TREND NOTICE
ALASKAN WAY VIADUCT & SEAWALL REPLACEMENT PROGRAM

Washington State Department of Transportation

Trend Title: **Address Level of Service for Atlantic Street Intersection – SB Alaskan Way Revision**	Date: June 30, 2008
Trend Log Number/Rev. **SS0009**	Segment Name: South Holgate Street to south King Street Viaduct Replacement Project
Prepared By: Steve Beadle / Cliff Mansfield / June 30, 2008 _____ Name / Date Preparer's Supervisor Ali Amiri / June 30, 2008 ._____ Name / Date	Approval Level / Authority: ☒ Project Director / Deputy Project Director
Nature of Change: ☒ Scope	☐ Schedule ☐ Budget
Does Trend Impact Legislative Funding Allocation? ☒No ☐Yes	Does Trend Affect Biennium Aging? ☒No ☐Yes

Description of the Trend (Use Continuation Sheets as Needed):

Analysis of the 30% design of Atlantic Street Intersections with Alaskan Way, Atlantic Street Underpass, East Marginal Way, Colorado Street and Terminal 46 suggest that an acceptable level of service (LOS) will not be provided for the 2030 design year. Projected BNSF Tail Track usage and increased Port of Seattle Terminal 46 operations in 2030 threaten to degrade the level of service during tail track preemption, below acceptable levels.

Coordination with the City of Seattle, the Port of Seattle and BNSF suggest that the best option for improving the LOS is the removal of incoming traffic from the South Bound Alaskan Way leg of the intersection. Options for removal of this traffic are being assessed and will involve compromises between the amount of improvement needed and impacts to other aspects of the current design. These options need to be looked at further for impacts to other design disciplines and discussed with stakeholders before a clear recommendation can be made. However, two options currently at the forefront are:

A. South Bound Alaskan Way traffic combined with North Bound lanes into a three lane two way section on the East side of mainline 99 and placing the ferry holding on the west along the alignment that was previously slated for SB Alaskan Way.
B. Eliminating the paved area on the west and placing both a three lane, two way section of Alaskan Way and the ferry holding on the East side of mainline 99.

Option A only marginally improves the level of service of the intersection during preemption and increases the potential for driver confusion and complications related to users making the wrong movement. Example: Ferry traffic entering the U-tube or U-tube traffic entering the ferry holding. Additionally, the intersection near S King St where the ferry traffic would need to reenter, Alaskan Way, and the North Bound off ramp appears complex and it is still unclear if an elegant solution could be found. In this option no changes to either mixed use trail would be needed. The weak improvement in the LOS in the intersections is partially a result of worst case scenario analysis. The analysis assumes the AM and PM peak volumes combined with a tail track closure and the simultaneous usage of the ferry holding. It is unclear how often this combination of events would occur. However, the complicated nature of the intersections at both ends combined with less ideal functionality makes this option difficult to recommend.

Option B improves the LOS of the intersection significantly but would require compromises to the current mixed use trial and/or ferry holding cross sections. A significant concern with Option B is that it may impact the current urban design that has been developed through extensive coordination with the City of Seattle and other stakeholders. The lanes previously intended for SB Alaskan Way would no longer be needed at the completion of the project opening the possibility of eliminating the bridge over the U-tube. However, these lanes would still be needed during construction to maintain traffic through the area. At completion this area could be left unpaved and some mitigation for the changes to the east side mixed use trail might be possible

Both options have been developed to avoid any impact to the mainline structure and avoid any additional need for R/W.

Recommendation: This trend seeks approval for scope only to pursue Option B. Additional work to coordinate this change with stakeholders is needed to identify agreeable solutions to the space constraint resulting from placing the mixed use trail, the ferry holding and Alaskan Way North and South Bound all on the East. However, it appears that Option B simply functions better and solutions to the space constraints are achievable.

We are currently assessing the impacts to schedule and costs that such a significant design revision will cause at this stage of project development. However, we are anticipating comments on the EA about the function of this intersection and making this change now will allow any schedule delays and costs to be minimized.

Justification for the Trend (Use Continuation Sheets as Needed):

Why are we requesting approval of this Trend, and what are the benefits?
On going analysis has raised concerns about the acceptability of the LOS for the intersections. In addition it is anticipated that comments will be received on the EA addressing concerns about the functionality of the intersection.

The primary benefit is to provide an intersection design with an acceptable LOS. Discussions and comments from project stakeholders have also raised concerns about the acceptability of the current intersection. Approval of this trend would allow the project team to identify and design an acceptable solution for the Atlantic Street intersections and minimize delays associated with making these changes by allowing all work on the 90% plan set to focus on the revised alignments.

What are the consequences of not approving this Trend?
It is anticipated that the current design will not be acceptable based on the 2030 design year and comments on the EA will require that we address this issue. It is more prudent to make changes now rather than risk additional schedule impacts.

Impacts of this Trend:

Schedule Impacts to QPR Milestones:

Milestone Description	Date Before Trend	Date After Trend	# Calendar Days Impact
Project Definition Complete	29-Jun-07	29-Jun-07	0
Begin Preconstruction Engr.	23-Jul-07	23-Jul-07	0
Environmental Doc. Compl.	16-Oct-08	16-Oct-08	0
RW Certification	18-May-09	18-May-09	0
Advertisement Date	3-Aug-09	3-Aug-09	TBD
Operationally Complete	31-Dec-12	31-Dec-12	TBD

Schedule Impacts to Other Milestones:

Milestone Description	Date Before Trend	Date After Trend	# Calendar Days Impact
Bid Opening	25-Sep-09	25-Sep-09	TBD
Award	19-Oct-09	19-Oct-09	TBD
Execution	9-Nov-09	9-Nov-09	TBD
Construction Start	23-Nov-09	23-Nov-09	TBD
Final Contract Completion	30-Sep-13	30-Sep-13	TBD
30% Submittal	18-Feb-08	18-Feb-08	0
60% Submittal	31-Jul-08	31-Jul-08	TBD
90% Submittal	12-Jan-09	12-Jan-09	TBD
100% Submittal	18-May-09	18-May-09	TBD

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Cost Impacts (x $1,000)

Project Phase	Baseline Target Estimate	Trend Estimate	Variance from Trend
PE	52900	52900	TBD
RW	46200	46200	0
CN	446300	446300	TBD
Total	545,400	545,400	0
Total Estimated Impact	0	0	0

Mitigation(s) for the Trend:

List and Description of Attachments:

1. **Atlantic Street/Southbound Alaskan Way Traffic Analysis Summary– Further explains the recommended solution and contains tables depicting the LOS for the different scenarios.**
2. **General Observations from Tail-Track Video- Summarizes the results of video documentation of the RR usage of the tail track.**
3. **Concept graphics representing the current arrangement, Option A, and Option B.**

Acknowledgement Status (Name / Date):

☑ AWV&SRP Design Manager — Ali Amiri / 7/14/08

☐ AWV&SRP Construction Manager — Tom Madden / 7-17-08

☑ AWV&SRP Environmental Manager — for Allison Hanson / 7-31-08

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Approval Status:

- ☐ *Fully Approved*
- ☒ *Elevate to UCO Regional Administrator/SDOT Director*
- ☐ *Approved for Scope Only; Additional Study / Justification Required (See "Instructions" Below)*
- ☒ *Defer Approval Pending Receipt of Additional Information (See "Instructions" Below)*
- ☐ *Rejected*

- DEFER 60% PSFE TURN-IN PENDING ELEVATION OF ISSUE
- COORDINATE W/ STAKEHOLDERS FOR BUY-IN
- PROVIDE BENEFIT/RISK SUMMARY OF RECOMMENDED APPROACH.

Approval Authority (Name / Date):

- ☐ Project Director / Deputy Project Director _____ / 7/8/08
- ☐ UCO Regional Administrator _____ / _____

Instructions:

Does Fully Approved Trend require a PCRF? ☐ Yes ☐ No

Does Fully Approved Trend require a 603 Form? ☐ Yes ☐ No

If Approved; Updating of Project Cost / Schedule Basis/Baselines:

- ☐ *Cost Basis / System Updated*
- ☐ *Schedule Basis/ System Updated*

_____

Project Controls Manager Name / Signature / Date

If Approved; Updating of Project Cost / Schedule with PCRF Submittal:

- ☐ *PCRF Submitted*

_____

Business Manager Name / Signature / Date

Distribution: AVW Project File; WSDOT Task Order Manager; AWV Document Control; AWV UCO; AWV Project Controls

AWV S. Holgate to S. King Street Replacement Project

Atlantic Street/Southbound Alaskan Way Traffic Analysis Summary

July 2, 2008

Introduction

A number of design modifications have been analyzed for the Atlantic Street/U-Tube intersection area to improve expected operations. The initial design included southbound surface Alaskan Way traffic entering the intersection complex as a fifth leg, between the U-Tube entrances and approximately across from Colorado Avenue S. The inclusion of a fifth leg in any intersection can be problematic from an operations standpoint. In this case, the inclusion is particularly problematic due to other constraints at this location, including heavy truck traffic, a rail-yard tail track, and closely spaced intersections.

Considering that the combination of heavy truck traffic, rail-yard tail track crossings and closely spaced intersections could not be satisfactorily accommodated within this alignment, the transportation team tested a number of different operational scenarios to identify the sensitivity of operations at this intersection to changes in contributing constraints. These operational changes included reducing general purpose or truck traffic for specific movements and times, as well as channelization changes. However, none of the operational changes resulted in significantly improved operations at the Atlantic/U-Tube intersection complex. Different levels of use of the tail track were also tested; however, recent field observations of current tail track observations confirmed that the assumptions used for the high range of tail track usage during the peak periods (i.e., three 10-minute train crossings during the peak hour) were not unreasonable.

The next design modification analyzed by the transportation team was the removal of the southbound surface Alaskan Way approach from the Atlantic/U-Tube intersection complex. The resulting traffic routing changes and results of this analysis are presented in greater detail below.

Proposed Design Modification – Remove southbound Surface Alaskan Way

Removing the southbound Surface Alaskan Way leg from the S. Atlantic/U-Tube intersection complex requires a number of changes to the currently proposed traffic design. These changes include the following:

- Convert the one-way east side frontage road (currently named Northbound Alaskan Way) to a two-way, three-lane facility north of Royal Brougham Way, with one northbound lane and two southbound lanes between Royal Brougham Way and S. Atlantic Street. The three lane section north of Royal Brougham Way could be configured as two lanes in one direction and one opposing lane, or as one lane in each direction with a center turn lane.
- Provide a southbound connection from the existing surface Alaskan Way to the two-way frontage road south of King Street on the east side of SR 99.

Under this scenario, southbound Alaskan Way traffic would use the east side frontage road to access S. Atlantic Street. Some southbound traffic was assumed to cut over to First Avenue S. at Royal Brougham Way. Traffic turning at Royal Brougham Way was projected to have destinations on First Avenue S either north or south of Royal Brougham Way, but was a relatively small percentage of the overall southbound Alaskan

Way movement. The rest of the southbound surface Alaskan Way traffic continued south to S Atlantic Street and onto their projected destinations along E Marginal Way, First Avenue S, I-5 or I-90 (via Edgar Martinez Way) or S. Atlantic Street.

Results of this analysis for year 2030 (assuming three train blockages of 10 minutes each) show noticeable improvements for the S Atlantic Street intersection complex, including improved projected operations between N. SIG and T-46. This particular improvement is evidenced primarily in that a higher percent of the truck demand is served by the system. During the AM peak hour with an assumed three-train crossing, the percentage of trucks served exiting T-46 improves from 84% to 98%, while in the PM peak hour, the amount of trucks served exiting N SIG at Colorado/S Atlantic improves from 79% to 100% (Table 1 and 3 for AM peak and 2 and 4 for PM peak).

Overall average operations improve from a poor LOS F (123 seconds of average vehicle delay – Table 1) for the current design in the AM to an improved LOS F (87 seconds average vehicle delay, which is close to the LOS E, 80 second threshold – Table 3) with the frontage road proposal. More significant overall improvements are expected for the PM peak hour in that average operations for the Atlantic St signal system improves from LOS F (99 seconds average delay) in the PM for the current design to LOS D (51 seconds average delay) for the frontage road proposal (Tables 2 and 4).

Note that the LOS at First Avenue S. and S Atlantic Street does not change considerably from the current design, i.e., LOS remains at C in the AM and D in the PM under the frontage road alternative. Also, LOS at Royal Brougham Way intersections with both the frontage road and First Ave S are projected to be LOS C or better for both peak periods with the frontage road proposal.

Ferry Holding Considerations

Removing the southbound surface Alaskan Way leg of the intersection allowed the transportation team to explore the possibility of relocating the ferry holding lanes to the west of SR 99 – to the previously designated southbound surface Alaskan Way alignment. Vehicles wishing to access the ferry holding would travel westbound along Atlantic Street, past the frontage road and turn right into the ferry holding lane, just past the eastern entrance to the U-Tube.

As shown in Tables 5 and 6, shifting the ferry holding to the west side of SR 99 increases the expected delay for the S Atlantic Street intersections. It was initially thought that accommodating an outbound movement would not degrade the LOS at the Atlantic/U-Tube intersection complex; however, the analysis indicates that it does. While the results are not as pronounced as for incoming traffic; an additional movement still needs to be accommodated, which degrades the improvements gained by eliminating the leg entirely. The degradation in LOS is the result of adding an additional movement into the intersection when the U-Tube is in use.

When the tail track is blocked (U-Tube is in use) the ferry traffic blocks westbound vehicles waiting to enter the eastern U-Tube entrance, creating more westbound delay along Atlantic that then queues through First Avenue S. As shown in the Table 5, westbound Atlantic at the frontage road degrades from and LOS D to and LOS F in the AM peak and from LOS C to E in the PM peak (Table 6). We have increased the time allotted to westbound traffic, but the result is still degradation in LOS for this approach. The additional friction and delay on westbound Atlantic impacts the operations at First

Avenue and Atlantic Street; the westbound Atlantic Street approach is projected to degrade from LOS D to LOS F (50 and 94 seconds of delay respectively) in the AM peak, PM peak LOS is not projected to degrade.

Compounding this problem is the reduction in traffic flow for southbound traffic on the frontage road that is bound for E Marginal Way (southbound). Due to ferry traffic and associated westbound queuing, this movement is projected to experience increased delay, particularly in the PM peak, when LOS is projected to degrade from LOS D to F (Tables 4 and 6).

Way-Finding and Driver Expectations

In addition to the above noted operational results, there are a number of other issues to take into account if moving the ferry holding lanes to the west side of SR 99 is going to be considered or implemented.

The first issue is way-finding for unfamiliar ferry users. The Atlantic Street/U-Tube intersection is not typical in its operations (alternate routings through U-Tube when the tail track is in use) or its users (heavy truck traffic, and train movements on the tail track). The ferry holding lanes are typically only used during peak ferry travel-periods, i.e., holidays and summer weekends, when many users of the ferry system are not regular ferry riders and are not familiar with the ferry holding concept. In addition, many drivers are from outside of the greater Seattle area, State, and occasionally the country. These drivers will be unfamiliar, not only with the route to Colman Dock, but with the possibility of train blockages and alternate routings that can occur along S Atlantic Street in this area.

If the ferry holding lanes are relocated to the west side of SR 99, it will bring unfamiliar drivers through the Atlantic Street intersections. Unfamiliar drivers may get confused (even with extensive and correct signing) and turn into the U-Tube when the tail track is in use. This will reduce the usefulness of the U-Tube for freight and overall traffic, but also add confusion and out of direction travel for ferry travelers. Similarly, there is the possibility of trucks or other traffic desiring to use the U-Tube inadvertently turning into the ferry holding lanes instead.

The second issue is driver expectation and understanding for all drivers. As noted above, the ferry holding lanes are used during peak ferry travel-periods. Under typical operating conditions, Colman Dock has adequate storage for vehicles waiting to board either the Bainbridge or Bremerton ferries. This means that ferry users will typically use the frontage road that is located east of the Atlantic/U-Tube intersection to access Colman Dock. However, when ferry holding is in-force, drivers will be asked to continue westbound through the Atlantic/U-Tube intersection and enter the holding lanes west of the eastern U-Tube entrance.

This change in accessing Colman Dock and the ferry system will need to be communicated to drivers via variable message signs on S. Atlantic Street (and likely First Avenue S), with enough advance warning that drivers are not caught unaware and turn northbound on the frontage road. Due to the complex nature of the Atlantic/U-Tube intersection a considerable amount of signage is already needed to convey when U-Tube use is appropriate and how truck and general purpose drivers should negotiate the westbound to southbound left turn to Colorado Avenue S. The need for additional signing that would be required to direct ferry traffic to holding lanes west of SR 99 would

likely overwhelm most drivers, increasing congestion and delay along S Atlantic Street and First Avenue S.

Recommendation

Given the operational results as well as the other issues associated with moving the ferry holding lanes west of SR 99, the transportation team recommends that the ferry holding lanes remain east of SR 99.

In addition, the transportation team recommends locating of the ferry holding lanes between SR 99 and the frontage road. This will allow for access to the back side of the WOSCA property from the frontage road, improving mobility and access for all drivers and property owners.

Finally, the transportation team recommends a single lane in each direction with a two-way center-turn lane as the configuration of the frontage road north of Royal Brougham Way.

Table 1

Approaches	2030 Build Scenario - Mitigated Design Southbound Alaskan Way per 60% Design						
	AM Peak Hour						
	Volume input	Vol Served	% Served	Average Queue (ft)	Maximum Queue (ft)	Delay	LOS
Atlantic Street at Alaskan Way						**123**	**F**
Northbound E Marginal	320	312	97%	309	1203	180	F
Eastbound T-46	160	134	84%	444	813	249	F
South eastbound Alaskan Way	490	477	97%	220	679	131	F
Northbound Colorado	225	216	96%	477	1142	130	F
Westbound Atlantic St at Alaskan Way	290	270	93%	37	137	31	C
Southbound U-Tube (eastern)	-	196	-	161	1175	82	F
Southbound U-Tube (western)	-	226	-	38	777	88	F
Atlantic Street at Frontage Road						**6**	**A**
Southbound Frontage	135	137	100%	14	116	24	C
Eastbound Atlantic Street	715	709	99%	1	86	1	A
Westbound Atlantic Street	575	539	94%	11	175	8	A
Atlantic Street at 1st Avenue						**32**	**C**
Northbound 1st Avenue	990	959	97%	53	326	30	C
Southbound 1st Avenue	1790	1790	100%	64	515	24	C
Eastbound Atlantic Street	500	475	95%	45	250	33	C
Westbound Atlantic St	925	950	100%	118	597	48	D
Royal Brougham at 1st Avenue						**15**	**B**
Northbound 1st Avenue	1115	1063	95%	27	362	8	A
Southbound 1st Avenue	2125	2088	98%	49	446	16	B
Eastbound Royal Brougham Street	65	65	100%	12	111	20	B
Westbound Royal Brougham Street	340	344	100%	30	138	33	C
Royal Brougham at Frontage Road						**3**	**A**
Northbound Frontage	665	654	98%	0	0	0	A
Westbound Royal Brougham Street	225	222	99%	7	140	12	B
Surface Alaskan Way at Frontage						**11**	**B**
Northbound SR 99 Ramp	730	726	99%	18	176	9	A
North westbound Frontage Road	690	681	99%	3	193	13	B

Assumes 30 minutes of train blockage during AM peak hour, ie 3 occurrences of 10 minutes each
Results are from an average of 5 simulations

Table 2

Approaches	2030 Build Scenario - Mitigated Design Southbound Alaskan Way per 60% Design						
	PM Peak Hour						
	Volume input	Vol Served	% Served	Average Queue (ft)	Maximum Queue (ft)	Delay	LOS
Atlantic Street at NB E Marginal						**99**	**F**
Northbound E Marginal	510	435	85%	433	1418	195	F
Eastbound T-46	65	65	99%	43	127	83	F
SEB Alaskan Way	765	754	99%	242	831	82	F
Northbound Colorado	160	126	79%	202	439	90	F
Westbound Atlantic St at Alaskan Way	250	241	96%	34	136	38	D
Southbound U-Tube (eastern)	-	224	-	34	690	31	C
Southbound U-Tube (western)	-	150		14	1024	118	F
Atlantic Street at Frontage Road						**6**	**A**
Southbound Frontage	130	132	100%	11	105	22	C
Eastbound Atlantic Street	1005	1040	100%	11	188	4	A
Westbound Atlantic Street	515	530	100%	6	164	6	A
Atlantic Street at 1st Avenue						**43**	**D**
Northbound 1st Avenue	1700	1716	100%	200	714	49	D
Southbound 1st Avenue	1550	1570	100%	113	602	40	D
Eastbound Atlantic Street	1070	1115	100%	135	285	36	D
Westbound Atlantic St	815	836	100%	80	400	45	D
Royal Brougham at 1st Avenue						**14**	**B**
Northbound 1st Avenue	1685	1543	92%	32	240	8	A
Southbound 1st Avenue	1615	1611	100%	33	305	14	B
Eastbound Royal Brougham Street	80	77	96%	11	96	19	B
Westbound Royal Brougham Street	445	489	100%	43	195	38	D
Royal Brougham at Frontage Road						**5**	**A**
Northbound Frontage	575	587	100%	0	0	0	A
Westbound Royal Brougham Street	320	328	100%	15	222	14	B
Surface Alaskan Way at Frontage						**12**	**B**
Northbound SR 99 Ramp	475	472	99%	12	114	9	A
North westbound Frontage Road	690	712	100%	1	75	14	B

Assumes 30 minutes of train blockage during AM peak hour, ie 3 occurrences of 10 minutes each
Results are from an average of 5 simulations

Table 3

Approaches	2030 Build Scenario - Mitigated Design Realignment of Alaskan Way to Frontage Road Ferry Holding East of SR 99 AM Peak Hour						
	Volume input	Vol Served	% Served	Average Queue (ft)	Maximum Queue (ft)	Delay	LOS
Atlantic Street at NB E Marginal/Alaskan Way/Colorado						**87**	**F**
Northbound E Marginal	320	309	97%	193	1271	126	F
Eastbound T-46	160	156	98%	66	124	102	F
Northbound Colorado	225	204	91%	748	1387	220	F
Southbound Alaskan Way/Frontage Rd	535	538	100%	133	734	57	E
Westbound Atlantic St at Alaskan Way/Frontage Rd	525	517	99%	118	518	41	D
Southbound U-Tube (eastern)	-	190	-	241	1240	113	F
Southbound U-Tube (western)	-	168	-	45	906	50	D
Atlantic Street at 1st Avenue						**33**	**C**
Northbound 1st Avenue	990	970	98%	54	300	31	C
Southbound 1st Avenue	2025	1821	90%	54	378	22	C
Eastbound Atlantic Street	265	393	100%	55	334	46	D
Westbound Atlantic Street	925	948	100%	130	559	50	D
Royal Brougham at 1st Avenue						**16**	**B**
Northbound 1st Avenue	1115	1023	92%	27	244	8	A
Southbound 1st Avenue	2360	2093	89%	47	437	16	B
Eastbound Royal Brougham	150	150	100%	15	106	35	D
Westbound Royal Brougham	330	344	100%	28	138	31	C
Royal Brougham at Frontage Road						**13**	**B**
Northbound Frontage Road	665	633	95%	4	94	6	A
Southbound Frontage Road	415	492	100%	28	574	11	B
Westbound Royal Brougham	225	221	98%	41	212	36	D
Surface Alaskan Way at Frontage Road						**17**	**B**
Northbound Alaskan Way	730	726	99%	47	387	21	C
Southbound Alaskan Way	665	671	100%	49	379	15	B
North westbound Frontage Road	450	431	96%	44	284	15	B

Assumes 30 minutes of train blockage during AM peak hour, ie 3 occurrences of 10 minutes each
Results are from an average of 5 simulations

Table 4

Approaches	2030 Build Scenario - Mitigated Design Realignment of Alaskan Way to Frontage Road Ferry Holding East of SR 99 PM Peak Hour						
	Volume input	Vol Served	% Served	Average Queue (ft)	Maximum Queue (ft)	Delay	LOS
Atlantic Street at NB E Marginal/Alaskan Way/Colorado						**51**	**D**
Northbound E Marginal	510	494	97%	151	1022	79	E
Eastbound T-46	65	64	99%	36	115	74	E
Northbound Colorado	125	131	100%	101	483	67	E
Southbound Alaskan Way/Frontage Rd	735	737	100%	169	838	51	D
Westbound Atlantic St at Alaskan Way/Frontage Rd	515	521	100%	81	429	30	C
Southbound U-Tube (eastern)	-	259	-	63	728	41	D
Southbound U-Tube (western)	-	287	-	66	991	41	D
Atlantic Street at 1st Avenue						**51**	**D**
Northbound 1st Avenue	1700	1709	100%	255	748	59	E
Southbound 1st Avenue	1610	1605	100%	63	335	25	C
Eastbound Atlantic Street	910	887	97%	281	502	78	E
Westbound Atlantic Street	815	824	100%	111	565	57	E
Royal Brougham at 1st Avenue						**21**	**C**
Northbound 1st Avenue	1685	1421	84%	101	585	18	B
Southbound 1st Avenue	1615	1612	100%	37	369	14	B
Eastbound Royal Brougham	240	228	95%	19	131	27	C
Westbound Royal Brougham	445	488	100%	59	216	50	D
Royal Brougham at Frontage Road						**15**	**B**
Northbound Frontage Road	575	595	100%	8	104	11	B
Southbound Frontage Road	765	669	87%	79	854	17	B
Westbound Royal Brougham	320	280	88%	33	230	21	C
Surface Alaskan Way at Frontage Road						**18**	**B**
Northbound Alaskan Way	475	472	99%	44	299	28	C
Southbound Alaskan Way	1730	1687	98%	123	524	16	B
North westbound Frontage Road	390	409	100%	39	271	14	B

Assumes 30 minutes of train blockage during PM peak hour, ie 3 occurrences of 10 minutes each
Results are from an average of 5 simulations

Table 5

Approaches	2030 Build Scenario - Mitigated Design Realignment of Alaskan Way to Frontage Road Ferry Holding West of SR 99 AM Peak Hour						
	Volume input	Vol Served	% Served	Average Queue (ft)	Maximum Queue (ft)	Delay	LOS
Atlantic Street at NB E Marginal/Alaskan Way/Colorado						**92**	**F**
Northbound E Marginal	320	314	98%	214	1222	133	F
Eastbound T-46	160	156	97%	76	136	140	F
Northbound Colorado	225	206	92%	264	880	100	F
Southbound Alaskan Way/Frontage Rd	535	518	97%	105	507	55	D
Westbound Atlantic St at Alaskan Way/Frontage Rd	525	506	96%	252	515	93	F
Southbound U-Tube (eastern)	-	184	-	241	1226	131	F
Southbound U-Tube (western)	-	247	-	61	695	48	D
Atlantic Street at 1st Avenue						**43**	**D**
Northbound 1st Avenue	990	967	98%	51	305	33	C
Southbound 1st Avenue	2025	1819	90%	56	380	22	C
Eastbound Atlantic Street	265	394	100%	50	270	45	D
Westbound Atlantic Street	925	934	100%	237	928	94	F
Royal Brougham at 1st Avenue						**16**	**B**
Northbound 1st Avenue	1115	1016	91%	26	314	8	A
Southbound 1st Avenue	2360	2089	89%	47	437	15	B
Eastbound Royal Brougham	220	149	68%	16	132	31	C
Westbound Royal Brougham	330	344	100%	29	132	32	C
Royal Brougham at Frontage Road						**9**	**A**
Northbound Frontage Road	665	379	57%	2	88	3	A
Southbound Frontage Road	415	497	100%	7	321	4	A
Westbound Royal Brougham	225	222	99%	37	186	29	C
Surface Alaskan Way at SR 99 Ramps						**23**	**C**
Northbound Alaskan Way	450	413	92%	6	133	5	A
Southbound Alaskan Way	665	680	100%	5	75	2	A
Northbound SR 99 Ramps	730	724	99%	123	521	52	D

Assumes 30 minutes of train blockage during AM peak hour, ie 3 occurrences of 10 minutes each
Results are from an average of 5 simulations

Table 6

Approaches	2030 Build Scenario - Mitigated Design Realignment of Alaskan Way to Frontage Road Ferry Holding West of SR 99 PM Peak Hour						
	Volume input	Vol Served	% Served	Average Queue (ft)	Maximum Queue (ft)	Delay	LOS
Atlantic Street at NB E Marginal/Alaskan Way/Colorado						**74**	**E**
Northbound E Marginal	510	503	99%	129	939	70	E
Eastbound T-46	65	64	99%	42	114	85	F
Northbound Colorado	125	128	100%	77	353	53	D
Southbound Alaskan Way/Frontage Rd	735	682	93%	286	832	81	F
Westbound Atlantic St at Alaskan Way/Frontage Rd	515	501	97%	189	490	80	E
Southbound U-Tube (eastern)	-	246	-	114	957	75	E
Southbound U-Tube (western)	-	293	-	118	1118	63	E
Atlantic Street at 1st Avenue						**53**	**D**
Northbound 1st Avenue	1700	1702	100%	266	721	63	E
Southbound 1st Avenue	1610	1610	100%	62	340	25	C
Eastbound Atlantic Street	910	894	98%	288	515	80	E
Westbound Atlantic Street	815	819	100%	115	500	60	E
Royal Brougham at 1st Avenue						**21**	**C**
Northbound 1st Avenue	1685	1424	85%	100	602	18	B
Southbound 1st Avenue	1615	1614	100%	36	349	14	B
Eastbound Royal Brougham	240	229	95%	19	121	28	C
Westbound Royal Brougham	445	490	100%	56	217	49	D
Royal Brougham at Frontage Road						**12**	**B**
Northbound Frontage Road	575	275	48%	1	75	3	A
Southbound Frontage Road	765	738	97%	29	549	13	B
Westbound Royal Brougham	320	325	100%	33	227	20	B
Surface Alaskan Way at SR 99 Ramps						**8**	**A**
Northbound Alaskan Way	390	416	100%	5	89	5	A
Southbound Alaskan Way	1730	1664	96%	13	113	1	A
Northbound SR 99 Ramps	475	466	98%	49	199	33	C

Assumes 30 minutes of train blockage during PM peak hour, ie 3 occurrences of 10 minutes each
Results are from an average of 5 simulations

General Observations from Tail-Track Video
6/3/08

- Switching appears relatively limited between 1:30 and 3pm

- Switching picks up in the late afternoon (3pm to 5pm) and again between 11:30pm and 2am (limited video observations for middle of the night activities).

- Approximately once per day switching occurs between the Whatcom lead track and the SIG tail-track (operations can take up to 1 hour – the track is **not** blocked the whole time).

- Truck activity begins around 5:30am into T-46 and ends typically around 4:45pm.

- Trucks exiting T-46 appeared to have trouble exiting when southbound vehicles/trucks were trying to turn left onto Atlantic Street and could not find a gap in the northbound traffic. Occasionally, the northbound traffic stopped at the signal at Royal Brougham Way extended back and blocked Atlantic (queues tended to clear quickly).

- Trucks exiting T-46 have difficulty maneuvering when the tail-track is in use and trucks are queued SB on Alaskan/E. Marginal. Trucks seem most likely to head southbound to E Marginal when the tail-track is in use if unimpeded.

- Trucks were seen to queue both NB and SB (and somewhat EB) in the street waiting to enter T-46 during and immediately following the lunch hour.

S. Royal Brougham Way* Blockages by Trains (hours:minutes)

Day	12:00 AM	12:30 AM	1:00 AM	1:30 AM	2:00 AM	2:30 AM	3:00 AM	3:30 AM	4:00 AM	4:30 AM	5:00 AM	5:30 AM	6:00 AM	6:30 AM	7:00 AM	7:30 AM	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:00 AM	10:30 AM	11:00 AM	11:30 AM	12:00 PM	12:30 PM	1:00 PM	1:30 PM	2:00 PM	2:30 PM	3:00 PM	3:30 PM	4:00 PM	4:30 PM	5:00 PM	5:30 PM	6:00 PM	6:30 PM	7:00 PM	7:30 PM	8:00 PM	8:30 PM	9:00 PM	9:30 PM	10:00 PM	10:30 PM	11:00 PM	11:30 PM	Total Number of Blockages	Video Hours	Total Minutes Blocked	% of Total
Tuesday 5/20																									1 0:07								1 0:02	1 0:02	1 0:03		1 0:18	1 0:13											6	9.5	45	8%
Wednesday 5/21																							1 0:02															2 0:02				1 0:02		2 0:11							10	11	17	3%
Thursday 5/22																					1 0:02	1 0:03	1 0:01				2 0:05				1 0:09	1 0:06	1 0:02		1 0:02			1 0:01	1 0:06	2 0:10	1 0:05									22	10	52	9%
Friday 5/23																							1 0:09			1 0:03	2 0:12					1 0:02																			8	9	26	5%
Tuesday 5/27																		1 0:11				1 0:08	1 0:14			1 0:03	1 0:03				1 0:01	1 0:05	2 0:05						2 0:08	1 0:03	1 0:01		1 0:04				1 0:03			22	13.5	69	9%
Wednesday 5/28	1 0:01	1 0:03	1 0:02				1 0:07	1 0:05											1 0:02	2 0:05				1 0:01	1 0:07						1 0:11	2 0:09		1 0:19		1 0:01			2 0:12	1 0:04								2 0:12	33	22.5	101	7%
Thursday 5/29	1 0:02	2 0:10	1 0:07	1 0:01			1 0:06	1 0:04		1 0:11							2 0:01						1 0:02								1 0:14	2 0:06	1 0:04			1 0:03	1 0:02											29	22	73	6%
Friday 5/30	1 0:05	1 0:19	1 0:01														1 0:10					1 0:11		1 0:09	1 0:06									1 0:06															31	15.5	67	7%

Key

	No Data
	No blockages
	1 - 9 minutes of blockage
	10-14 minutes of blockage
	15 or more minutes of blockage
2	Number of blockages
0:17	Total duration of blockage of Royal Brougham (in hours:minutes)

* between the Alaskan Way Viaduct & Alaskan Way S.

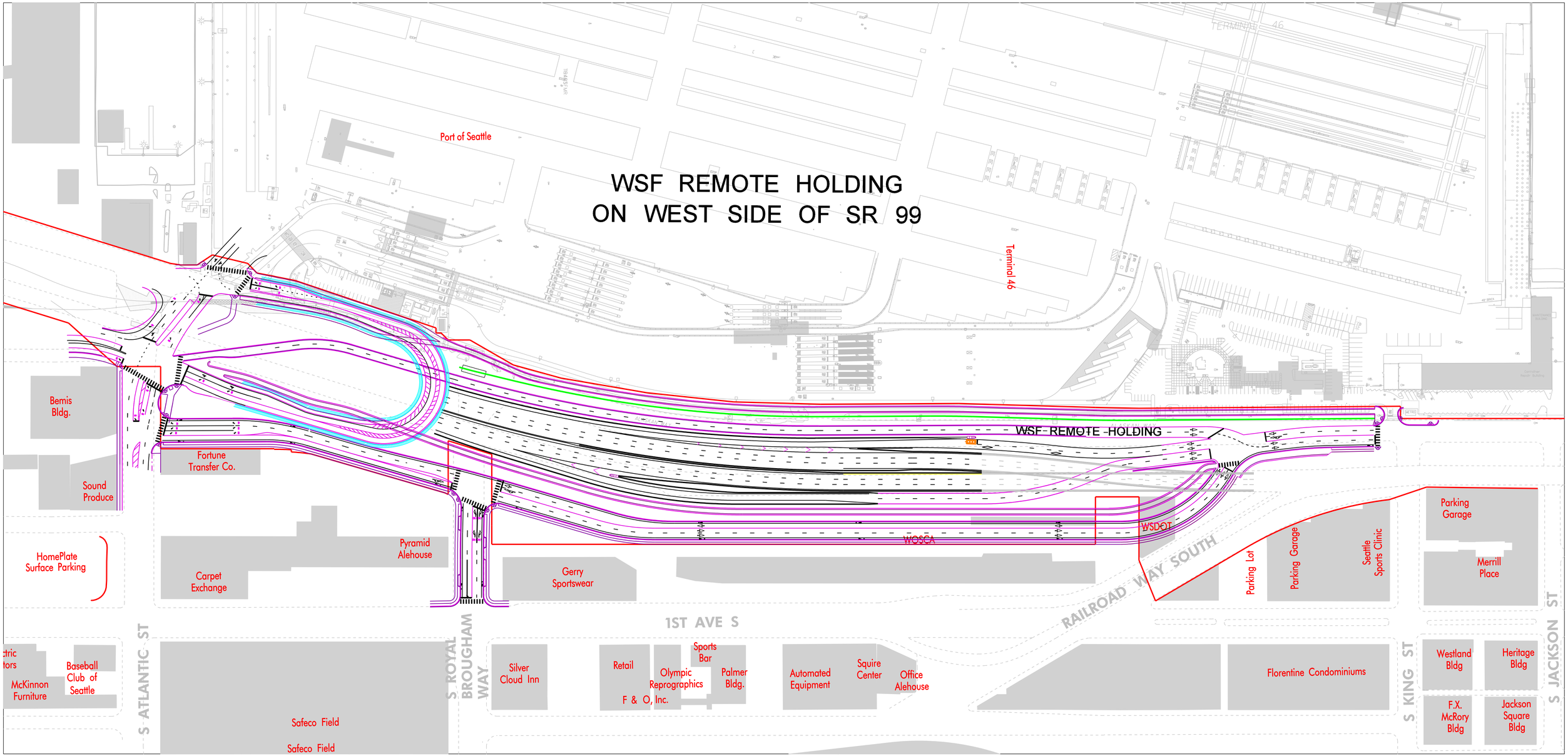
S. Atlantic Street* Blockages by Trains (hours:minutes)

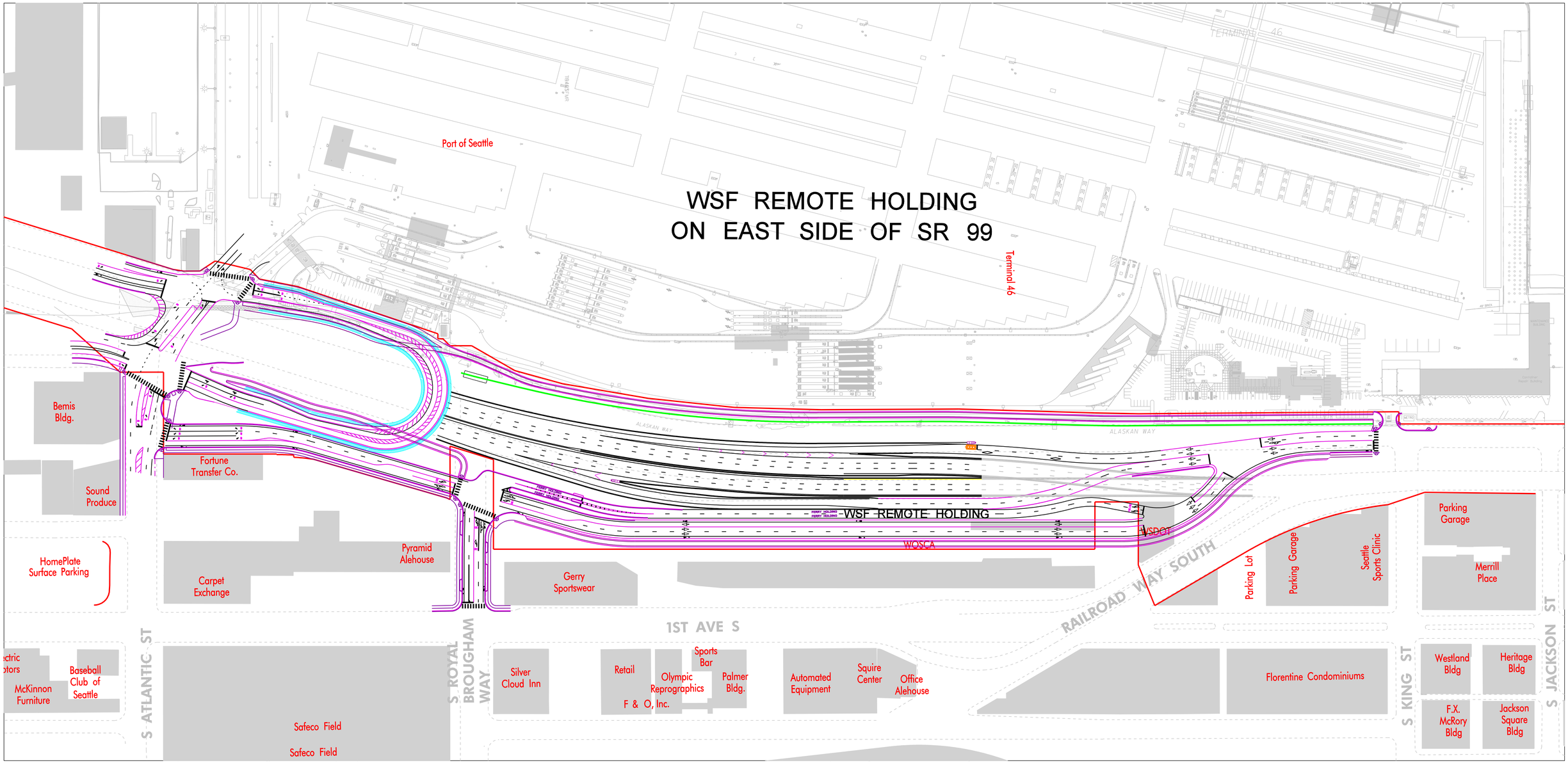
Day	12:00 AM	12:30 AM	1:00 AM	1:30 AM	2:00 AM	2:30 AM	3:00 AM	3:30 AM	4:00 AM	4:30 AM	5:00 AM	5:30 AM	6:00 AM	6:30 AM	7:00 AM	7:30 AM	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:00 AM	10:30 AM	11:00 AM	11:30 AM	12:00 PM	12:30 PM	1:00 PM	1:30 PM	2:00 PM	2:30 PM	3:00 PM	3:30 PM	4:00 PM	4:30 PM	5:00 PM	5:30 PM	6:00 PM	6:30 PM	7:00 PM	7:30 PM	8:00 PM	8:30 PM	9:00 PM	9:30 PM	10:00 PM	10:30 PM	11:00 PM	11:30 PM	Total Number of Blockages	Video Hours	Total Minutes Blocked	% of Total
Tuesday 5/20																									1 0:09							1 0:06	1 0:07	3 0:15		1 0:20	1 0:16										1 0:03	9	9.5	76	13%
Wednesday 5/21																							1 0:04											1 0:02				1 0:03	2 0:09			1 0:05	1 0:02	2 0:21	1 0:03					10	11	49	7%
Thursday 5/22																					1 0:04	2 0:23				1 0:01	3 0:13				1 0:05	2 0:06	2 0:13	1 0:02	2 0:07			4 0:06	1 0:15	2 0:26										22	10	121	20%
Friday 5/23																						1 0:14	1 0:13			2 0:15	1 0:08					1 0:03	2 0:09																	8	9	62	11%
Tuesday 5/27																		2 0:21				5 0:24	1 0:01			1 0:05	1 0:06					1 0:04	2 0:12	4 0:23					1 0:10		1 0:08	1 0:09		1 0:11				1 0:11	22	13.5	144	18%
Wednesday 5/28	2 0:16	1 0:05	2 0:07				2 0:22	2 0:15	1 0:03		1 0:09								1 0:04	2 0:10	2 0:17			1 0:07	2 0:12	1 0:04						1 0:14	2 0:16	1 0:02	2 0:29	1 0:01	1 0:03			1 0:18	3 0:12							1 0:22	33	22.5	248	18%
Thursday 5/29	2 0:03	2 0:15	1 0:04	3 0:11			1 0:13	2 0:17	1 0:03	1 0:14							2 0:12				1 0:02	2 0:05									1 0:16	2 0:13	2 0:09		1 0:06	2 0:13	2 0:11										1 0:05	29	22	172	13%
Friday 5/30	1 0:07	2 0:23	3 0:05	1 0:01	1 0:02						1 0:02					2 0:01	2 0:10	1 0:01			3 0:05	4 0:16	4 0:15	1 0:09			2 0:01						1 0:03	2 0:17															31	15.5	118	13%

Key

	No Data	2	Number of blockages
	No blockages	0:17	Total duration of blockage of Atlantic (in hours:minutes)
	1 - 9 minutes of blockage		
	10-14 minutes of blockage		
	15 or more minutes of blockage		

* between Utah Avenue S. & Alaskan Way S.


WSF REMOTE HOLDING
ON WEST SIDE OF SR 99
Port of Seattle
Terminal 46
WSF REMOTE HOLDING
WOSCA
WSDOT
Bemis Bldg.
Fortune Transfer Co.
Sound Produce
HomePlate Surface Parking
Pyramid Alehouse
Carpet Exchange
Gerry Sportswear
1ST AVE S
RAILROAD WAY SOUTH
Parking Lot
Parking Garage
Seattle Sports Clinic
Parking Garage
Merrill Place
S ATLANTIC ST
S ROYAL BROUGHAM WAY
S KING ST
S JACKSON ST
McKinnon Furniture
Baseball Club of Seattle
Safeco Field
Safeco Field
Silver Cloud Inn
Retail
Olympic Reprographics
F & O, Inc.
Sports Bar
Palmer Bldg.
Automated Equipment
Squire Center
Office Alehouse
Florentine Condominiums
Westland Bldg
Heritage Bldg
F.X. McRory Bldg
Jackson Square Bldg


WSF REMOTE HOLDING
ON EAST SIDE OF SR 99
Port of Seattle
Terminal 46
Bemis Bldg.
Fortune Transfer Co.
Sound Produce
HomePlate Surface Parking
Pyramid Alehouse
Carpet Exchange
Gerry Sportswear
WSF REMOTE HOLDING
WOSCA
WSDOT
ALASKAN WAY
RAILROAD WAY SOUTH
1ST AVE S
S ATLANTIC ST
S ROYAL BROUGHAM WAY
S KING ST
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