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.

ASSESSING THE NETWORK

We evaluated safety and mobility issues associated with the recommended 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 ZERØ

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.

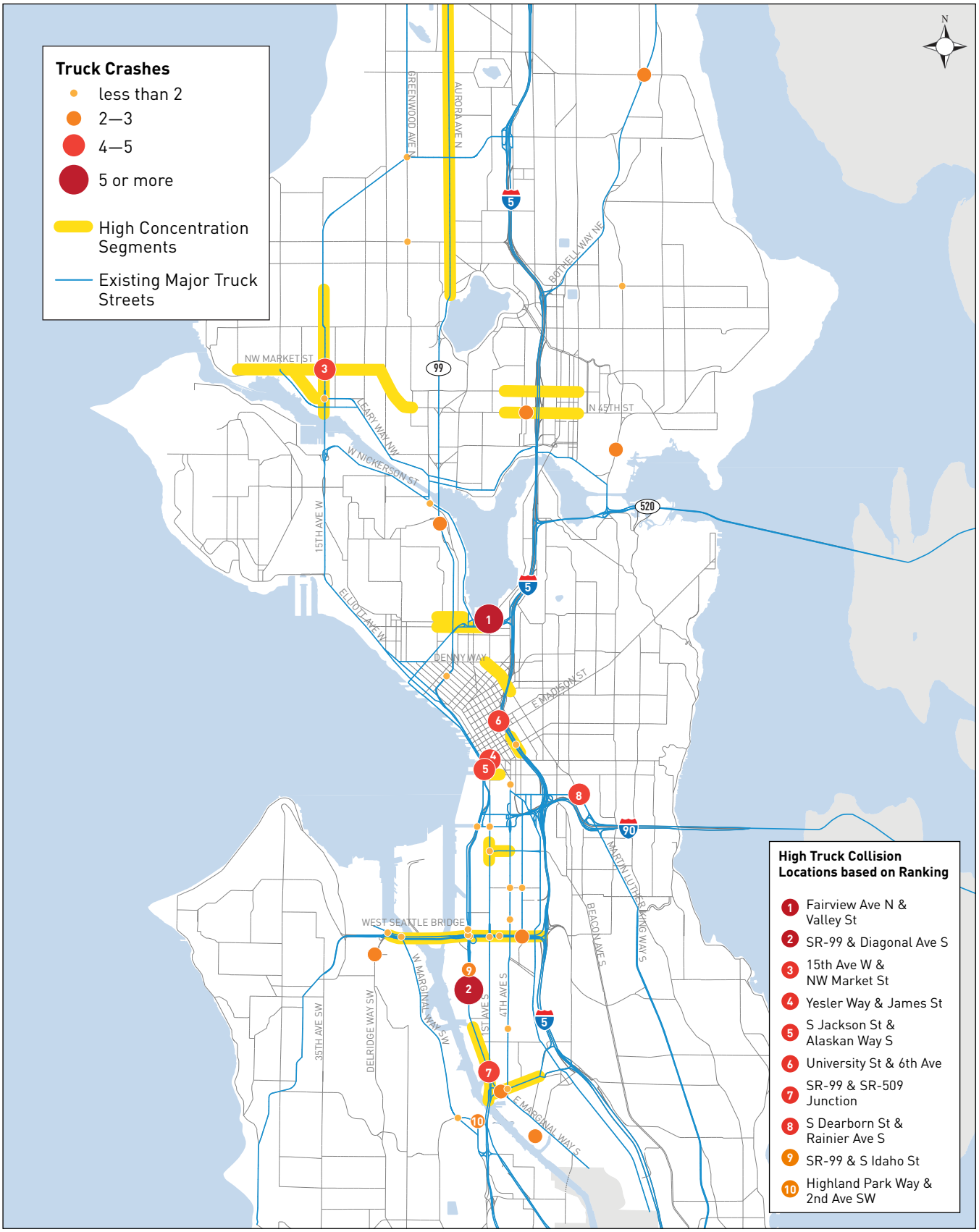
TABLE 5-1: TRUCK COLLISION – HIGH CONCENTRATION SEGMENTS (JANUARY 2009 – MAY 2014)

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/South 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 recommended freight network.

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 along key freight corridors can create bottlenecks because 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, Market Street, and other urban arterials and local roads.

Seattle has over 100 at-grade railroad crossings.[1] At these locations, trucks are stopped at the tracks when trains are passing 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. However rail movements are also vital for freight movement to/from the Port; hence prioritizing one over the other creates difficult trade-off decisions. Creating grade separation between the conflicting modes is one way to enable both to move continuously without impacting the other.

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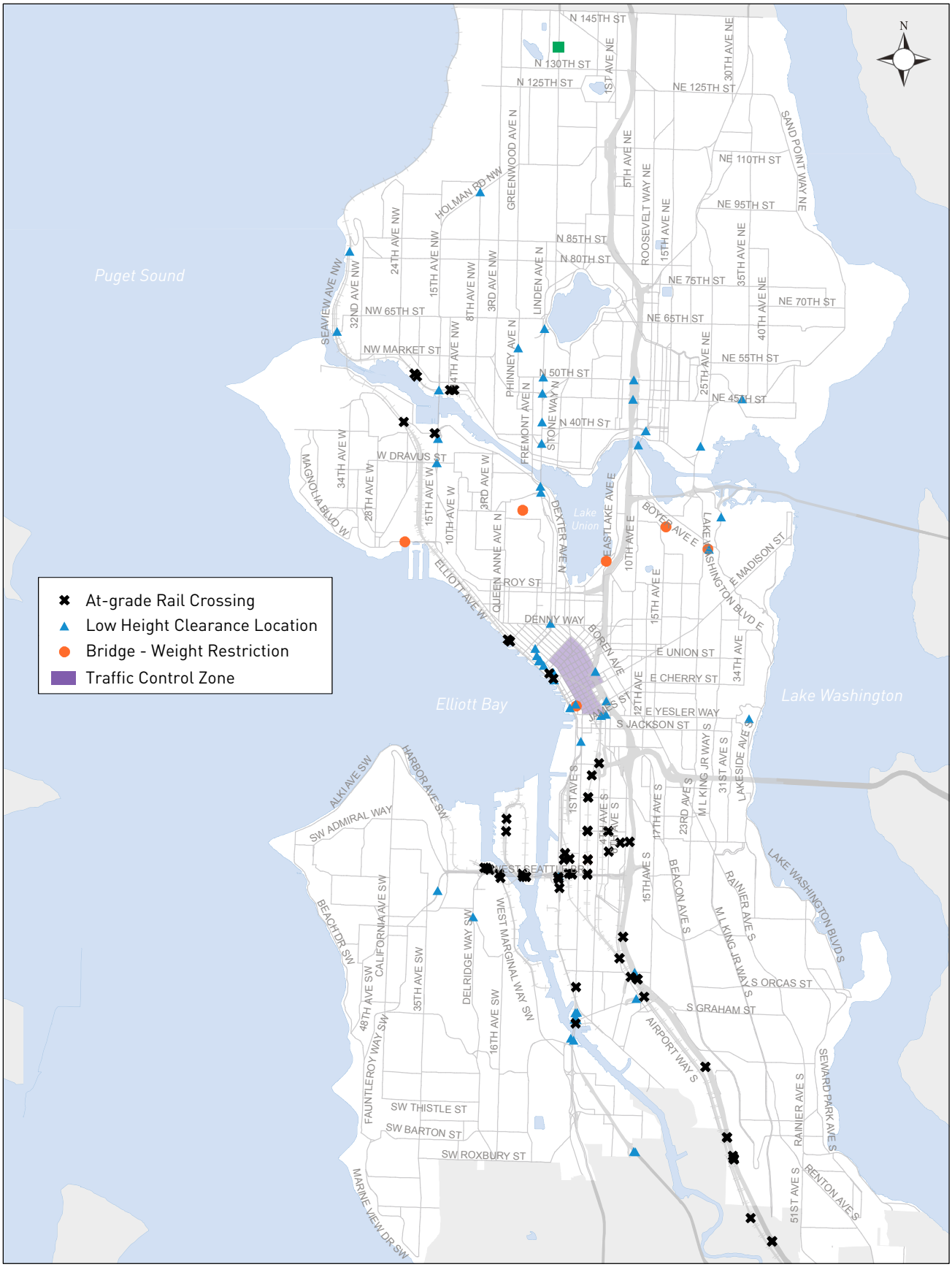
[1]PSRC. July 2014. Economic Evaluation of Regional Impacts for the Proposed Gateway Pacific Terminal at Cherry Point. Staff Summary and Supplemental Information.

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 Avenue N north of the Fremont Bridge
- Portions of Greenwood Avenue 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?

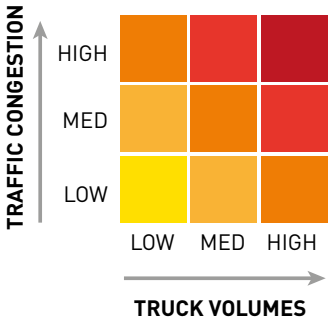
A freight bottleneck is a location where traffic flows are constrained to a point where they experience significant delay and can come to a complete halt. Typical bottlenecks include locations where multiple roadways funnel into one facility (e.g., at bridges), or where capacity on a facility is reduced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

Bottleneck Analysis

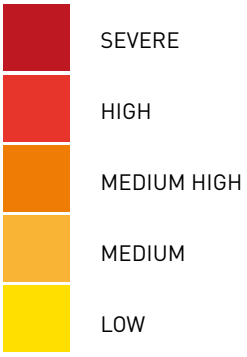
Because congestion is widespread during peak periods and will likely continue to worsen in the future, it is important to identify congested areas that have the most impact on truck travel. To do this, locations of projected future traffic congestion were identified and overlaid on a map of 2035 truck 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	
15th Ave/Ballard Bridge (Nickerson St to 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

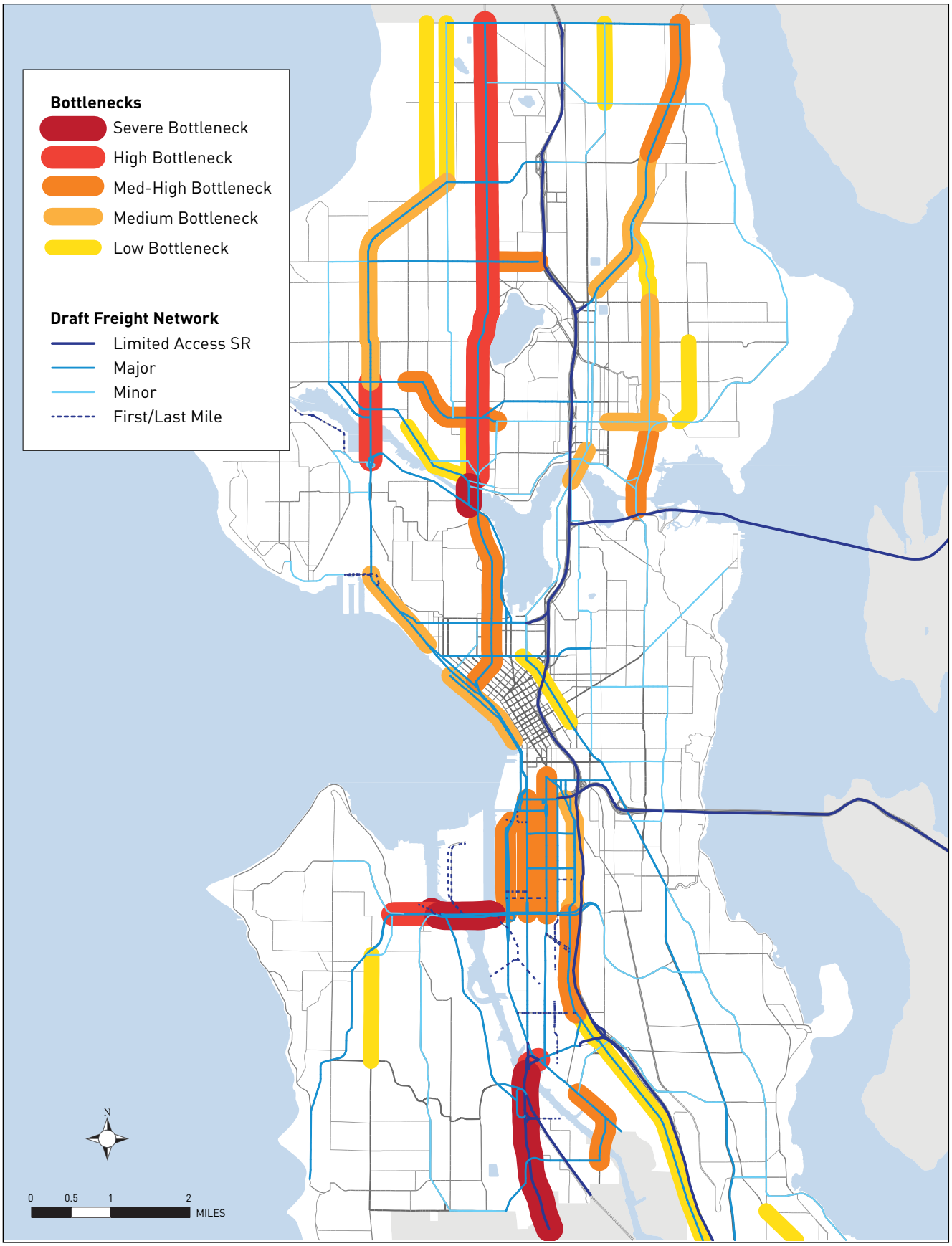
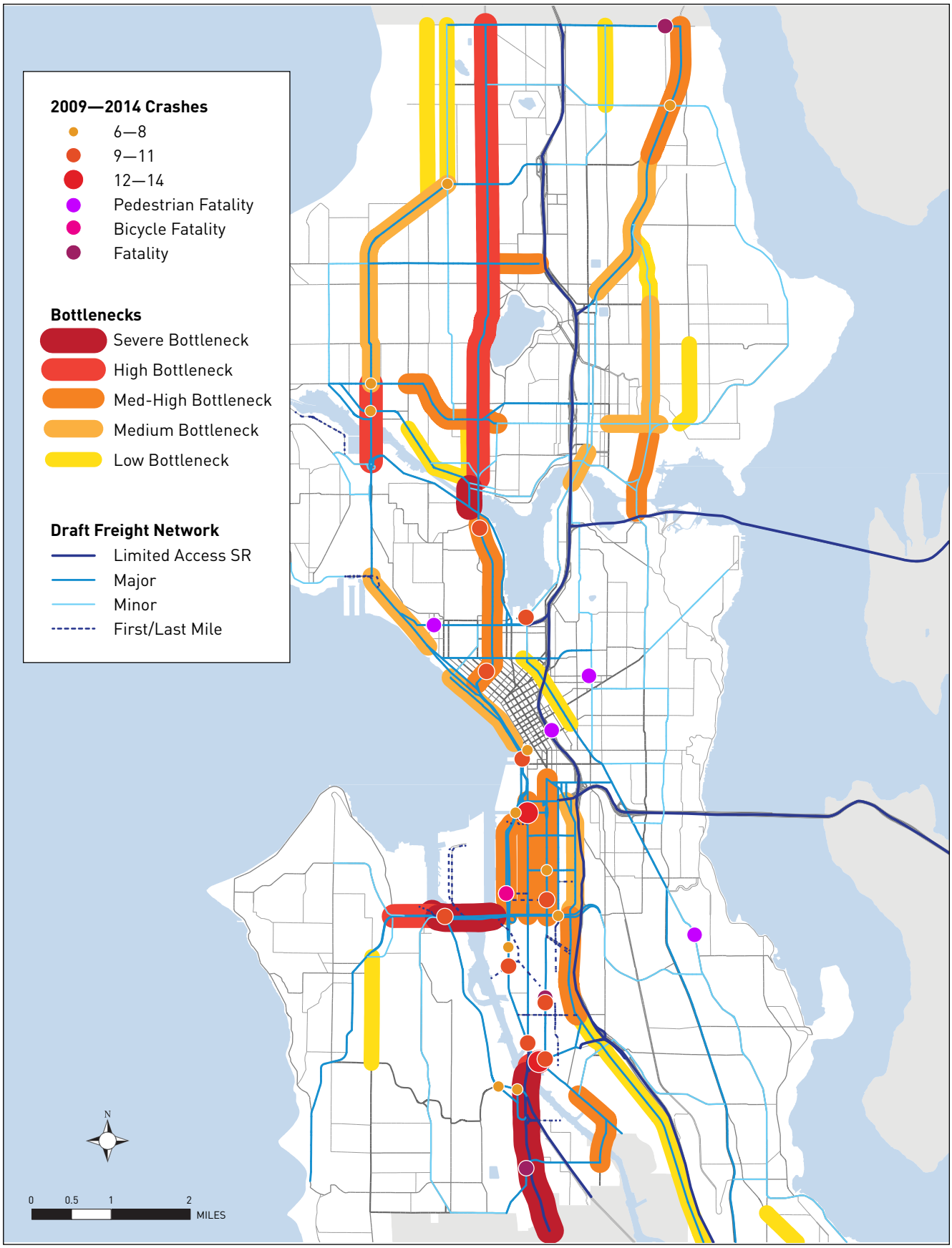


FIGURE 5-5: FREIGHT BOTTLENECK AND SAFETY LOCATIONS



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
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			
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.

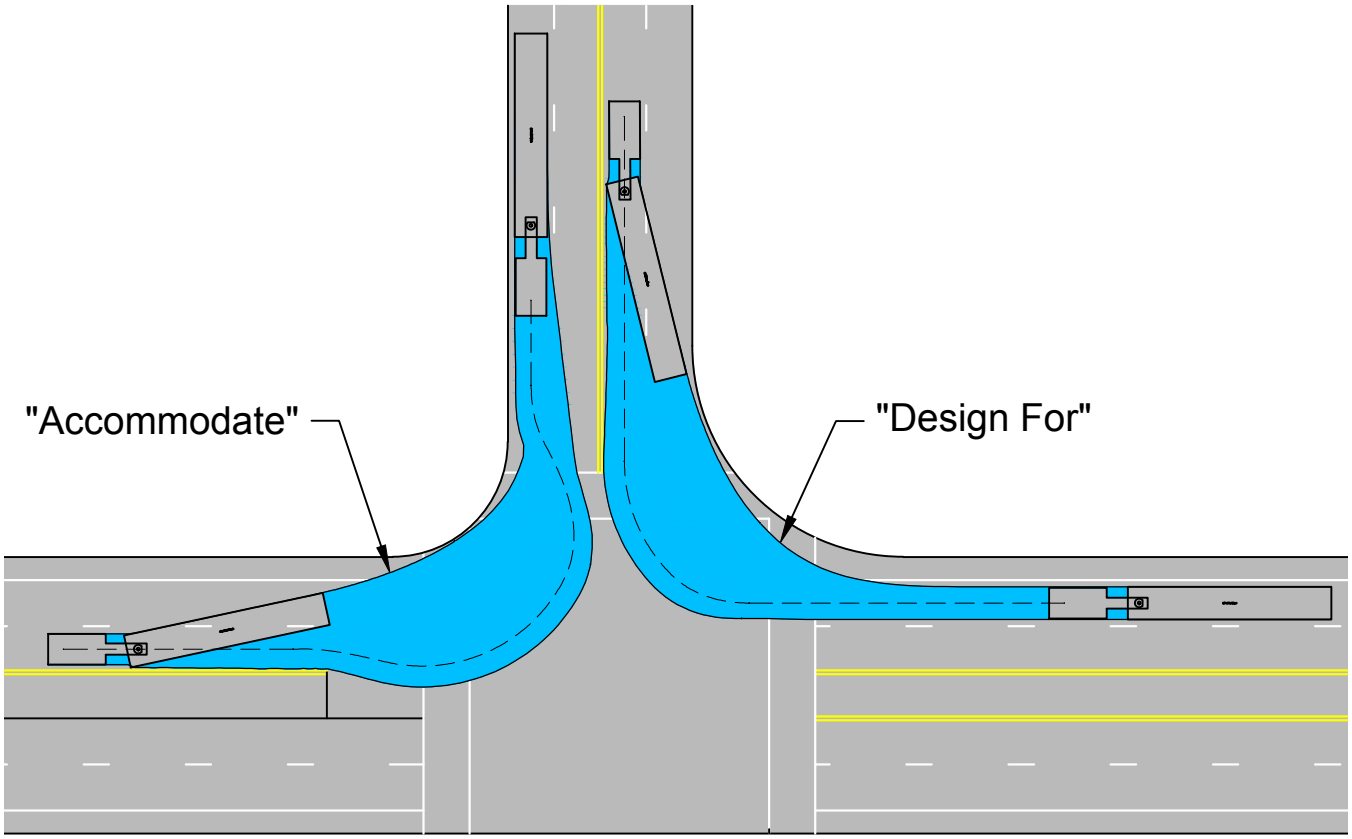
Accommodating for a vehicle allows encroachment of other lanes, shoulders, or other elements to complete the required maneuver. Designing for a vehicle does not require encroachment onto those elements. Typically, an intersection turn movement is considered "designed for" if the design vehicle is allowed 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 VERSUS 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. Other strategies include increasing the tree canopy and reducing truck idling 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 Utilize 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 through the Move Seattle Levy
	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 Maintain 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 Maintain 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 Minimize 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 Minimize 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
	1.10.2 Design bicycle facility treatments to provide predictable movement of people on bicycles
1.11 Minimize conflicts between pedestrian and freight mobility	1.11.1 Design pedestrian facility treatments to provide predictable movement of people walking
	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, and/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, and/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

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 axels
	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 enhance freight mobility, reduce conflicts, and increase safety
	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, and respond to industry changes

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 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 street technology.
	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

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 and/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 the Levy to Move Seattle, SDOT's Large Capital Program prioritization, and Freight Access Project lists to determine if they addressed freight bottleneck 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 55 projects that apply a variety of solutions presented in the freight toolbox. Eighteen of these are new projects not previously identified in other planning efforts.

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. 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.

TABLE 5-5: PROJECTS

Project Title	Project Description
Catalyst Projects	
Ballard Bridge Replacement	Address capacity constraints and bridge access for the Ballard Bridge.
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.
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.
4th Avenue South Viaduct Replacement (4th Ave 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.
1st Ave S Viaduct over UPRR Yard (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.

TABLE 5-5: PROJECTS (CONTINUED)

Project Title	Project Description
North	
BINMIC Truck Route Improvements (Area bounded by Dravus St, Nickerson St, Market St, and Fremont Ave)	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.
15th Ave W Spot Improvements at W Dravus St and W Emerson St	This project addresses turn radii issues for trucks 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 and 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 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.
15th Ave NW / NW Market St Intersection Improvement	Improve southeast corner curb radius, which would impact existing signal equipment.
NW Leary Way at 46th St or 45th St (46th St to Shilshole Ave)	Intersection operations should be evaluated and treatments considered to improve access to/from 46th Street or 45th St. Type of improvements to be coordinated with outcomes of the BINMIC Truck Route Improvements.
Intersection of West Emerson St / 21st Ave W / W Commodore Way	Rebuild 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.

TABLE 5-5: PROJECTS (CONTINUED)

Project Title	Project Description
North	
NW Market Street / Leary Way / N 36th Street Rebuild (N 46th Street to Shilshole Ave)	Rebuild and make operational/ITS improvements to Leary Way corridor to facilitate freight movement. This project would coordinate specific truck operational improvements with the BINMIC Truck Route Improvements.
Holman Road / 13th Ave W Intersection improvements	Remove height limitation from existing pedestrian overpass and install half signal.
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.
Intersection improvements at 6th Ave NE and NE 40th St	Intersection improvements at 6th Ave NE and NE 40th St.
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.
Ballard Bridge Access Improvements	Address capacity constraints and bridge access to the Ballard Bridge.
7th Ave NE/ 40th St E Intersection Improvements	Reconfigure intersection to facilitate turning and crossing movements at 5-leg intersection.
Integrated corridor management system on N 85th St between 15th Ave NW/Holman Rd 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.
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.
Dynamic message signs along 15th Ave NW corridor (Ship Canal to Holman Road)	Install dynamic message signs to provide travel conditions on major freight corridors prior to connecting to Major Truck Streets.
Dynamic message signs along 25th Ave NE corridor (Ship Canal to Montlake/75th St)	Install dynamic message signs to provide travel conditions on major freight corridors prior to connecting to Major Truck Streets.
Mobility improvements along NW Market St between 8th Ave NW and Stone Way	Restrict left turns at non-critical intersections to improve East/West mobility for freight.
ITS improvements Aurora Ave N from Ship Canal to N 145th St	Modify signal timing on northbound Aurora Ave to improve freight traffic during the morning peak.
15th Ave / Elliott Ave Rebuild (Mercer Place to Holman Road NW)	Rebuild and make operational/ITS improvements to 15th Ave/ Elliott Ave.

TABLE 5-5: PROJECTS (CONTINUED)

Project Title	Project Description
Central	
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.
Elliott Ave truck lanes (Broad Street to SR 99 ramps)	Study and implement freight-only lanes for southbound truck traffic.
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.
ITS upgrades on Boren Ave from Howell St to Jackson St (Rainier Ave to Deny Way)	Upgrade all signals in Major Truck Street corridor to current standards and improve north-south mobility in center city.
South	
E Marginal Way Corridor Improvements (S Royal Broughman St to S Idaho St)	Reconstruct a core freight route to heavy haul vehicle standards and offers safety and operational improvements for all users. Serves SODO's freight terminals and the center of the Duwamish industrial district. Incorporates separate bicycle and pedestrian facilities while maintaining freight efficiency.
E Marginal Ave 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.
E Marginal Way / 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.
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.
Lower 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.

TABLE 5-5: PROJECTS (CONTINUED)

Project Title	Project Description
South	
S Holgate St Rail Crossing Improvements (S Holgate St from Occidental Ave to 4th Ave S)	Rebuild the pavement to Heavy Haul route requirements, improve channelization and signage, add new curb/gutter, and provide sidewalks along the south side outside the immediate crossing areas.
S Atlantic St Corridor Improvements (S Atlantic St - Alaskan Way to 4th Ave S)	As the SR 99 bored tunnel is completed, SDOT will regularly monitor travel conditions to evaluate potential changes in corridor operations. This project would implement signal, channelization, and ITS improvements based on the results of the monitoring program.
S Spokane St ITS Upgrades (Chelan Ave to 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 Airport Way and Chelan Avenue, 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 at the western terminus of the corridor.
1st Ave S / Atlantic St Intersection Improvements	Enhance signal operations and lighting at the intersection by installing new LED street lighting and right-turn overlap signal phases on the east and west approaches. The project would also improve the turn radius for trucks at the southeast corner of the intersection by widening the northbound right-turn lane. Pavement marking improvements are included to enhance the visibility and durability of the lane lines and crosswalks.
Railroad Crossing Delay Warning System (Crossings at Holgate, Lander, and Horton streets)	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.
S Hanford St & Main SIG Yard Access Improvements (entrance and intersection)	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 E 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.
S Michigan St ITS Improvements (E 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
W Marginal Way / Chelan St Intersection Improvement	Intersection signal operational improvements for freight. There is another study underway to improve access for cyclists.
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.

TABLE 5-5: PROJECTS (CONTINUED)

Project Title	Project Description
South	
E Marginal Way S railroad track removal (Diagonal St to 1st Ave Bridge or W Marginal Way)	Improve pavement and remove unused rail lines.
Airport Way S / Edmunds Street intersection improvement	Monitor and evaluate for future signal warrants and address geometric issues.
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.
16th Avenue S and E Marginal Way S Intersection Improvements	Improve northbound right-turn curb radius.
S Lucile Street Rebuild (Airport Way to SR 99)	Rebuild and make operational/ITS improvements.
Massachusetts St Rebuild (access road - Colorado Ave to 1st Ave S)	Rebuild Massachusetts St to improve safety and access to North SIG Yard, while maintaining two-way operations. Roadway would be segregated for general purpose and truck traffic. Provide improved truck access/operations at the 1st Ave S / S Massachusetts St intersection.
Diagonal Ave S / S Oregon St / Denver Ave S Rebuild (East Marginal Way (SR 99) to Union Pacific Argo Yard)	Rebuild existing truck route facility.
S Dallas Ave / 16th Ave S Intersection Improvement	Improve curb radius for northbound and westbound turning movements.
West Seattle Bridge access to Port Terminal 18 and Terminal 5	Provide direct freight access from the West Seattle Bridge to Terminal 18 or Terminal 5 from West Seattle Bridge.
SR 99 access to Port Terminal 18 and Terminal 5	Provide direct freight access from SR 99 to Terminal 18 or Terminal 5 from SR 99.
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.
Citywide	
Citywide Small Spot Improvement Program	Freight spot improvement program to help trucks move more quickly at key bottlenecks.
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 establishing relationships 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.