CITY OF SEATTLE

West Seattle Bridge / Duwamish Waterway Corridor

Whitepaper and Priority Investment List

Prepared for Councilmember Tom Rasmussen

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SDOT

Seattle Department of Transportation

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Introduction

Background

The crossing over the Duwamish River that connects West Seattle neighborhoods, the Duwamish Industrial Area and Port of Seattle terminals to downtown Seattle and the overall regional transportation network has long been one of the City's busiest and most fragile travel corridors. With rapid growth in both West Seattle and Center City over the last decade, along with a significant share of the population shifting modes from single occupancy vehicles to transit, and with reconstruction of the SR 99 corridor still ongoing, this fragility has become an increasingly unpredictable part of daily life for West Seattle residents and other travelers on the corridor. This document originates with a directive from Mayor Murray, at the request of Councilmember Tom Rasmussen, for the Seattle Department of Transportation (SDOT) to compile recommended projects and strategies from an array of recent plans into a single point of reference for residents and employers, as well as city and regional decision makers who have the power to allocate resources, to understand, react to, fund and implement the City's stated priorities for producing more resiliency, dependability and redundancy in this key corridor.

While this corridor has seen a series of important improvements over the last 35 years, from the new high level West Seattle Bridge, to the replacement and widening of the Spokane St Viaduct, new grade separation projects at Atlantic St and Royal Brougham, much improved transit connections with the RapidRide C line and more modest improvements, including the Port of Seattle's East Marginal flyover project and improved bike facilities, there is still much work to be done. The replacement of the Alaskan Way Viaduct surely, if very slowly, is becoming a reality. The Mayor's Move Seattle Plan pledges a Lander St Overpass and reconstruction of East Marginal Way as top priorities for the City over the next 10 years, along with greatly improved, safer bike connections between the west side of the Swing Bridge and the key connections to West Seattle neighborhoods that fan out from it. And maybe most importantly, the Mayor has made one of his top priorities for a November 2016 regional ballot, what may be the Holy Grail of improved connectivity with West Seattle: a grade-separated, rapid, high capacity light rail connection to downtown Seattle and beyond.

Corridor Description

The primary West Seattle Bridge Corridor area is between Fauntleroy Way and I-5 and the secondary corridor area extends beyond to provide connections to downtown Seattle and the I-90, SR 519, SR 99 and SR 509 state-owned facilities. It also includes the West Seattle Bridge and Spokane St between 39th Ave SW/Fauntleroy Way S and I-5.

Between SR 99 and I-5, the connections across the Duwamish function in some places like limited access highways and in others like city arterial Sts. The Spokane St Viaduct speed limit is 40 mph while on the rest of the corridor, the West Seattle Bridge functions more like a limited access facility with a speed limit of 45 mph. Lower Spokane St functions as a city arterial, with a speed limit of 30 mph.

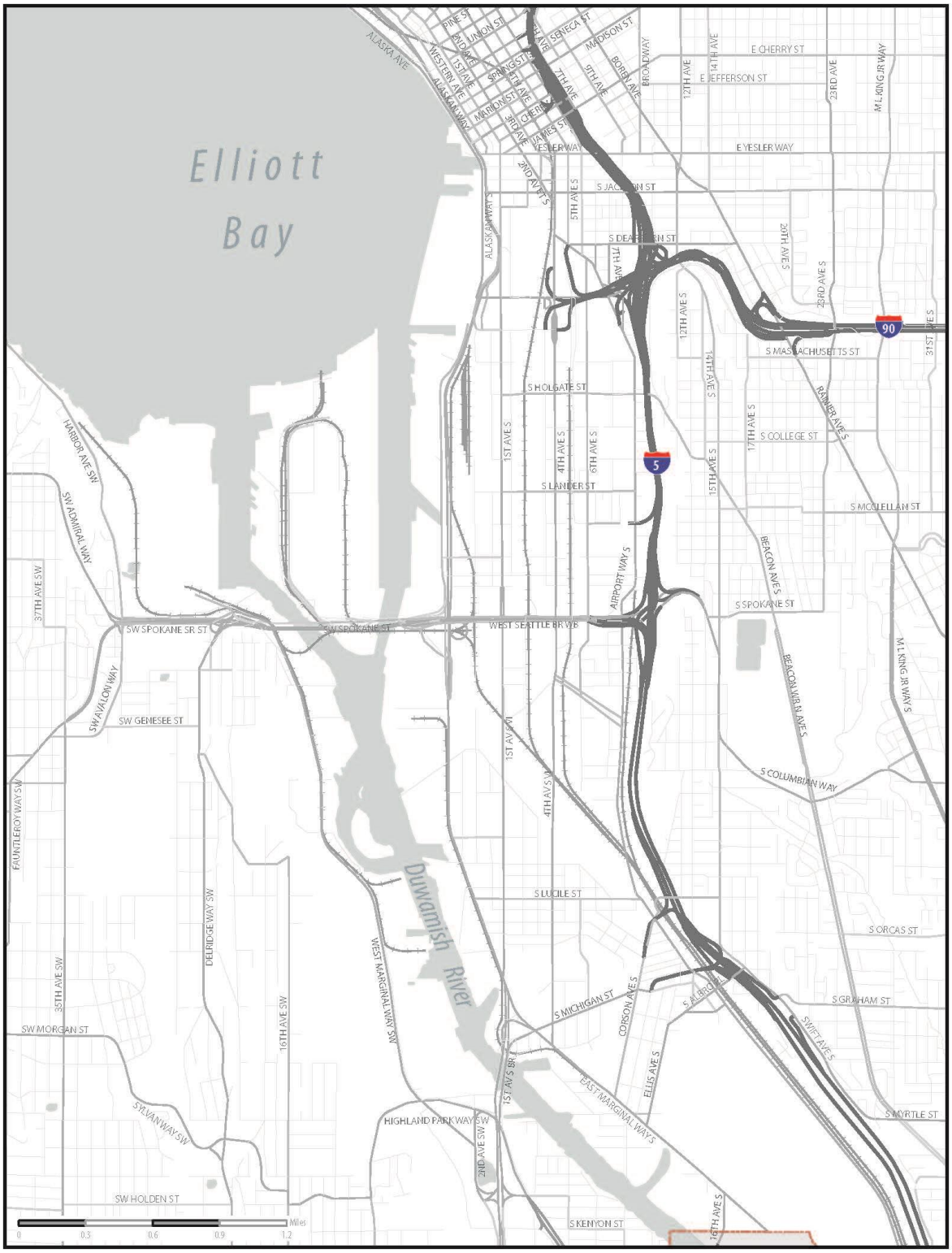


Figure 1: West Seattle Bridge/Duwamish Waterway Corridor

Current Use

The capacities of the key facilities are as follows:

Facility	Vehicles per day (vpd)
West Seattle Bridge	93,000 vpd
Spokane St Viaduct	77,200 vpd
Lower Roadway	13,100 vpd
Spokane St east of SR 99	9,200 vpd

Both the Class 1 Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) Railroads have lead tracks that cross East Marginal Way south of Spokane St with connections to West Seattle. All container trains destined to or from Port of Seattle Terminals 5 and 18 use these lead tracks. In addition, local industries in West Seattle and on Harbor Island also receive train shipments (e.g., rail barge, steel mill). When all terminals are active, there are approximately four trains per day serving Port functions, in addition to trains serving West Seattle industrial functions.

The project list on pages 7 and 8 provides an overview of the recommended projects and traffic management strategies. Each project on the list is referenced to a section within this whitepaper that provides greater context for the improvement, along with more information about the rationale and benefits gained for the corridor once implemented. None of the projects listed are original to this document. All have been vetted, developed or recommended in previous planning efforts or operational analyses. The sources include:

- *Move Seattle: Mayor Edward B. Murray's 10-Year Strategic Vision for Transportation,* Seattle Department of Transportation, Spring 2015
- *Traffic Incident Management in Seattle: Observations and Recommendations*, Sam Schwartz Engineering and TranSafe Consulting, July 2015
- *South King County HCT Corridor Study: Final Report*, Sound Transit, August 2014
- *ITS Strategic Plan, 2010-2020,* Seattle Department of Transportation, March 2010
- *City of Seattle Next Generation ITS Plan*, Prepared by Transpo Group for Seattle Department of Transportation, 2014
- *Seattle Industrial Areas Freight Access Project*, Seattle Department of Transportation and Port of Seattle, May 2015
- Seattle Freight Master Plan, Seattle Department of Transportation (In progress, scheduled to be completed early 2016)

As can be seen from the project list, several of the recommended projects, strategies and protocols can be quickly implemented at low cost and low impact, but with relatively big improvements in reliability and reducing impacts of traffic incidents. Other projects on the list, such as the S Lander Overpass and light rail to West Seattle are much closer to getting fully funded than anyone was predicting just a couple years ago. However, these projects will also require a strong push both with local voters and granting agencies in Olympia and Washington DC. Several other projects, including ITS investments, safer bike connections to the lower Swing Bridge and spot transit improvements can be made somewhat rapidly but will only be funded if the Move Seattle levy is approved by Seattle voters in November.

West Seattle Bridge / Duwamish Waterway Project List

KEY		BENEFIT/COST
Acronym — *Whitepaper Title (Author)* T/NM = Transit and Non-Motorized (Candida Lorenzana) IM&T = Incident Management and Traffic (Ron Borowski) I = Infrastructure Investments (Tony Mazzella) B&MO = Swing Bridge and Marine Operations (John Buswell)	= pedestrian/bicycle = transit = general purpose = truck = bridge operations	= low = medium = high $ = below $100,000 $$ = $100,101 to $1M $$$ = above $1M to $10M $$$$ = above $10M

Early Start (initiate in 0-12 months):

Type/Benefit	#	Project	Cost Estimate[1]	Funding Source	Benefit/Cost	Whitepaper section T	NM	IM&T	I	B&MO	Priority Level	Page #
	1	**Red bus lane on West Seattle Bridge**: Paint existing bus lane red to more clearly designate the bus lane and potentially reduce violations.	$200,000	TBD	$$	√					1	12
	2	**Seattle Transit Benefit District (TBD)** Transit Service Investments – Improvements to frequency and reliability on Rapid Ride C and Routes 21, 55, 60, 120 (2015). Restructure C Line to originate from South Lake Union instead of Ballard for improved reliability and access to employment centers (March 2016)	Improvements Included in STBD annual $40 million investment	STBD	$$$$	√					1	12
	3	Various **feasibility studies** to determine operational and design improvements to increase safety and mobility on the Upper Bridge. Refer to whitepaper for detailed descriptions.	$200,000	Currently unfunded	$			√			2	9
	4	**Incident Management**: List of recommended SPD and SDOT **operational, training and tow truck response improvements** for enhanced incident management through corridor and throughout the city. - Economic analysis to determine the cost benefit of oncall tow truck Refer to whitepaper for detailed descriptions of improvements.	TBD by SDOT/SPD	Refer to draft consultant study, *Transportation Incident Management in Seattle: Observations and Recommendations* (Sam Schwartz Engineering and TransSafe Consulting, July 2015)	$$			√			1	10
	5	**Install Intelligent Transportation System (ITS) equipment** including Bluetooth readers and dynamic message signs (DMS) along the **S Spokane Street corridor between Airport Way and Port of Seattle terminals** to collect and display real-time travel-time information to truck drivers and the general traveling public.	$665,000 - $1 million depending on final scope (e.g. $335,000 for the DMS)	Levy & future grants	$$				√		1	21
	6	Coordinate with working vessel operators that are frequent users of the Swing Bridge to understand their planned sailing times. This will allow us to develop a relationship that will **provide early warning and coordination of bridge openings** should there be a traffic incident in progress.	TBD	Existing SDOT budget	$			√		√	1	29
	7	**Conduct value engineering of S Lander Street grade separation project** (4-lane grade-separated roadway with bicycle and pedestrian facilities across S Lander Street between 1st and 4th avenues).	$7 million	State	$$$	√			√		1	15, 23
	8	Change operations **sequencing of Swing Bridge opening functions**. Maintain overall safety, but reduce some consecutive movements and make them concurrent. This will reduce the opening length of time reducing vehicle delay.	$25,000	Existing SDOT budget	$					√	2	29
	9	**Enhanced at-grade crossing – Alki Trail connections at five-way intersection** (Delridge Way SW/Chelan Ave SW/SW Spokane Street/W Marginal Way SW and Port of Seattle Terminal 5).	$300-$500,000	Current SDOT budget	$$		√				1	18

Short Term (1-3 years):

Type/Benefit	#	Project	Cost Estimate	Funding Source	Benefit/Cost	Whitepaper section T	NM	IM&T	I	B&MO	Priority Level	Page #
	10	**Two-Way Columbia Street Project**: Improvements to convert Columbia Street to two-way allowing for Business Access and Transit (BAT) lanes in both directions from 1st to 3rd Avenue.	$6-7.5 million	Metro	$$$$	√					1	13
	11	**Interim Pathways Transit Improvements** on 4th Avenue S / 1st Avenue S and 1st Avenue / Columbia Street: Improvements such as re-channelization, parking removal, right turn improvements, queue jumps and a bus-only turn lane will allow transit to move faster and more reliable in the 9-15 month period after SR99 tunnel opens but Alaskan Way is not available.	$275,000	Currently unfunded	$$	√					1	13
	12	**4th Ave S Transit improvements** including bus lane extension and revised signage on 4th Avenue	$1.1 million	Currently unfunded	$$$	√					2	13
	13	**Delridge Way Rapid Ride** transit improvements – bus lane extension, curb bulbs, review parking restrictions	$3.3. million	Levy / grants	$$$	√					2	14
	14	**Water Taxi service expansion** – Support King County Marine Division to explore the expansion of service to allow for a two-boat schedule with service every 15 minutes instead of every 30 minutes	$450,000 annually	King County Marine Division	$$	√					2	14

KEY		BENEFIT/COST
Acronym — *Whitepaper Title (Author)* T/NM = Transit and Non-Motorized (Candida Lorenzana) IM&T = Incident Management and Traffic (Ron Borowski) I = Infrastructure Investments (Tony Mazzella) B&MO = Swing Bridge and Marine Operations (John Buswell)	= pedestrian/bicycle = transit = general purpose = truck = bridge operations	= low = medium = high $ = below $100,000 $$ = $100,101 to $1M $$$ = above $1M to $10M $$$$ = above $10M

Short Term (1-3 years):

	15	**Expansion of Water Taxi shuttle service area and parking** near water taxi dock (only necessary with water taxi service expansion).	Requires work by Metro and SDOT to evaluate shuttle service and parking.	Currently unfunded	$$$	√					2	14
	16	**Arterial paving** of S Spokane Street Lower Roadways east of Swing Bridge	$1.92 million	Existing SDOT budget	$$$			√			1	-
	17	A pilot project to determine the feasibility of installing **freight-only lanes on Lower Spokane Street**; and if deemed feasible, would implement modifications to roadway channelization, install traffic signal and signing modifications and provide detection and variable message signs.	Feasibility Study: $200,000 Implementation: $4 million	Currently unfunded	$$$			√	√		2	22
	18	Installation of video detection, blank-out message signs that display **real-time information and adaptive signal timing at signalized intersections adjacent to major east-west railroad crossings** to alert travelers to impending train crossings and duration of street closing to reduce delay, traffic queuing and alert emergency responders.	$435 -$500,000	$100,000 – Grant secured	$$				√		1	22

Mid-Term (4-6 years):

Type	#	Project	Cost Estimate	Funding Source	Benefit/Cost	Whitepaper section					Priority Level	Page #
						T	NM	IM&T	I	B&MO		
	19	W Marginal Way **bicycle/pedestrian connection:** creates an all ages and abilities connection from West Seattle trail and Duwamish trail to Alki Trail that eliminates the need for cyclists to navigate the existing five-way intersection	$600k-$1.3 million	Currently unfunded	$$$		√				2	18
	20	**Alaskan Way – All-day BAT Lanes**, both directions	Included City of Seattle Waterfront Program	N/A	$$$	√					1	14
	21	**4th Avenue connection to Spokane Street**: direct ramp connection from 4th Avenue to the Spokane Street Viaduct.	$27 million	Currently unfunded	$$$$	√					1	14
	22	**Camera enforcement** of West Seattle bus lane	Requires legislative authority	Currently unfunded	$$$	√					3	15
	23	Identify a **second grade-separated crossing of Burlington Northern Santa Fe (BNSF) mainline railroad tracks between S Atlantic and S Spokane streets** in addition to S Lander.	$500,000	Currently unfunded	$$				√		3	-
	24	Construct a **4-lane grade-separated roadway with bicycle and pedestrian facilities across S Lander Street between 1st and 4th avenues** and close S Holgate Street so as to eliminate delay for motorists and pedestrian due to frequency of train crossings.	$150 million	Levy ($20 million), State ($7 million secured), other partners	$$$$		√	√	√		1	15, 23

Long Term (7 to 10 years):

Type	#	Project	Cost Estimate*	Funding Source	Benefit/Cost	Whitepaper section					Priority Level	Page #
						T	NM	IM&T	I	B&MO		
	25	**Elevated Crossing** from existing Terminal 5 overpass to Alki Trail	$150-$350,000 for further analysis	Currently unfunded	$$$		√				3	19
	26	**Sound Transit 3 package:** West Seattle to Downtown light rail and Early Implementation bus improvements	Possible inclusion in ST3 package	Sound Transit	$$$$	√			√		1	15, 24
	27	Work with the Port of Seattle to build a **Terminal 18 "only" lane for west bound vehicles on the lower Spokane Street** roadway. This will eliminate the current situation where trucks are lined up and stopped blocking general purpose vehicles from traveling west bound between E. Marginal Way and the Swing Bridge.	$30 million	TBD	$$$$					√	1	-

[1] All cost estimates are planning-level only and will require additional refinement. Estimates do not include anticipated annual operations and maintenance costs.

Incident Management and Traffic

Background

There is an ongoing need for effective incident management of collisions and congestion due to events. Travel incidents may be created by vehicle breakdowns, collisions, and enforcement functions. Competition with other transport modes also creates unanticipated and unscheduled congestion incidents. These include West Seattle Swing Bridge openings for marine traffic, closures of streets

crossing mainline tracks to accommodate passenger and freight trains, other local area train movements to service local businesses and truck backups on Port terminal access routes.

The West Seattle Bridge corridor is a limited access facility, similar to the elevated portion of SR 99, with geographic restraints, which means:

- Incidents exacerbate congestion due to limited number of crossings over roadways
- Response times can be slowed due to limited alternate routes
- Few options exist for detour routing following incidents on bridges, arterials or highways

Following an extremely disruptive blocking traffic incident on SR-99 this past March, Mayor Murray directed SDOT and the Seattle Police Department (SPD) to engage a consultant team to help identify a comprehensive range of national Traffic Incident Management (IM) best practices. The resulting report recommendations spanned the categories of incident management, training, traffic management and operations, and Intelligent Transportation Systems (ITS). The latter is the application of technology advances to optimize safe and efficient movement of people and goods. SDOT and SPD recently completed this comprehensive study of incident management practices and functions applicable to Seattle. The *Traffic Incident Management in Seattle* report's list of recommended projects that would improve West Seattle Bridge corridor travel conditions are identified under the "Recommended Projects" of this section.

Current Conditions

Safety, reliability and mobility are affected by vehicle congestion on the upper and lower roadways due to traffic demand, incidents, modal competition, and in the recent past, extensive construction on nearby arterial streets. To further expand on these points:

- West Seattle is an "access constrained community" – West Seattle is a peninsula with five major access connections to Seattle and South King County, including the West Seattle Bridge/Duwamish corridor routes, Highland Park Way SW, Delridge Way SW, and 1st Ave S/Olson Pl SW. There are limited numbers of access routes and road capacity is fixed
- Modal priorities on Lower Spokane St do not favor residents and businesses – West Seattle trips take a backseat to the other modal priorities of ships, trains and trucks institutionalized by the Coast Guard, Federal Railroad Administration and international trade, which is evidenced by the following:
    - Trains cross and occupy city streets when they need to, whether on mainline or local tracks
    - Larger ship sailing schedules determine when the Spokane Street Swing Bridge opens to marine traffic
    - Port customers bring their ships in and out as demand and conditions permit, generating truck traffic and congestion on various segments of S Spokane St
    - Port truck related queues form at various times due to terminal processing conditions and management decisions

    - The Port has asked the City to allow heavier trucks (98,000 pounds, up from the current 80,000 pounds) on Lower Spokane St roadways and Duwamish River Crossings west of E Marginal Way as part of the City's proposed Heavy Haul Network
- Cumulative modal conflicts make Lower Spokane St a very difficult route to take due to its unreliability and S Spokane St is a St rich in cumulative traffic impacts. Emergency response vehicles responding to incidents are impeded by traffic queues, bridge openings, and rail operations on the lower level, and by traffic congestion on the upper and lower roadways.
- Several non-mainline tracks located under the Spokane St Viaduct are often blocked by rail cars serving local businesses for extensive periods of time, resulting in unpredictable, lengthy traffic delays

Anticipated Future Conditions

West Seattle population levels have and will continue to grow, and corridor traffic volumes, as well as bike and transit demand, have and will continue to increase. With these increases in volumes, an increase in the number of incidents is expected and traffic speeds will be slower with lengthened peak periods. At the same time, Port of Seattle container activity has and will continue to fluctuate with variations in truck and freight rail activity.

- Population Growth Will Continue – West Seattle's population was 86,800 persons in 2010, 14% of Seattle's population. Population is growing, as evidenced by extensive multi-family unit development, similar to overall city growth
- Traffic Growth – The West Seattle Bridge corridor has the highest traffic demand out of all city streets. The combined upper and lower roads accommodate up to 106,000 vehicles per day. Increase in traffic will be characterized by the following:
    - Traffic volumes on the West Seattle Bridge and Spokane Viaduct are projected to increase 26-33% over the next 20 years
    - Truck traffic growth on the Spokane Street Viaduct is expected to increase 72% over the next 20 years
    - The Port of Seattle has a stated goal of increasing shipping volumes for the current 1.5 million Twenty-foot Equivalent Units (TEUs) to 3.5 million TEUs by 2035, assuming a growth rate of 3.5 %/year. By 2020, T-5 is expected to reopen with increased cargo capacity and increased truck peaking demand as larger capacity ships serve T-5
    - Super ships (new super-post-Panamax ships of15,000+ TEUs), more than twice the size of existing ships (6-8,000 TEUs), could arrive two at a time at T-5, increasing the extent of truck demand peak periods and congestion on city Sts. Freight and passenger train volumes are also projected to increase on the rail mainlines
- Train traffic will increase, with coal and oil trains possibly driving much of the increase. Trains will be longer, increasing the mainline crossing blockage time and impacting Lower Spokane St travel reliability

This constrained environment for travel burdened by general traffic congestion, ships, trains, trucks and incidents and SDOT will need to meet the challenge of minimizing incidents, whether planned, like construction, or unplanned, like collisions, and expanding the modal capacity of a restrained system.

Recommended Projects

Early Start (0 to 12 months)

Feasibility studies to determine operational and design improvements #3

The SDOT Transportation Operations Division (TOD) has identified a series of evaluations to improve future safety, incident management and traffic flow on the West Seattle Bridge/Duwamish Corridor. The basis was a set of traffic operations recommendations identified by TOD staff in response to this and previous calls to improve the corridor's performance. The Division proposes that $200,000 of new funding be considered to undertake the seven evaluations listed below:

Evaluation	**Benefit Category**
1. Evaluate feasibility and benefit of installing center barrier sections so response vehicles can make U-turn to speed up response time	Incident Management
2. Evaluate the feasibility and benefit of installing marking and signs to provide one designated emergency lane in each direction of upper roadways for use during emergency; maintain for general traffic use at other times	Incident Management
3. Coordinate with WSDOT to determine feasibility of traffic management modifications to improve eastbound Spokane St Viaduct connection to south- and northbound I-5	Traffic Management
4. Evaluate Lower Spokane chokepoints relationships to determine if rail, truck, and bridge opening blockages can be better coordinated to avoid cumulative impacts	Traffic Management
5. Evaluate better communications and protocols for Port cooperation with truck queue management and dispersal	Traffic Management
6. Evaluate process and capability for providing data report to Washington State office of Federal Railroad Administration (FRA) in order for FRA to enforce the maximum 20 minute blockage rule.	Incident Management and Traffic Management
7. Initiate a SDOT/WSDOT Peer Review Team to review traffic operational and safety improvement opportunities on upper and lower roadways and make recommendations.	Incident Management, Traffic Management, and Safety

Incident Management (recommendations from consultant study) #4

The seven recommendations below are from the joint SDOT/SPD study, *Transportation Incident Management in Seattle: Observations and Recommendations* (Sam Schwartz Engineering and TransSafe Consulting, July 2015). These recommendations will likely have specific benefit to the West Seattle Corridor utilizing existing or modest new resources, and can likely be delivered within a reasonable timeframe:

1. Utilize SDOT emergency laborers (E-Laborers) and cross-train with WSDOT incident response personnel to supplement on-scene response to incidents. Outfit SDOT E-Laborers with sirens, extra gas and other equipment to provide more services on-site
2. SDOT should provide "Gridlock Alerts" that provide citywide notice of either major planned events that will cause congestion or following a major traffic incident that causes widespread strain on the road network. Consider "emergency level" communications that can reach most cell carriers
3. Using available travel time and traffic flow data, SDOT should identify typical days of the week or times of the year with high congestion in certain locations, and put extra focus on quick incident response times for them at those times. Share this data in advance regularly with SPD
4. Create staging locations for response vehicles (such as safety service patrols) to quicken response to incidents as they occur
5. Develop procedures for handling commercial vehicle backups on city Sts: pre-plan staging areas, traffic control, etc. SDOT can provide permits to the Port of Seattle for traffic control on adjacent city streets
6. Cross-train Port commercial vehicle inspectors with WSP CVE officers in joint operations near and around the Port to reduce equipment violations and protect the City's roadway infrastructure
7. City agencies should partner with the private sector to create apps and spread information on travel conditions to private-sector employees (i.e. to switch to transit or work off-site)

Cost estimates will be determined as SDOT and SPD drill down on the details as they implement specific recommendations.

Transit

Background

The West Seattle Bridge (high level bridge) is the main corridor for transit service from West Seattle to downtown Seattle and SoDo (South of Downtown). For transit riders, the primary issue in the corridor is the speed and reliability of service. Transit service traveling to and from West Seattle can encounter congestion both on the West Seattle Bridge and on State Route 99, increasing travel time and unpredictability for riders. With construction of the Alaskan Way Viaduct Replacement program, riders have experienced increasing delays in recent years. Once the construction is complete and the State Route 99 (SR 99) tunnel opens, there will continue to be a need for transit priority measures along this transit corridor.

Current Conditions

King County Metro currently operates 13 routes over the West Seattle Bridge during weekdays. There are 29,300 total riders and 765 buses in the corridor each weekday. The busiest routes are the Rapid Ride C Line, Route 21, and Route 120. Buses enter the West Seattle Bridge via these pathways:

- Fauntleroy Ave SW
- Admiral Way SW
- Avalon Way SW
- Delridge Way SW

There are two patterns of service for these routes once they are on the West Seattle Bridge. The first is traveling to and from downtown Seattle via SR 99, using the Seneca and Columbia St ramps to access downtown. The second is traveling to and from at 1st Avenue through SoDo and into downtown Seattle.

Currently, there are transit lanes eastbound on the West Seattle Bridge, but the lanes are not continuous. Transit does experience congestion in the morning peak period (6-9am) as traffic backs up on the bridge and on the ramps leading up to the bridge at Delridge Ave SW, Admiral Way SW and Fauntleroy Ave SW. The eastbound bus lane, which is second from the right lane, allows buses exiting at 1st Avenue to continue to use the lane as they travel east. Buses traveling downtown via SR99 continue without a priority lane as the exit ramp leading to SR 99, only 19 feet wide, has capacity for just one lane of traffic. Once on SR 99, an all-day bus lane in the northbound direction allows buses to bypass congestion from just south of S Hinds St to S Holgate St. Under typical non-congested conditions, buses mix with general purpose traffic as they continue to travel northbound into downtown Seattle.

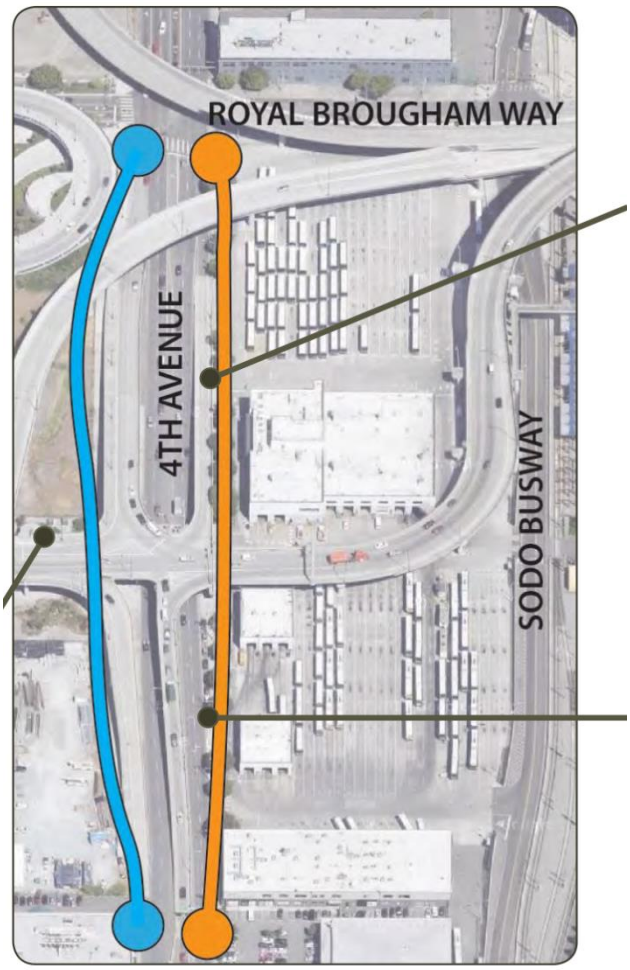
In the southbound direction, no bus lane exists on SR 99 or on the West Seattle Bridge. Buses encounter some congestion in the westbound direction on the West Seattle Bridge, but most delay occurs on southbound SR 99.

Anticipated Future Conditions

Bus operation on the West Seattle Bridge is anticipated to continue increasing in volume but not otherwise change significantly. With Seattle Transportation Benefit District (STBD) investments, there are improvements to several West Seattle bus routes, including increased volumes of buses on the bridge and in the corridor to and from downtown Seattle. With the split of the Rapid Ride C and D Lines in March 2016, the reliability of the Rapid Ride C Line will likely improve as it will no longer rely on buses beginning trips in Ballard to travel through downtown and then onto West Seattle.

Once the SR 99 bored tunnel project is complete, there will be changes to how buses access downtown Seattle, but it will not impact operation on the West Seattle Bridge specifically. Current plans call for a bus only lane exiting at Dearborn St, with buses accessing downtown via the new Alaskan Way surface St in the future on all-day, two-way business access transit (BAT) lanes and Sound Transit is studying a light rail connection.

Figure 2: 4th Avenue S Transit Improvements



A northbound and southbound bus lane could be accommodated through this narrow roadway section by going outside of the existing roadway alignment.

Recommended Projects

Early Start (0 to 12 months)

Red Bus Lane on the West Seattle Bridge #1

These improvements would include:

- Painting the existing bus lane red to more clearly designate the bus lane and potentially reduce violations. Targeted enforcement would require further coordination with the Seattle Police Department (SPD)

Further evaluation and coordination with King County Metro would be required for these improvements. Additional work is needed to finalize a design and identify a source of funding for the red bus lane.

Seattle Transportation Benefit District Investments #2

As mentioned, with STBD investments, there will be improvements to frequency and reliability of some West Seattle bus routes, which means increased volumes of buses on the bridge and in the corridor into downtown Seattle. With the split of the Rapid Ride C and D Lines in March 2016, Rapid Ride C Line service will become more reliable since it does not have to rely on buses beginning their trips in Ballard to travel through downtown and then onto West Seattle. These improvements are already funded through the voter-approved STBD measure.

Short Term (1 to 3 years)

Two-Way Columbia St Transit Project #10

Once the SR 99 bored tunnel project is complete, there will be changes to how buses access downtown Seattle. The plans call for a bus only lane exiting at Dearborn St, with buses accessing downtown via the new Alaskan Way surface St in the future on all-day, two-way BAT lanes. In addition to these transit

lanes, Metro and SDOT are closely coordinating on improvements that would convert Columbia St to a two-way street, allowing for BAT lanes in both directions from 1st to 3rd Avenue. Combined, these improvements will provide a faster and more reliable pathway for transit services once the SR 99 tunnel is complete. Two-way Columbia is a Metro funded project and is expected to cost $6-7.5 million.

Interim Pathways Transit Improvements #11

Metro, SDOT and their partners continue to coordinate on a set of transit improvements that will help buses move faster and more reliably into downtown Seattle during the interim when the SR 99 Tunnel is open, but the Alaskan Way surface street is not yet rebuilt. This period is expected to last 9-15 months. These improvements focus on three potential pathways to allow for maximum flexibility in transit service operation. These pathways include buses traveling on:

- 1st Avenue between the Dearborn exit at SR 99 and Seneca and Columbia Sts
- Inbound 4th Avenue S and outbound on 1st Avenue S and S Lander St to and from downtown
- A hybrid pathway where buses travel inbound via 4th Avenue S and outbound on 1st Avenue via Columbia St

The improvements include:

- Channelization changes and parking removal on 1st Avenue for transit to operate in the inside lane
- Channelization and parking changes at Columbia St to allow buses to turn left from Columbia St onto First Avenue once the Columbia St ramp is demolished.
- Right-turn improvements at 1st Avenue and Seneca to improve turning movement for buses
- Extension of the 4th Avenue S northbound bus lane from Weller St to Royal Brougham (already completed in 2015)
- Southbound transit queue jump at 1st Avenue and Hanford St for buses traveling toward the West Seattle bridge

The anticipated cost for these improvements is estimated to be $275,000 with additional reserve funding needed for areaways monitoring for 1st Avenue and potential pavement improvements in the amount of $940,000.

4th Ave S Transit Improvements #12

As part of a 2012 draft study, the City of Seattle identified potential improvements on 4th Avenue S that could benefit transit service (see Figure 3). This includes extending bus lanes south of Royal Brougham. This area is currently two lanes northbound and southbound to Massachusetts St and constrained by the ramps to Edgar Martinez Drive and support columns in the area.

Continuous bus lanes on 4th Avenue could be constructed on the backside of existing sidewalks which would require pedestrians to cross the bus lanes near Edgar Martinez Drive and at Royal Brougham. This project would require acquisition of right-of-way, including property from King County Metro's existing bus bases in the area. The bus lanes have the potential to reduce congestion during events. Further study and coordination with King County Metro would be necessary to implement these

improvements. Cost estimates from the 2012 study indicate these improvements would cost $700,000-$1.1 million and do not include right-of-way acquisition costs.

Delridge Way RapidRide Plus Transit Improvements #13

Improvements may include bus lane extensions, curb bulbs and changes to existing parking restrictions in order to provide more priority for transit within West Seattle. To further define specific improvements and determine costs, additional coordination between King County Metro and SDOT is necessary. Delridge is identified as a future RapidRide corridor. The new state transportation package allocates $8 million to upgrade Metro Route 120 to a RapidRide line. If approved by voters, Move Seattle Levy funds would also be available for transit improvements on the corridor.

Water Taxi Service Expansion and Associated Shuttle Improvements #14 and #15

Expansion of Water Taxi Service would require further coordination with the King County Marine Division. There are opportunities to expand service to allow for a two-boat schedule with service every 15 minutes instead of every 30 minutes. A weekday-only service expansion is anticipated to cost $450,000 annually. To support this expanded service, the Water Taxi shuttle service area would need to be expanded or revised to ensure better coverage and connections from multiple West Seattle neighborhoods. Potential parking solutions near the water taxi dock would also need to be evaluated. Further study would be needed to determine costs of both these options that support increased water taxi service.

Mid-term (4-6 years)

Alaskan Way – All-day BAT lanes #20

Once the SR 99 bored tunnel project is complete, there will be some changes to how buses access downtown Seattle, but these changes will not impact operation on the West Seattle Bridge specifically. Current plans call for a bus only lane exiting at Dearborn St, with buses accessing downtown via the new Alaskan Way surface St in the future on all-day, two-way BAT lanes. This work is expected to be completed as part of the City of Seattle Central Waterfront project.

4th Avenue connection to Spokane St #21

As part of a 2012 draft study, the City of Seattle identified potential for a direct ramp connection from 4th Avenue to the Spokane St Viaduct. The travel time and reliability of buses traveling toward West Seattle and Southwest King County would be improved with a direct congestion. Further coordination with King County Metro would be required to further this project as well as an effort to update costs. Cost estimates from the 2012 study indicate these improvements would cost $20-27 million and do not include right of way costs. Prioritization of this facility may depend on the success and timing of funding for a West Seattle light rail connection as part of a Sound Transit 3 measure.

Camera Enforcement #22

Authority from the Washington State Legislature would be required to allow camera enforcement for any bus lanes in the West Seattle corridor. Further evaluation and policy discussion among the State, the City and King County would be required to begin pursuing any changes. In addition, this would also

require a study of any potential camera enforcement system and identification of the costs associated with it.

South Lander St Grade Separation/Rail Crossing #24

The S Lander St project would construct a grade separation (overpass or underpass) on a major Port of Seattle freight route that crosses a railroad mainline. The project would reduce truck delay and congestion in addition to potentially providing a more reliable pathway for transit service. While there is a benefit to improving reliability, a Lander St grade separation would also increase the travel time for transit particularly if used as the primary pathway to and from downtown Seattle. The project is anticipated to cost up to $150-200 million. There is currently $20 million in the proposed Move Seattle levy package to fund the project along with $7 million just appropriated by the state through the new transportation package. The new state package also includes added funding for the Freight Mobility Strategic Investment Board, which ultimately could be an important source of funding for the Lander project.

Long-Term (7 to 10 years)

Sound Transit 3 Package #26

Sound Transit has received funding authorization from the state legislature and plans to send a Sound Transit 3 ballot measure to regional voters in November 2016. Although the package is still being developed, one of the draft priority projects is a light rail connection from West Seattle/Junction area to downtown Seattle.

Non-Motorized

Background

For bicycles and pedestrians, connectivity and safety are the central issues in the corridor. Bicyclists and pedestrians currently travel to and from the Alki Trail at the five-way intersection that connects them to the Spokane St Bridge. The intersection has some constraints, including:

- Need for bicycles and pedestrians to cross the intersection in two or three phases, not only delaying their trips, delaying general purpose and freight vehicles as well
- The intersection geometry results in poor visibility
- Lack of capacity at existing traffic islands to accommodate bicyclists waiting at the cross the intersection
- Freight traffic needs, which require longer crossing distances for bicycles and pedestrians.
- Limited wayfinding for bicycles and pedestrians

Another challenge for bicycle riders once they cross the Spokane St Bridge is East Marginal Way, where bicycles often mix with freight traffic traveling to and from Port of Seattle facilities.

Current Conditions

On average, there are over 700 bicyclists using the Spokane St Bridge on a weekday, up to 1,200 cyclists using the bridge per day, depending on the time of year.

Current bicycle and pedestrian users rely on a five way intersection between the Alki Trail and the SW Spokane St Bridge to complete their connections. The five way intersection is comprised of Delridge Way SW, SW Spokane St, Chelan Ave SW, W Marginal Way SW and the Port of Seattle Terminal 5 access road.

Figure 3: Current Five-Way Intersection

West Seattle Five-way Intersection at Delridge Way SW, SW Spokane St., Chelan Ave. SW, W Marginal Way SW, and Port of Seattle Terminal-5 access road (Photo by Adrian Verdugo)

Bicyclists have a choice to merge with traffic to access the Alki Trail or use three crosswalks to move through this intersection. On the SW Spokane St Bridge, cyclists have a separated path that runs parallel to the bridge roadway. Once bicyclists cross the bridge, cyclists can pick up the West Seattle/Spokane St Bridge trail to East Marginal Way, where there are bike lanes in each direction or the

Elliot Bay Trail, a sidewalk on the west side of the roadway. Cyclists can follow either of these pathways into the southern portion of downtown, at Royal Brougham Way.

SDOT completed a draft study analyzing different connections between the Spokane St Bridge and the Alki Trail to improve operation and safety for all users at this five way intersection. The intersection is identified in the Bicycle Master Plan as a catalyst project, which will create an important connection in Seattle's bicycle network for users of all ages and abilities.

Anticipated Future Conditions

SDOT will be implementing an enhanced at-grade crossing at the intersection by the end of 2016 that is identified in the draft study of trail connections at the West Seattle five-way intersection.

Figure 4 outlines the improvements of the enhanced at-grade crossing. The improvements include bike boxes and green bike lane crossings between the West Seattle Bridge Trail/Delridge Way SW to the Alki Trail and sightline improvements at the West Seattle Bridge Trail's crossing of the SW Spokane St slip lane. A flashing beacon will also be added to the crossing of the Spokane right turn slip lane to enhance the crossing and reduce or eliminate the number of non-yielding vehicles at this crossing.

The green bicycle boxes are proposed for Delridge Way SW and W Marginal Way SW to create a protected space for bicyclists and leave more space for pedestrians on the existing traffic islands. The green bike lane crossings would extend from the bike boxes and curve across to the refuge island between W Marginal Way SW and Chelan Ave SW for westbound cyclists. In the eastbound direction, a green bike lane would be provided from W Marginal Way SW to SW Spokane St with a new bicycle curb ramp and path to connect to the West Seattle Bridge Trail.

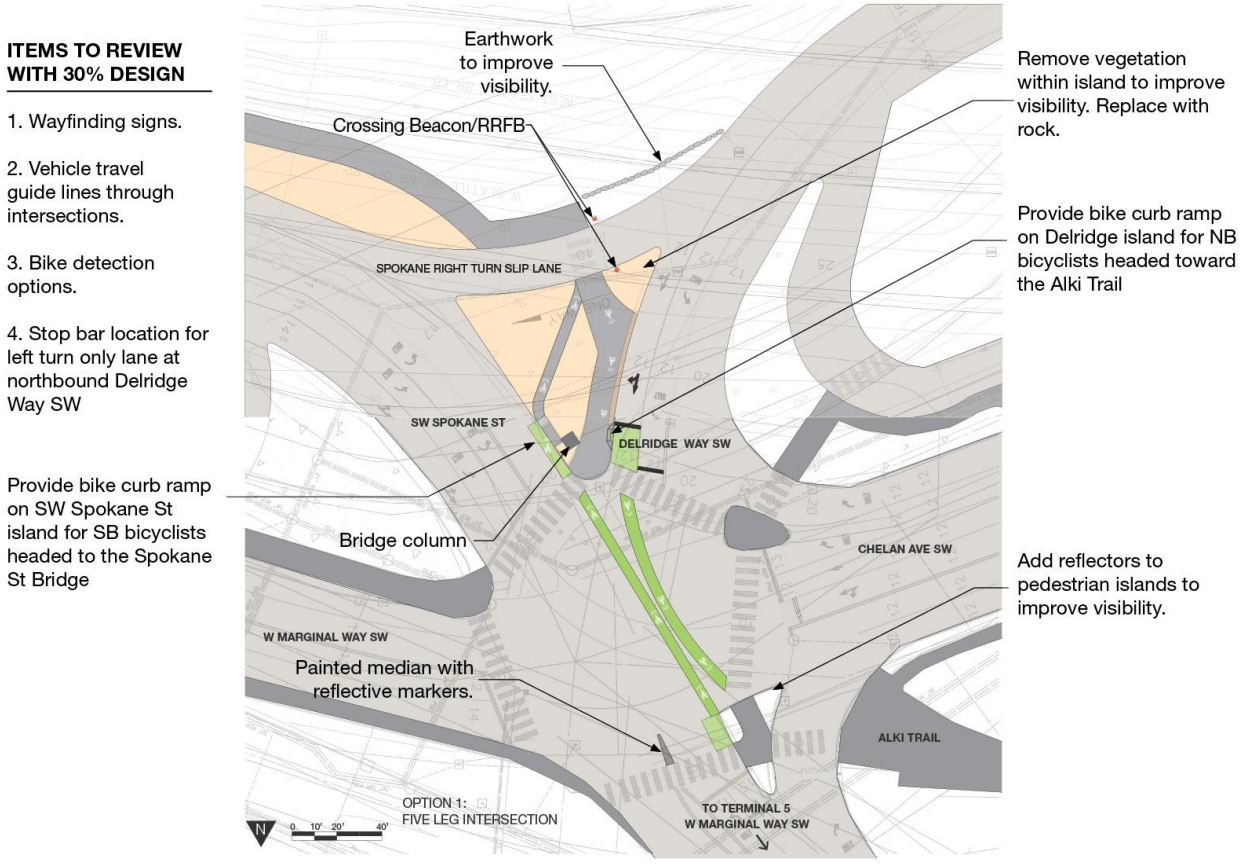


Figure 4: Enhanced At-Grade Crossing (Short Term)

Recommended Projects

Early Start (0 to 12 months)

Enhanced At-Grade Crossing for Bikes #9

SDOT will implement improvements at the five-way intersection of Delridge Way SW, SW Spokane St, Chelan Ave SW, W Marginal Way SW and the Port of Seattle Terminal 5 access road in 2016. Figure 4 above provides an overview of these improvements. This project is currently funded and is anticipated to cost $300,000-$500,000.

Mid-term (4-6 years)

W Marginal Way Bicycle and Pedestrian Connection #19

The second of three options identified in the SDOT draft study makes use of the unimproved right-of-way between the W Marginal Way SW curb and BNSF railroad tracks. (See Figure 5 below) Westbound pedestrians and bicyclists traveling along the West Seattle Bridge Trail would turn left from the trail onto SW Marginal Place toward the Duwamish Trail instead of descending to the five-way intersection. Currently a dead end, SW Marginal Place would need to be improved, similar to other greenway

enhancements, where it meets the West Seattle Bridge Trail in order to facilitate this trail connection. At the bottom of SW Marginal Place, pedestrians and bicyclists would cross W Marginal Way SW at the existing signal onto a new paved connection built in the unimproved right-of-way between W Marginal Way SW and the BNSF railroad tracks.

This option creates an all ages and abilities connection from the West Seattle Bridge Trail and Duwamish Trail to the Alki Trail eliminating the need for people riding bikes to enter the roadway and navigate the five-way intersection. The route length for this option is longer and less direct than other options. Paint markings and wayfinding improvements would be necessary to identify the route. The cost of this improvement ranges from $600,000 to $1.3 million and is currently unfunded.

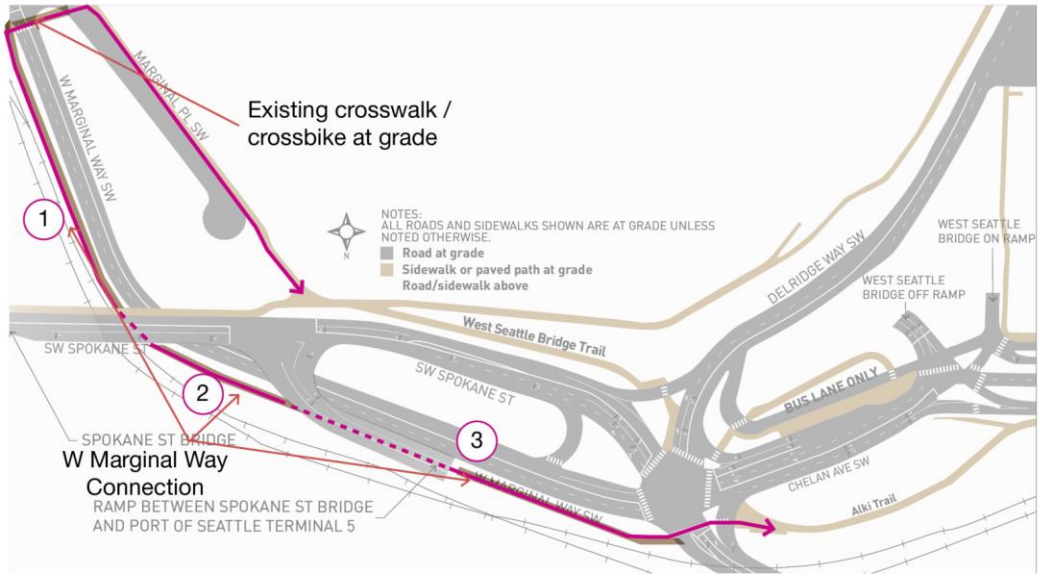


Figure 5: W Marginal Way Connection (Mid-Term)

Long-Term (7 to 10 years)

Elevated Crossing for Bikes #25

This is the last of three options identified in the SDOT draft study. This option proposes constructing an elevated structure attached to the Port of Seattle Terminal 5 overpass connecting from the SW Spokane Street Bridge to the Alki Trail.

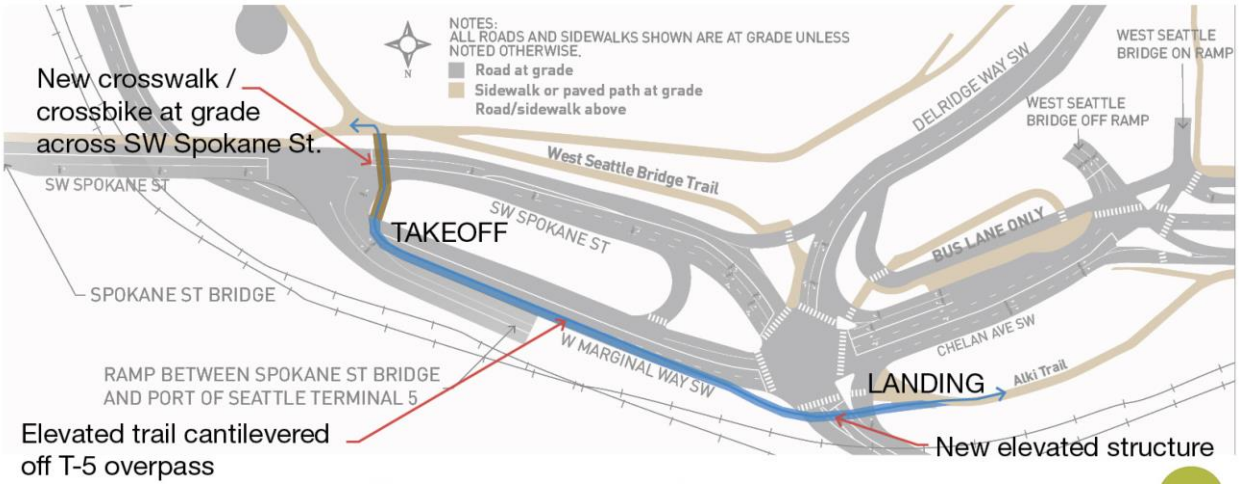


Figure 6: Elevated Crossing Cantilevered from Terminal 5 Overpass (Long-Term)

Pedestrians and bicyclists would cross SW Spokane St from the West Seattle Bridge Trail at the existing signal onto the elevated pathway cantilevered from the Terminal 5 overpass. A crosswalk will need to be installed at this intersection; the stop line for eastbound vehicle lanes relocated to the west; signal controls adjusted for bicycle and pedestrian crossing; and concrete barrier removed and replaced with curb ramps to access the elevated trail. This provides an alternative to pedestrians and bicyclists instead of descending along the West Seattle Bridge Trail toward the five-way intersection.

Instead, westbound pedestrians and bicyclists would descend along the elevated pathway cantilevered from the Terminal 5 overpass and connect over W Marginal Way SW to the Alki Trail. The elevated trail would land just behind the current location of the Chelan Café. Eastbound pedestrians and bicyclists would climb from the Alki Trail up the elevated pathway and would cross SW Spokane St at the top connecting to the West Seattle Bridge Trail. This would require structural review of the existing Terminal 5 overpass to confirm that it could be retrofitted with the cantilevered trail. The Port of Seattle and the City would need to confirm the ability to cantilever off the overpass and land in the trail easement behind the Chelan Café. A structural and traffic analysis would be required to provide a cost estimate for this project.

Infrastructure Investments

Background

Medium to long range capital investments in transportation infrastructure within the corridor are essential to both maintain and enhance mobility as traffic volumes and multi-modal demands increase. These investments will include both capital projects and technology improvements that will provide additional roadway capacity and better manage the existing network.

Seattle Industrial Areas Freight Access Project (FAP)

This recently completed planning study was undertaken in partnership with Port of Seattle. The goal of FAP was to identify transportation investments needed over the next 20 years to help keep Seattle's industrial lands economically vital and productive.

The FAP developed, evaluated and recommended a prioritized list of capital and operational improvements for freight truck priority on important truck Sts and Port terminal connector routes including the West Seattle Bridge corridor and other key east-west roadways. Many of these improvements also would benefit other travel modes.

FAP recommendations relevant to the West Seattle Bridge / Duwamish Corridor are described below.

Recommended Projects

Early Start (0 to 12 months)

South Spokane St Intelligent Transportation System (ITS) Upgrades #5

Lower Spokane St is a primary freight route serving nearly 5,000 trucks daily and providing critical access from Port Terminals 5 and 18 to the regional highway network. It currently experiences recurring delays throughout the day caused by train crossings, bridge openings and congested intersections.

This project would install ITS equipment including Bluetooth readers and dynamic message signs along the corridor between Airport Way and Port Terminals 5 and 18 in order to collect and display real-time travel time information to trucks drivers and other motorists. Traffic signal system improvements at the intersection of Chelan Avenue could also be included in the project scope. Taken together these improvements would provide freight operator and the general public with critical information, travel options and better reliability.

This project is also included in the *2014 Next Generation ITS Implementation Plan* and funding in the 2015 *Transportation Levy to Move Seattle* proposal. The costs are anticipated to be around $665,000 - $1 million depending upon the final scope.

Short Term (1 to 3 years)

Lower Spokane St Freight Only Lanes Pilot Project #17

Lower Spokane St is a primary freight corridor carrying nearly 5,000 trucks per day and connecting Port terminals and other industrial land uses to the regional highway network. . It currently experiences recurring delays throughout the day caused by bridge openings, train crossings and peak demand at already congested intersections. This pilot project would determine the design, engineering and operational feasibility of installing freight-only lanes on the corridor; and, if deemed feasible, implement the modifications to roadway channelization, install traffic signal and signing modifications and provide detection and variable message signs. The project would evaluate time-of-day operations and a contingency for allowing all traffic to use the lanes in the event of a bottleneck occurring on the upper bridge.

This project is currently unfunded. The feasibility analysis can be done in the short term and will cost around $200,000 while the implementation of modification to the roadway and signaling/signing will cost around $4 million.

Railroad Crossing Warning Signs # 18 (Additional Railroad Mainline Grade Separation Study)

Overall east-west connectivity in the Greater Duwamish Manufacturing and Industrial Center is seriously constrained by a series of at-grade railroad crossings (see Figure 1). This project will identify a second grade-separated crossing of the BNSF mainline railroad tracks between S Atlantic and S Spokane Sts, in addition to the S Lander St Crossing described earlier.

Due to feasibility constraints, particularly engineering challenges and anticipated costs of a second crossing, SDOT is also recommending a suite of technology improvements such as adaptive signal timing, video detection and blank out message signs that display real time information at key locations as an alternative to a fully grade separated structure. The signs would be installed at signalized intersections adjacent to major east-west railroad crossings to alert travelers to impending train crossings and duration of St closing to reduce traffic queuing and alert emergency responders.

Railroad Crossing (RR) signs are also included in *2014 Next Generation ITS Implementation Plan* and funding in proposed 2015 *Transportation Levy to Move Seattle.* The implementation of RR Information Signs will cost around $435,000-$500,000 and can be completed in the short term, while the RR Crossing Study will cost around $500,000 and will likely be carried out over a longer-term timeframe.

Mid-Term (7 to 10 years)

Figure 7: Current BNSF Rail Crossing at S Lander St

South Lander St Overpass Project #24

S Lander St and Burlington Northern Santa Fe rail lines currently intersect which creates significant vehicle and pedestrian delay due to conflicts with freight and passenger trains crossing Lander St (Figure 8). With this project, S Lander St would be elevated above the rail lines between First Avenue S and Fourth Avenue S. A 2008 design process that was later suspended for lack of funding showed an overpass with four lanes and sidewalks and bicycle facilities. Neither vehicle traffic nor pedestrians would any longer be able to cross the railroad tracks.

This project helps reduce congestion, minimize delay and increase safety by:

- separating trains from vehicles and pedestrians
- reducing traffic delays caused by train crossings
- enhancing overall connectivity and circulation within the North Duwamish Manufacturing and Industrial Center
- improving access to Port of Seattle terminal facilities
- providing system redundancy during major construction periods and other travel interruptions

St Closures	Hours/Day	Ave Weekday Traffic Vol
S Lander St	3.8	16,100
S Holgate St	4.5	10,800

Figure 8

This project was placed on hold as of March 2008 due to funding limitations. The future schedule of the project remains uncertain at this time though the project has been included in SDOT's 10-year strategic plan – "Move Seattle" – and in the proposed *Transportation Levy to Move Seattle* (at $20 million) which will go before Seattle voters in fall 2015. The City is actively seeking funding partners and outside grants to help complete this high-priority project. The new state transportation package allocates $7 million for this project. Based on the 2008 design, the total costs are anticipated to be more than $150 million, depending upon final design, right-of-way acquisition costs and cost of utility relocations.

Long-Term (6 to 10 years)

Sound Transit3 Priority Projects #26

As Sound Transit (ST) develops its future regional system plan the City of Seattle has provided detailed comments on the Draft Priority Projects identified by ST. The City's top priority is a light rail connection from Ballard to Downtown to West Seattle with a new downtown tunnel as a key element of this corridor.

In the West Seattle segment of this corridor, the City would like to see a phased approach with connections from Downtown to the West Seattle Junction funded in ST3 since this segment appears to have the highest ridership. The City has requested ST develop and evaluate surface, tunnel and aerial alignments, as well as, identify early implementation items that would benefit existing bus service prior to full light rail implementation such as early implementation of a bus ramp or transit lanes that can be converted to light rail in the future or other options to improve transit travel times and reliability for bus connections to West Seattle. In addition, the City has asked ST to identify any changes or impacts that modify operations or overall mobility on the Spokane St or West Seattle bridges.

Swing Bridge and Marine Operations

Figure 8: Lower Spokane St Swing Bridge

Background

In 1978 one of the two bascule bridges crossing of the West Duwamish waterway was struck by the freighter Cabo San Lucas. The damage was so severe the bridge was deemed inoperable, reducing the number of vehicle lanes in half on the only connection to West Seattle along the Spokane St corridor. This was the catalyst to fund and construct the six lane high-level crossing of the Duwamish River. The West Seattle high-level bridge opened in 1984 and quickly became the preferred route between West Seattle, I-5 and the Downtown/Center City area. Planning for the high-level bridge always included a low-level bridge that would primarily serve Port of Seattle traffic between container ship terminals and the rail yards. The low-level Swing Bridge opened in 1991 and has provided an alternate route for commuters during peak times when the high-level crossing is congested. Although, this route can provide a good alternative with comparable travel times, it can be adversely affected by a bridge opening for a marine vessel.

The Swing Bridge is considered a navigational restriction to the West Duwamish Waterway, and thus is regulated by the U.S. Coast Guard. The City's permit with the Coast Guard requires that the bridge open for vessel passage on demand with no restrictions. The number of vessels that request an opening is relatively small, about 7 per day, but when this happens during AM or PM peak commute time the delay and resulting vehicle back up is significant. The average bridge opening duration is approximately 11 minutes. Once committed to the Swing Bridge, alternate vehicle routes are limited. The City has met

with the Coast Guard in an effort to establish similar bridge opening restrictions, similar to the restrictions in place on the Lake Washington Ship Canal. This effort has been unsuccessful, primarily due to the different nature of the vessel traffic and navigational challenges associated with the West Duwamish Waterway. The majority of the vessel traffic on the West Duwamish Waterway is commercial working vessels and not pleasure crafts. Due to the relatively high clearance at the Swing Bridge, 52 feet, only large tugs and ocean going vessels require an opening. It is a common statement in the shipping industry that "they are only making money when they are moving". The larger ocean going vessels have navigational challenges relating to tides, river current and the narrow passage between the RR Bridge and the Swing Bridge. Restricting or delaying a vessel opening during commute times can cause other delays based on a vessel's need to sail at particular times to meet the navigational challenges. While there has been movement toward improved protocols for advance notification of openings, the marine community has been reluctant to agree to any proposals that would delay their sailing.

Vessel Opening Demand

In 2014 the Swing Bridge opened 1,831 times. This was an increase of 124 openings over the previous year. The majority of vessels requesting an opening are working tugs, barges and freighters. In May 2015 there were 206 openings and only 12 openings (6%) were for pleasure crafts. Large slow moving vessels require longer openings, some exceed 20 minutes. The average opening during May was 12.8 minutes. Unlike vehicle traffic, working vessels do not have specific timeframes when volumes are higher. Sailings are based on factors other than time of day. Other than the 1:00 AM to 4:00 AM time period, there is no other time of the day that requires a significant greater number of openings. A relatively small group of waterway users represent the majority of bridge openings. Island Tug & Barge, Kiewit/General, Western Tow Boat and Foss Tug accounted for 69% of all openings in May.

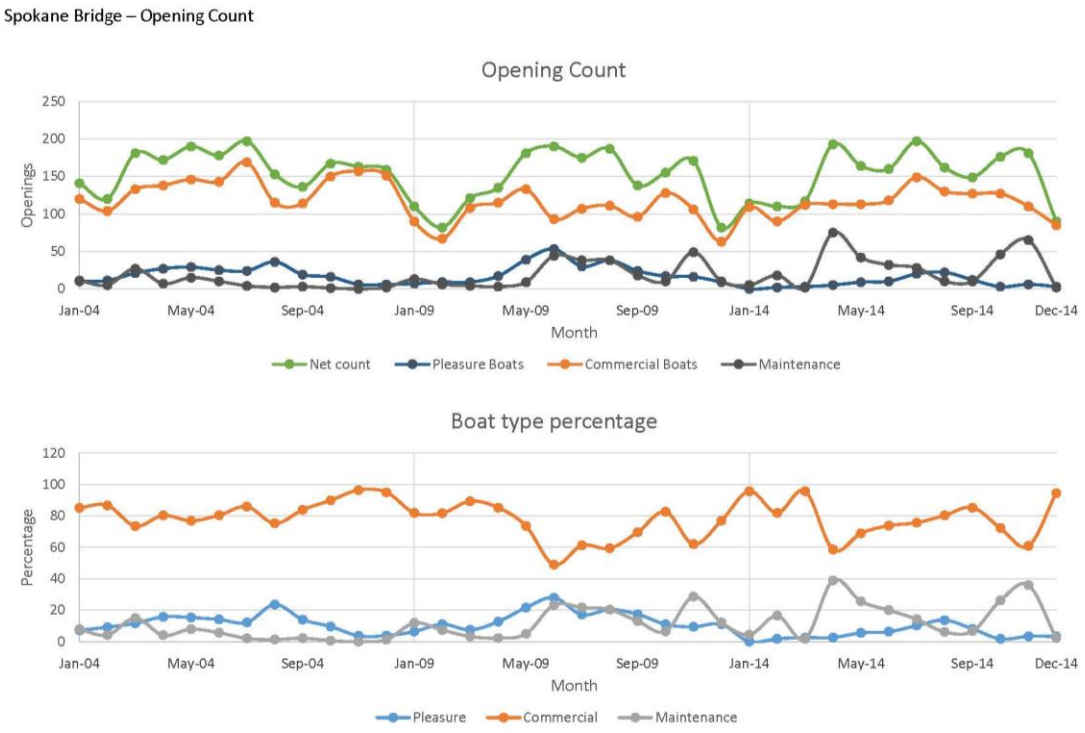


Figure 9 : Count and Breakdown of Openings by Boat Type in 2004, 2009, and 2014

Vehicle Demand

The Spokane St Swing Bridge carries approximately 10,500 vehicles per week day. A significant number of these vehicles are trucks hauling containers to or from Port of Seattle facilities. The AM peak from 7:00 AM to 10:00 AM averages about 1,000 vehicles per hour. The PM peak from 4:00 PM to 6:00 PM averages about 750 vehicles per hour. Although accurate pedestrian and bicycle counts are not available, the Swing Bridge is the second most utilized route in Seattle, with thousands of daily riders during the summer. With the Spokane St corridor being only one of two crossing of the Duwamish River inside Seattle City limits, it is also a popular pedestrian route. The detour route is significant if the Swing Bridge is not available. The distance to the 1st Avenue S. Bridge and back to the Swing Bridge is 6 miles. This could be an option for vehicles and may be an option of bicycles, but not a viable option for pedestrians.

Peak Vehicle Commute Times

Based on May 2015 traffic counts, vehicle volumes increase rapidly between 6:00 AM and 7:00 AM, peak at 9:00 AM and don't level off until 11:00 AM. The PM peak is less pronounced but increases between 4:00 PM and 6:00 PM, peaking at 5:00 PM. The morning peak is 1200 vehicles per hour and the afternoon peak is 800 vehicles per hour. The traffic counts suggest that more vehicles take the Swing Bridge in the morning than during their return trip in the afternoon. The morning high volume spans from 7:00 AM to 11:00 AM. A bridge opening during the morning peak commute will quickly create a delay for up to 300 vehicles.

Relationship to other issues

U.S Coast Guard

The Spokane St Swing Bridge crosses the West Duwamish Waterway. The waterway existed long before a bridge was installed. The U.S Coast Guard is charged with managing navigable waterways within the United States. Federal law CFR 33 Chapter 11, enacted in 1894, requires bridges to be permitted and, in general, not restrict navigation. The permit for the Swing Bridge requires that bridge openings must occur, without delay, when requested by a vessel captain. In the past, SDOT requested that the Coast Guard grant a deviation from this requirement and allow "closed periods" during peak commute times. Similar to the permit for the Lake Washington Ship Canal bridges, a closed period would restrict bridge openings and avoid vehicle delays during peak commute times. The Coast Guard has denied SDOT's request stating the significant hardship delaying vessel sailing would have on the waterway users. Waterway users argue that sailings are scheduled around tides and currents. A peak period delay of only a few hours could result in many hours of delay until sailing conditions are again favorable. The Coast Guard and federal courts have ruled that, although navigation may have a higher standing than vehicle travel, it is not absolute.

SDOT requested that vessel openings be delayed during time of extreme congestion due to a blocking incident on the West Seattle High-Level Bridge. The Coast Guard has specifically ruled that "a bridge opening cannot be delayed due to an incident on a parallel route". They have agreed to broadcast a request that vessel's "volunteer" delaying their sailing should SDOT report a blocking incident on the High-level Bridge.

West Seattle High-level Bridge

The West Seattle high-level bridge is a preferred route when traveling to and from West Seattle. However, during commute times this bridge is at or near capacity. In the event of a blocking incident on the High-level Bridge the Swing Bridge is the natural detour route and volumes quickly exceed capacity. Should a vessel request an opening, the resulting impact is significant delays up to one hour or longer. The cost of these delays is the productivity of the individuals, but also the environmental impact due to the additional minutes of vehicle idling and discharging carbon into the air.

Past improvements and current practice

SDOT made improvements to the transportation system to mitigate Swing Bridge openings delays. There are advance warning signs alerting motorist of an opening and recommending alternate routes. Subscribers to SDOT's Twitter account receive tweets that the Swing Bridge is open, allowing motorist to make travel route choices. The Coast Guard is willing to broadcast to waterway user a request that they delay vessel sailing avoiding bridge openings when a blocking incident has occurred on the High-level Bridge. SDOT has developed and continues to improve their Traffic Incident Management (TIM) procedures. TIM has already seen improvements in reducing traffic delays from time blocking incidents. SDOT works closely with the Port of Seattle to coordinate traffic control when large container vessels are in port increasing the number of short haul truck trips on the Swing Bridge. SDOT has a dedicated

communication signal to Fire Station 14 that warns them of Swing Bridge openings in an effort to avoid delays.

Anticipated future conditions

- Vessel traffic and opening requests will likely be static, with minor fluctuation due to swings in the economy
- Container cargo at the Port of Seattle will fluctuate due to regional competition and the Panama Canal widening
- Vehicle, bicycle and pedestrian traffic will likely increase due to new multi-unit housing projects in West Seattle
- Light rail and further enhanced bus service is planned for this corridor but not currently funded
- No new capacity lanes in the near future

Recommended Projects

Waterway User Coordination Program #6

This project will engage waterway users to provide information about pending openings. This information can be used to better manage the corridor and alert bridge users of potential delays. Data indicates that a relatively small group of marine businesses represent a majority of bridge openings. This program will be proactive in communicating with the waterway users to understand their sailing schedules well in advance. Building a relationship with the waterway users may result in more compliance with the "volunteer" closed period during peak commute times. Historic data on bridge openings will inform us on the success of the program.

Swing Bridge Operational Changes #8

The Swing Bridge control system is a computer based programmable controller system. There are over 2200 individual commands and steps in the process to completely open and close the bridge. Through careful critical path analysis of the opening and closing sequence there is an opportunity to reduce the electrical/mechanical functional time. We cannot control the time necessary for a vessel to safely transit the waterway, but if we can reduce the overall opening time by only 30 seconds, it can save over 15 hours of delay time per year.