participate in the development of guidelines for alternative fuel stations throughout the city that provide access for freight vehicles
	6.1.3 Work with partners to identify funding to advance alternative fuel technologies
	6.1.4 Prepare for the advent of freight applications of connected automated vehicle (C/AV) technology; define potential test locations and design of initial pilots
6.2 Reduce greenhouse gas (GHG) emissions produced by freight	6.2.1 Support the proposed "anti-idle" policy for City-owned and operated fleet vehicles and equipment used for transport, construction or landscaping, and train staff after adoption
	6.2.2 Work with the State Department of Licensing to explore and pilot an emissions signature program in which newer trucks pay less for emissions inspections
	6.2.3 Review best practices to consider testing and implementing renewable diesel on City-owned vehicles
	6.2.4 Support efforts to increase bicycle and electric vehicle freight deliveries
	6.2.5 Work with Port on "no idle" zones where trucks queue before entering Port facilities
	6.2.6 Work with the State on truck fleet program grants to offer incentives for cleaner running trucks
	6.2.7 Work with other City agencies to identify funding for exploration and testing of alternative fuels and energy components in City fleet

FREIGHT PROJECT CONCEPTS

Before developing new projects, we created an inventory of existing freight mobility and connectivity projects identified in other planning efforts. This included review of projects from:

- Levy to Move Seattle,
- SDOT's Large Capital Program prioritization
- Freight Access Project
- 2014 Washington State Freight Mobility Plan

We also added projects located in the newly identified critical urban freight corridor network developed by PSRC that are eligible for federal funding. The lists help us determine if projects address freight bottlenecks and safety issues. We then developed projects to resolve bottleneck and safety issues not addressed by existing proposed projects.

Identified freight bottleneck and safety locations, along with corresponding proposed improvement projects, were presented to the Advisory Committee and staff in other city departments to ensure they addressed freight system needs.

The resulting compiled project list includes over 60 projects that apply a variety of solutions presented in the freight toolbox.

The detailed list and descriptions of projects is provided in Table 5-5. Projects are organized by "catalyst projects" or by geographic area – north, central, south, and citywide. Project locations are mapped in Figures 5-7 to 5-9. They are not prioritized.

Catalyst projects are a small sub-set of the project list. They are located at choke points in the network that pose significant challenges to reliable goods movement and typically will require modal grade separation. Catalyst projects are large projects that will require multiple funding partners and stakeholder input to implement.

Unlike the city's other modal master plans, the FMP does not include planning-level cost estimates, which are typically derived by estimating standard unit costs. Due to the varied scales and complexities of freight projects, planning-level cost estimates will be developed for individual projects as they advance towards implementation.

TABLE 5-5: PROJECT LIST

No	Project Title	Project Description
Catalyst Projects		
1	Ballard Bridge Replacement	Replace structure to increase capacity and improve access.
2	S Lander St Grade Separation	Develop a grade separation of the roadway and the Burlington Northern mainline railroad tracks between 1st Ave S and 4th Ave S
3	SODO Rail Corridor Grade Separation	Improve access to manufacturing and industrial center and Port of Seattle facilities. May include non-motorized grade separation to increase safety and reduce modal conflicts.
4	4th Ave S Viaduct Replacement (4th Ave S grade crossing over Union Pacific Railroad Argo Yard)	Replace the viaduct structure spanning the Union Pacific Railroad (UPRR) yard at the conclusion of its service life, which is expected to occur within the 20-year planning timeframe (by 2035). The new structure will increase vertical clearance above the railroad tracks to improve safety and rail operations. Columns and pier walls will be removed to increase and optimize rail yard functionality and operations.

TABLE 5-5: PROJECT LIST (CONTINUED)

No	Project Title	Project Description
North		
5	1st Ave S Viaduct Replacement (Grade crossing over Union Pacific Railroad Argo Yard)	Replace the existing viaduct structure spanning the Union Pacific rail yard at the end of its useful life span.
6	BINMIC Truck Route Improvements (Area bounded by W Dravus St, W Nickerson St, NW Market St, and Fremont Ave N)	This project will evaluate truck freight movements to identify projects to address geometric and operating challenges for trucks. The projects will be focused on readily implementable improvements with primary consideration given to safety and freight connectivity. They may include signal timing adjustments, additional signage or wayfinding, larger intersection turn radii, lane width adjustments, and joint use of bus lanes. • Phase I: Collect data on needs through a detailed assessment of truck volumes, truck sizes, and over-dimensional truck activity. Build from the forecasts developed in the Freight Access Project and work with stakeholders to identify and prioritize specific truck route projects. • Phase II: Implement top priority projects given funding availability and opportunities. Develop a long-term budget and funding strategy to implement remaining projects.
7	15th Ave W Spot Improvements at W Dravus St and W Emerson St	This project addresses turn radii issues for trucks and enhanced multimodal operations through small-scale geometric and intersection operational improvements along 15th Ave W. Trucks of all sizes experience challenges traveling on the elevated structures at W Emerson St and W Dravus St. 15th Ave W, W Emerson St, and W Dravus St are vital connections for freight traveling to and from the Ballard-Interbay-Northend Manufacturing/Industrial Center (BINMIC). This project includes two components to implement changes at these locations. • The W Emerson St ramp over 15th Ave W serves trucks going to and from W Nickerson St. This component includes moving the centerline on the ramp to provide a greater turning radius for trucks and making adjustments to the stop bars channelization at the intersection on the west side of the ramp. • W Dravus St is used by trucks of all sizes, including overlegal vehicles unable to pass underneath the bridge on 15th Ave W. Northbound trucks have particular difficulty turning left onto W Dravus St from the off-ramp. This component of the project includes upgrading signal timing and hardware at the ramp terminals to ensure vehicle queues on the bridge clear to allow trucks adequate space to turn at the intersection. This project can be bundled with Ballard Bridge Access improvements
8	15th Ave NW / NW Market St Intersection Improvement	Improve southeast corner curb radius, which would impact existing signal equipment.

TABLE 5-5: PROJECT LIST (CONTINUED)

No	Project Title	Project Description
North		
9	15th Ave W / Elliot Ave W Reconstruct (Mercer Pl to Holman Rd NW)	Reconstruct and make operational/ITS improvements to 15th Ave W/Elliott Ave W
10	Dynamic message signs along 15th Ave NW corridor (Ship Canal to Holman Rd NW)	Install dynamic message signs to provide travel conditions on major freight corridors prior to connecting to Major Truck Streets
11	NW Leary Way at NW 46th St or NW 45th St (NW 46th St to Shilshole Ave NW)	Intersection operations should be evaluated and treatments considered to improve access to/from NW 46th Street or NW 45th St. Type of improvements to be coordinated with outcomes of the BINMIC Truck Route Improvements.
12	W Emerson St/21st Ave W/W Commodore Way Corridor Improvements	Reconstruct the existing intersection at 21st Ave NW and W Commodore Way to improve truck safety and mobility and improve bike/ped/truck facilities on W Emerson Place and 21st Ave W.
13	NW Market St / Leary Way NW / N 36th St Improvements	Reconstruct and make operational/ITS improvements to Leary Way NW corridor to facilitate freight movement. This project would coordinate specific truck operational improvements with the BINMIC Truck Route Improvements.
14	Mobility improvements along NW Market St between 8th Ave NW and Stone Way N	Restrict left turns at non-critical intersections to improve east/west mobility for freight.
15	Holman Rd NW / 13th Ave W Intersection improvements	Remove height limitation from existing pedestrian overpass and install half signal.
16	Intersection improvements at 4th Ave N, Westlake Ave N, Dexter Ave N, and Nickerson St	Evaluate the intersection of 4th Ave N, Westlake Ave N, Dexter Ave N, and Nickerson St to improve freight mobility.
17	Intersection Improvements at 6th Ave NE and NE 40th St	Eliminate the height restriction and turning movement conflicts on 6th Ave NE at the Burke-Gilman Trail bridge.
18	3870 Montlake Blvd NE - Montlake Blvd NE height restriction	Eliminate the height restriction on Montlake Blvd NE at the pedestrian bridge connecting UW to the Alaska Airlines Arena.
19	Ballard Bridge Access and Seismic Improvements	Address capacity constraints for bikes and pedestrians and seismic improvements to the Ballard Bridge.
20	7th Ave NE/ NE 40th St Intersection improvements	Reconfigure intersection to facilitate turning and crossing movements at 5-leg intersection.
21	Integrated corridor management system on N 85th St between 15th Ave NW/Holman Rd NW and I-5	Implement Integrated Corridor Management (ICM) and provide the opportunity for freight to avoid congestion on a given facility when it is present. Consider dynamic message sign and/or push out data on I-5 conditions and back-ups. Implement additional permanent surface street data collection.

TABLE 5-5: PROJECT LIST (CONTINUED)

No	Project Title	Project Description
North		
22	ITS Improvements N 85th St from Aurora Ave N to I-5	Install traffic signal control improvements (either traffic adaptive or responsive) to provide consistent travel times on freight corridor. Implement additional detection to provide congestion information.
23	Dynamic message signs along 25th Ave NE corridor (Ship Canal to Montlake Blvd NE / NE 75th St)	Install dynamic message signs to provide travel conditions on major freight corridors prior to connecting to Major Truck Streets
24	ITS improvements Aurora Ave N	Modify signal timing on northbound Aurora Ave N to improve freight traffic during the morning peak.
25	W Galer St Interchange Ramp	Construct ramp to improve access over BNSF mainline tracks and storage yard
26	Nickerson St / W Nickerson St Reconstruction	Reconstruct Nickerson St and improve freight movement alternatives in the Ballard-Interbay-Northend Manufacturing/ Industrial Center
Central		
27	Denny Way ITS (Denny Way from I-5 to Western Ave)	Update signal timing, vehicle detection, CCTV cameras, dynamic message signs, and fiber communications to improve traffic flow and provide enhanced traveler information along Denny Way from I-5 to Western Ave.
28	Elliott Ave W truck lanes (Broad St to SR 99 ramps)	Study and implement freight-only lanes for southbound truck traffic.
29	I-5 Connector ITS (areas surrounding I-5)	Installation of CCTV cameras along streets that provide Center City access to I-5/I-90 to provide congestion monitoring of traffic interchanging with the freeway.
30	ITS upgrades on Boren Ave from Howell St to S Jackson St (Rainier Ave S to Deny Way)	Upgrade all signals in Major Truck Street corridor to current standards and improve north-south mobility in center city
South		
31	East Marginal Way S Corridor Reconstruction and Safety Enhancements (S Atlantic St to S Michigan St)	Reconstruct a core freight route to heavy haul vehicle standards, add safety and advanced management systems and incorporates separate bicycle and pedestrian facilities while maintaining freight efficiency. Phase 1: S Atlantic St to Diagonal Ave S, Phase 2: Diagonal Ave S to S Michigan St
32	East Marginal Way S / 8th Ave S / S Myrtle St Intersection Improvements	Improve intersection geometry, revise signalization, upgrade drainage, rehabilitate pavement at railroad tracks, and install streetscaping. Project should be coordinated with Next Generation ITS.

TABLE 5-5: PROJECT LIST (CONTINUED)

No	Project Title	Project Description
South		
33	East Marginal Way S / S Hanford Street Intersection Improvements	Upgrade the signal, lengthen the northbound right-turn lane, improve the railroad crossing pavement, and evaluate the need for railroad crossing gates at the Whatcom track crossings. The project also includes rebuilding the intersection and its approaches to Heavy Haul route requirements. This project will also more clearly delineate parking on the southeast corner of the intersection.
34	East Marginal Way S railroad track removal (Diagonal Ave S to 1st Ave S Bridge or West Marginal Way)	Improve pavement and remove unused rail lines.
35	Duwamish Local Freight Access Improvements (S Holden St / 5th Ave S / S Kenyon St / 8th Ave S)	Reconstruct roadway with drainage, curb, sidewalks and landscaping. Coincides with W Duwamish Trail construction and, Seattle Public Utilities drainage substation proposal.
36	S Spokane St Freight-Only Lanes Pilot	Pilot project to design, implement, and evaluate freight-only lanes on the corridor. The first phase of the project would determine project limits and identify design options, and new infrastructure needed to implement the pilot. The second phase would implement modifications to roadway channelization for truck-only lanes, install signal and signage upgrades, and provide ITS equipment such as variable message signs and detection equipment. The project would evaluate time-of-day operations, while providing a contingency for allowing all traffic to use the lanes in the event of an incident on the upper bridge.
37	S Holgate St Rail Crossing Improvements (S Holgate St from Occidental Ave S to 4th Ave S)	Reconstruct the pavement to Heavy Haul route requirements, and improve channelization, signage, and pedestrian and bicycle environment.
38	S Atlantic St Corridor Reconstruction (S Atlantic St - Alaskan Way to 1st Ave S)	Reconstruct and make operational ITS improvements
39	S Spokane St ITS Upgrades (Chelan Ave SW to S Airport Way)	Install ITS equipment along the corridor to collect and provide real-time travel time information for trucks and the general public. Specific equipment would include Bluetooth readers and dynamic message signs installed along the corridor to collect and disseminate travel time information between S Airport Way and Chelan Ave SW, including access to Port Terminal 5. An additional project component, which has not yet been evaluated for cost, may be to improve the signal system at the intersection of Chelan Ave SW at the western terminus of the corridor.

TABLE 5-5: PROJECT LIST (CONTINUED)

No	Project Title	Project Description
South		
40	SW Spokane Pl Reconstruction	Reconstruct and make operational/ITS improvements to SW Spokane Pl
41	SR 519 / Edgar Martinez Dr S	Reconstruct and make operational/ITS improvements
42	Railroad Crossing Delay Warning System (Crossings at S Holgate St, S Lander St, and S Horton St)	Install ITS equipment to monitor and inform the public of road closures due to train activity, and provide alternative routing options via of dynamic message signs that display real-time information to drivers at key locations.
43	S Hanford St Reconstruction	Improve access to the Main Seattle International Gateway (SIG) Yard. Examine the feasibility of installing a traffic signal and other potential changes to facilitate traffic flow in the area. If or when warranted, a traffic signal at the Main SIG entrance could alleviate congestion and allow for improved truck access to the yard. This project also rebuilds the segment of Hanford St between the East Marginal Way S and 1st Ave S to Heavy Haul route standards, including new pavement at railroad crossings. It may include rail crossing gates or other devices, if needed.
44	S Michigan St ITS Improvements (East Marginal Way S to Corson Ave S)	Update signal timing, vehicle detection, CCTV cameras, dynamic message signs and fiber communications to improve traffic flow and provide enhanced traveler information along S Michigan St
45	West Marginal Way SW / Chelan St SW Intersection Improvement	Intersection signal operational improvements for freight. There is another study underway to improve access for cyclists
46	W Marginal Way SW Reconstruction	Reconstruct and make operational/ITS improvements to West Marginal Way SW
47	1st Ave S Bridge ITS	Provide information and advance warnings about bridge openings during peak travel times for freight based on historical statistics and real-time information
48	Airport Way S / S Edmunds St intersection improvement	Monitor and evaluate for future signal warrants and address geometric issues.
49	S Bailey St Channelization and Operational Improvements (S Michigan St to Carleton Ave S)	Improvements for the eastbound left-turn movement to access the I-5 ramps, including a review of signal operations and channelization changes.
50	16th Ave S and East Marginal Way S Intersection Improvements	Improve northbound right-turn curb radius.
51	S Lucile St Reconstruction (S Airport Way to SR 99)	Reconstruction and make operational/ITS improvements.

TABLE 5-5: PROJECT LIST (CONTINUED)

No	Project Title	Project Description
South		
52	S Massachusetts St Rebuild (access road - Colorado Ave S to 1st Ave S)	Reconstruct S Massachusetts St to improve safety and access to North SIG Yard, while maintaining two-way operations. Seek to provide separated travel lanes for general purpose and truck traffic. Provide improved truck access/operations at the 1st Ave S / S Massachusetts St intersection.
53	Diagonal Ave S / S Oregon St / Denver Ave S Reconstruction (East Marginal Way (SR 99) to Union Pacific Argo Yard)	Rebuild existing truck route facility.
54	S Dallas Ave / 16th Ave S Intersection Improvement	Improve curb radius for northbound and westbound turning movements.
55	West Seattle Bridge access to Port Terminal 18 and Terminal 5	Provide access improvements from the West Seattle Bridge to Terminal 18 and/or Terminal 5 from West Seattle Bridge.
56	SR 99 access to Port Terminal 18 and Terminal 5	Provide access improvements from SR 99 to Terminal 18 and/or Terminal 5 from SR 99.
57	SODO Phase 1 ITS (SODO area)	Provide advanced warning for railroad closures to minimize queuing as well as improve traffic monitoring capabilities for major haul routes in the SODO area.
58	S Holden St Reconstruction	Reconstruct and make operational/ITS improvements to S Holden St
59	1st Ave S Reconstruction	Reconstruct and make operational / ITS improvements to 1st Ave S
60	6th Ave S Reconstruction	Reconstruct and make operational / ITS improvements to 6th Ave S
61	Duwamish Ave S Reconstruction/East Marginal Way Grade Separation Reconstruction	Reconstruct and make operational / ITS improvements to Duwamish Avenue S, Duwamish Ave Bridge and S Spokane St
62	Harbor Island Access Improvements	Reconstruct and make operational/ITS improvements to 11th Ave SW, SW Florida St, 16th Ave SW and Klickitat Ave SW. Project does not include non-City right of way (T18 access portions).
63	SW Klickitat Way Reconstruction	Reconstruct and make operational/ITS improvements to SW Klickitat Way
64	SODO Rail Corridor Grade Separation	Improve access to manufacturing and industrial center and Port facilities - use FMP project description
65	4th Ave S Reconstruction and ITS Implementation	Reconstruct and make operational/ITS improvements to 4th Ave S
66	S Industrial Way	Reconstruct and make operational / design improvements to S Industrial Way

TABLE 5-5: PROJECT LIST (CONTINUED)

No	Project Title	Project Description
Citywide		
67	Citywide Small Spot Improvement Program	Freight spot improvement program to help trucks move more quickly at key bottlenecks.
68	Integrated Corridor management on WSDOT operated facilities • NB SR 99 at SW 103rd St • SB SR 99 at N 145 St • I-5 at NE 145th St • Northgate Way between SR 99 and SR 522	Implement integrated corridor management (ICM) by establishingrelationships with other jurisdictions to install dynamic message signs ahead of major connections between I-5, SR 99 and SR 522 that would provide the opportunity for freight to avoid congestion on a given facility when it is present. Install dynamic message sign and/or push out data on I-5 conditions and back-ups. Implement additional permanent surface street data collection.

FIGURE 5-7: NORTH SEATTLE FREIGHT PROJECTS

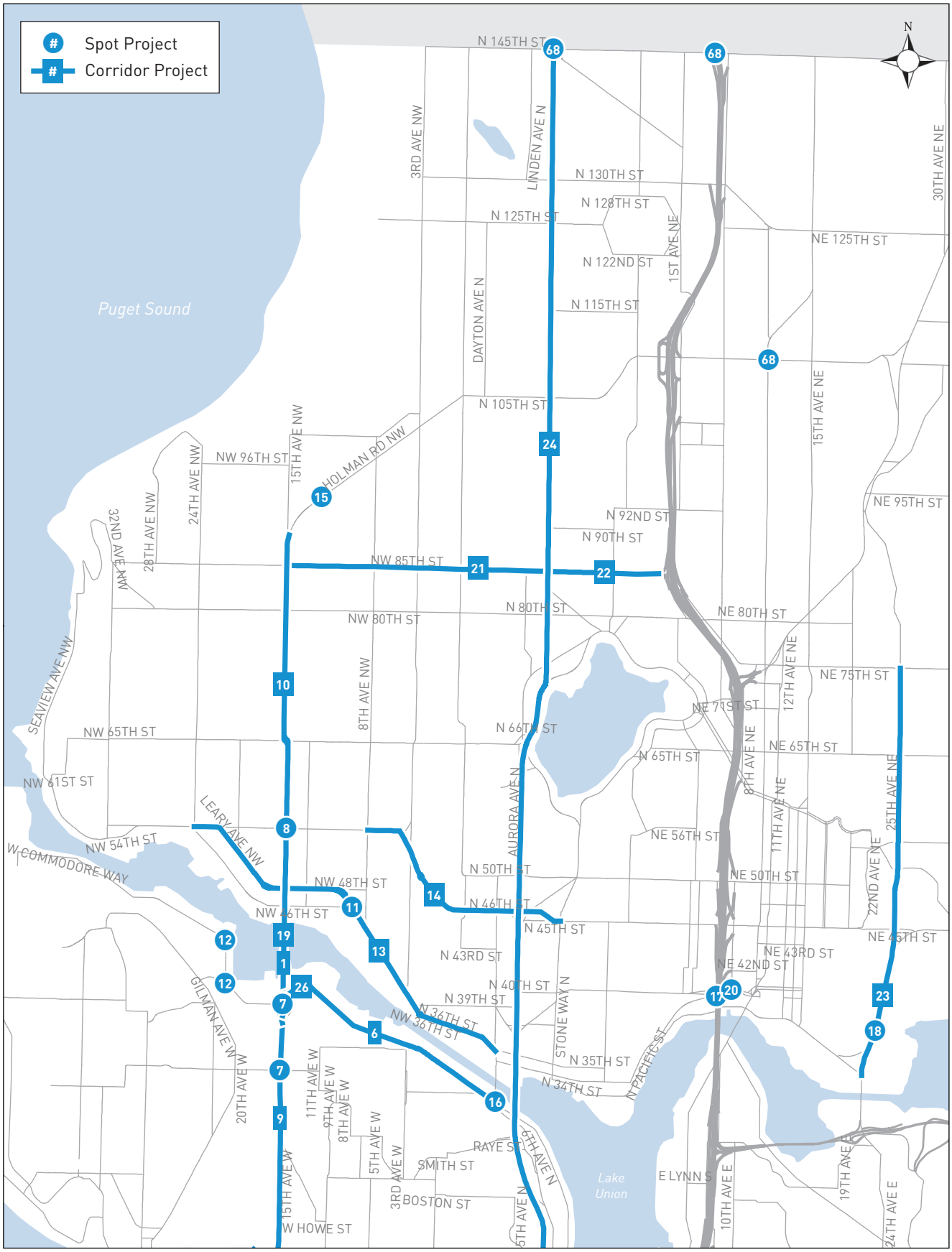


FIGURE 5-8: CENTRAL SEATTLE FREIGHT PROJECTS

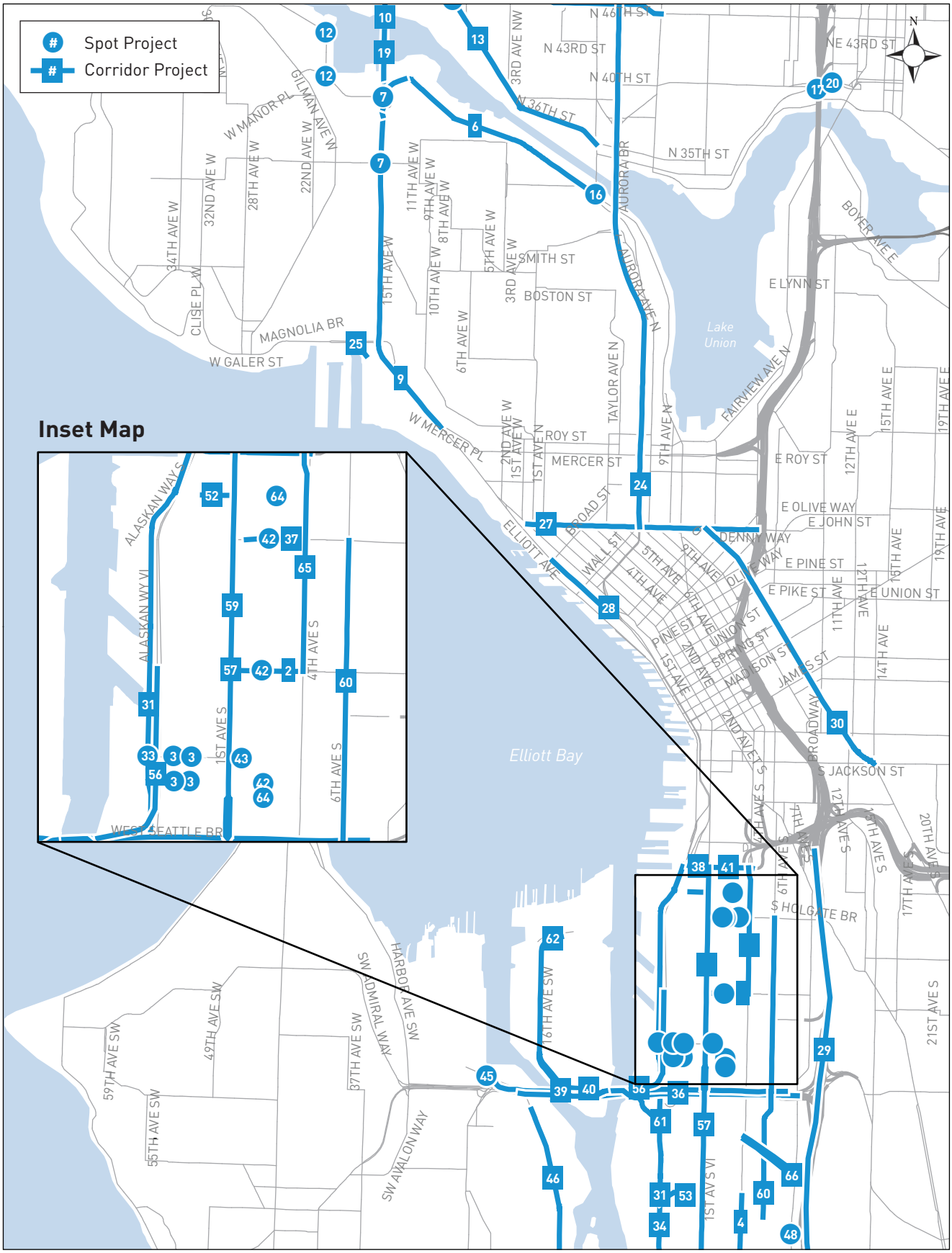
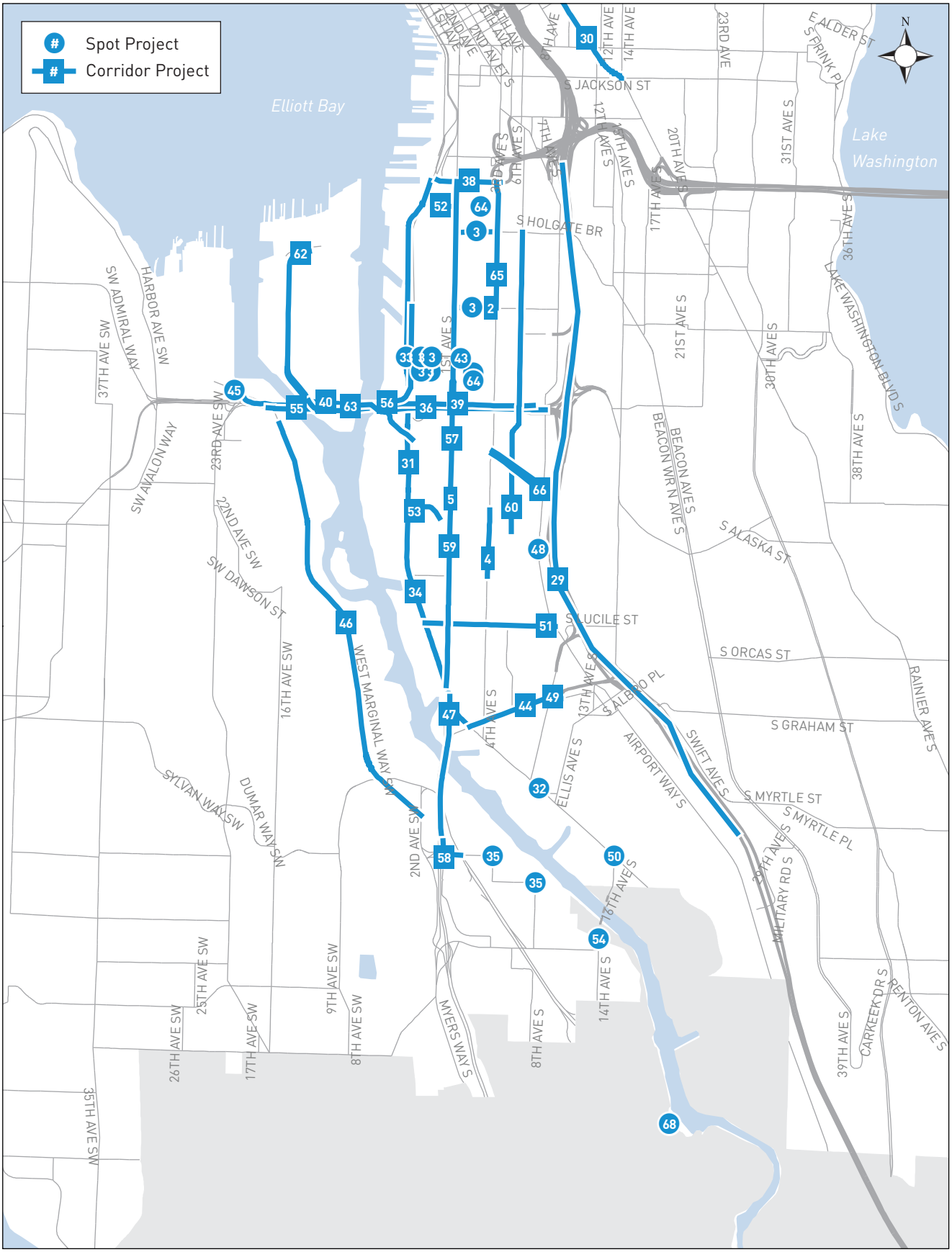


FIGURE 5-9: SOUTH SEATTLE FREIGHT PROJECTS

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CHAPTER 6: IMPLEMENTATION STRATEGY

IN THIS CHAPTER:

Now that we have looked at the issues affecting freight mobility, established a freight network, and identified projects to improve system performance, we need to develop an approach that will facilitate the funding and execution of these projects. This chapter presents the FMP implementation strategy.

The implementation strategy consists of several elements. These include a prioritization framework, an assessment of potential funding opportunities, and performance measures to track our progress moving forward. After Freight Master Plan (FMP) adoption, we will develop a 3- to 5-year Implementation Plan to outline near-term actions we will take to realize the plan. Unlike the city's other modal master plans, the FMP does not include planning-level cost estimates, which are typically derived by estimating standard unit costs. Due to the varied scales and complexities of freight projects, planning-level cost estimates will be developed for individual projects as they advance towards implementation.

PRIORITIZATION FRAMEWORK

A key factor that governs how goods movement in Seattle will change in the short- and long-term includes determining what projects, both large and small, should be implemented first. Full implementation of the FMP will take many years given the expected funding availability, which makes it important to develop a prioritization framework.

The prioritization framework is a data-driven evaluation tool based on achieving the FMP's vision and goals, while simultaneously providing enough flexibility to pursue projects based on specific opportunities. It uses both quantitative and qualitative criteria. Quantitative criteria are associated with each of the 6 FMP goals of safety, mobility, economy, state of good repair, equity, and environment. Quantitative evaluation criteria are outlined in Table 6-1.

In addition, qualitative criteria are important in the prioritization process, as not all prioritization considerations can be quantified. Qualitative criteria include potential to leverage other funding, community interest, policy directive, geographic balance, or other factors, as appropriate. Table 6-2 shows qualitative evaluation criteria.

FMP Implementation Plan

The implementation plan will be developed after FMP adoption and will be similar to those developed for our other modal master plans. Implementation plans typically identify near-term (3 to 5 year) improvements and strategies to move forward. The plans are regularly updated to ensure we can best:

- Match projects with annual funding availability
- Leverage opportunities with other projects and programs to strategically stretch our resources
- Secure and meet delivery commitments for grants and funding partnerships
- Package projects for efficient delivery
- Make implementation plan adjustments based on performance measurement and evaluation

Because the implementation plan will be updated regularly, the quantitative inputs we use to prioritize improvements can also be updated as new data is available.

TABLE 6-1: QUANTITATIVE EVALUATION CRITERIA

Goal	Criteria Description	Data Source
Safety	Prioritize locations that directly contribute to reducing truck collisions in high-collision locations and that contribute to the city's Vision Zero efforts. Safety criteria will focus on truck-related collisions and locations that have a higher potential for interactions between people driving trucks and people walking, bicycling, or taking transit.	• Truck collision history • Transit, bicycle and pedestrian master plan priorities that overlap with the freight network
Mobility	To create an efficient connected freight network, mobility criteria will prioritize locations on the Washington State Critical Urban Freight Corridors (CUFC) and Freight and Goods Transportation System (FGTS) and within manufacturing/industrial centers, urban centers, and urban villages. It will also prioritize areas with high forecasted truck volumes, and locations on the freight network.	• WSDOT CUFC network • WSDOT FGTS network • MIC, urban center, urban village boundaries • Average daily truck volumes • Freight network
Economy	Prioritize areas that have high concentrations of freight-related jobs and that provide direct and reliable freight connections to land uses that rely on the movement of goods.	• PSRC covered jobs data • MIC, urban center boundaries
State of Good Repair	Prioritize investments based on pavement condition and location on the regulatory networks.	• Pavement condition index • Heavy Haul network • Over-legal network
Equity	Prioritize investments in areas with high concentrations of low-income or minority populations to ensure appropriate measures can be taken to mitigate the impacts from freight.	• US Census Bureau
Environment	Prioritize projects that eliminate FMP bottleneck locations and/or reduce congestion on the freight network, thereby reducing idling and greenhouse gas emissions.	• FMP bottleneck analysis

TABLE 6-2: QUALITATIVE EVALUATION CRITERIA

Criteria	Description
Potential to leverage other funding	Initiating projects will help secure funding
Policy directive	Project specified by policy or City Council
Community interest	Local community or stakeholders have expressed interest in freight infrastructure improvements
Geographic balancing	Project improves the balance of funding spent among geographic sectors of the city

POTENTIAL FUNDING OPPORTUNITIES

Funding strategies for freight improvements are very different than for other transportation investments. The City of Seattle successfully makes the most of limited local dollars for transportation by leveraging those dollars with outside funding sources, such as grants and partnerships. However, most outside funds can only be used to create new facilities, add new travel capacity, or provide enhanced services.

In contrast, the City's greatest freight needs are to improve the condition and operations of existing facilities, not add new capacity or services. Although there are important outside partners that assist in making much-needed investments, most freight-supportive projects require direct city funding.

Fortunately, new funding opportunities are coming available just as the City moves into implementation of the Freight Master Plan. These opportunities are occurring at the local, state, and federal levels. Many of the state and federal funds are distributed through our regional metropolitan planning organization, the Puget Sound Regional Council. There are also new initiatives in public-private partnerships that can mutually serve public transportation efficiency and economic prosperity.

Local

In addition to traditional City of Seattle transportation funds, the recent Levy to Move Seattle package includes funding for freight projects that, together with other modes of transportation, creates an integrated 10-year transportation network. Specific levy-funded freight investments are identified in Table 6-3.

By using levy funding together with traditional City transportation funding, we can make significant progress on both signature projects and system-wide freight needs. Once the levy expires, additional local funding will need to be identified in future years to complete the vision of this 20-year plan.

As examples, Move Seattle includes earmarks for the S Lander St Grade Separation for freight reliability and for E Marginal Way to develop Seattle's Heavy Haul network serving Port of Seattle operations. The Levy also greatly enhances the Freight Spot Improvements Program, which strategically targets key locations that together significantly enhance freight safety and mobility.

The Port of Seattle has also committed to contribute between $10 million and $20 million through 2035 for future roadway repair and construction projects located on Seattle's Heavy Haul network to benefit the movement of cargo within the Seattle harbor. The funds will go towards improvements of roadways that connect the Port's shipping terminals, rail yards, warehouse, and trans-load centers as part of the Heavy Haul network.

TABLE 6-3: LEVY TO MOVE SEATTLE FREIGHT-SUPPORTIVE INVESTMENTS

Project	Levy Investment
Spot Improvements: Fund a targeted spot improvement program to help freight movement	$14M
Heavy Haul Network: Build the East Marginal Way corridor, a key route in Seattle's Heavy Haul Network	$5M
Partnership Improvements: Provide local money to design and build the Lander Street Overpass	$20M
Intelligent Transportation System Improvements: Implement Next Generation ITS Improvements to help all travelers move more reliably around the city and provide improved information for travelers	$17M
Traffic Signal Timing Improvements: Optimize traffic signal timing on 5 corridors throughout the city each year to improve traffic flow and serve people in cars and trucks, on bicycles, transit, and foot	$13M
Bridge Replacement: Plan and design high priority bridge replacements to begin construction after 2024. Of the funds identified in this element, up to $10M of total funding (local, levy, leverage) may be used for implementing near-term pedestrian and bicycle safety projects on bridges being studied for replacement (in addition to funding provided for pedestrian and bicycle safety projects in other elements).	$15M
Paving Spot Improvements: Repave 65 targeted locations every year, totaling about 70 lane-miles of arterial street, with a repair and maintenance program run by City crews	$15M
Arterial Roadway Maintenance: Repave up to 180 lane-miles of arterial streets, maintaining and modernizing 35% of Seattle's busiest streets carrying the most people and goods (also funded through the 7 enhanced transit corridors, below)	$235M
Transportation Operations: Maintain and improve the City's system of traffic signals, signs and markings.	$37M
Safety Corridors: Complete 12 – 15 corridor safety projects, improving safety for all travelers on our highest-crash streets	$23M

State

The State of Washington recognizes and supports freight mobility and safety, which contributes substantially to the state's overall economic vitality. Washington serves as a key export engine for the United States using rail, roadway, and marine freight systems.

Recently, the state has become a recognized leader in freight policy by adopting the Washington State Freight Mobility Plan. The Plan identifies key multimodal freight facility networks and collaborates with the City of Seattle, Port of Seattle, and other agencies to focus freight investments in projects that best serve statewide needs.

State funds dedicated to support local freight needs are administered by the Freight Mobility Strategic Investment Board (FMSIB). FMSIB has long been a partner with Seattle in key investments, and will see its role greatly expanded as it administers new federal funds available for local freight projects. Additionally, freight projects could be eligible for arterial and preservation funding programs administered by the Transportation Improvement Board (TIB).

Federal

In December 2015 a new federal transportation funding bill was signed into law called the Fixing America's Surface Transportation (FAST) Act. For the first time in federal transportation policy, the FAST Act recognizes and establishes dedicated funds for freight needs nationwide. The State of Washington is slated to receive $110 million over 5 years to distribute through FMSIB to local agencies. The Act also sets aside $4.5 billion in competitive grants for freight projects of regional and national significance. The FASTLANE program is one such grant program in the FAST Act to fund critical freight and highway projects across the country. The FAST Act authorizes $800 million in funding for the FASTLANE program for fiscal year 2016. While some of the latter funds are reserved for specific facilities, the City of Seattle is eligible to compete for much of the available funding.

Private Partnerships

In recent years public agencies and private entities have worked to become frequent partners in implementing critical transportation facilities and services. In addition to operational relationships with railroads and the Port of Seattle, new technologies and transformative travel options are making major partnerships for freight mobility both practical and mutually beneficial.

Other Implementation Strategies

Lastly, other transportation investments that are not specifically driven by freight needs can still benefit freight mobility and safety, and vice versa. We take an integrated approach to developing projects that serve freight as well as transit, bicycle, pedestrian, and general traffic needs. By taking this integrated approach, we can save money by building transportation improvements together, and limit construction impacts on neighborhoods.

PLAN PERFORMANCE MEASURES

Performance measures in the FMP are important for assessing whether the plan is meeting its goals over time. While they are focused on assessing progress over the long term, data on these measures should be readily available and collected on a regular basis to help track interim progress being made. This information will allow for course adjustment to help ensure achievement of our goals. Performance measures are generally outcome-based and are focused on achieving policy objectives, rather than concrete project or program deliverables. The intent of outcome-based performance measures is to determine whether investments are effectively achieving desired Plan outcomes.

Table 6-4 identifies the 5 FMP performance measures we will use to track our progress moving forward and the Plan goals each measure supports. The table also provides desired trends for each measure and the baseline data source to provide a foundation for comparing Plan performance moving forward.

TABLE 6-4: FMP PERFORMANCE MEASURES

Measure	FMP Performance Measure	Desired Trend	Data Source	Baseline measure	FMP Goal addressed					
					Economy	Safety	Mobility	State of Good Repair	Equity	Environment
1	Travel time on select FMP network corridors	Improve reliability rate	SDOT city-wide speed and reliability program	2016 travel times on identified FMP network corridors	X		X			X
2	Number of collisions involving trucks	Decreasing number	SDOT collision database, sourced from traffic collision reports	2015 truck collisions	X	X			X	
3	Number of fatal and serious injury collisions involving trucks	Fatal and serious injury collisions involving trucks reach zero by 2030	SDOT collision database, sourced from traffic collision reports	2015 fatal and serious truck collisions	X	X			X	
4	Percent of FMP network segments with annual volume counts	Increase the number of FMP network segments with annual counts	SDOT city-wide count program	2016 FMP network segments with annual count locations	X	X	X			
5	FMP network miles of major truck streets in fair or better pavement condition	Maintain and/or improve pavement condition on major truck streets	SDOT pavement condition index	2015 pavement condition on major truck streets	X	X	X	X	X	X

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