

2014 Corridor Capacity Report

WSDOT's comprehensive annual analysis of multimodal state highway system performance

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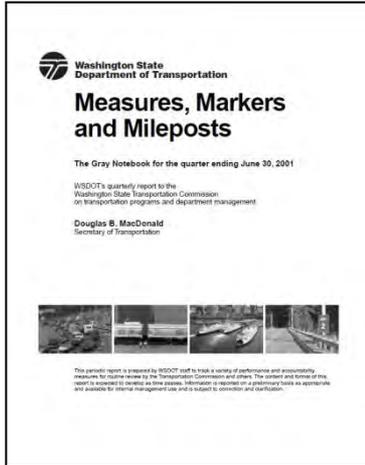
Purpose of the report

The 2014 *Corridor Capacity Report* (CCR) is intended to:

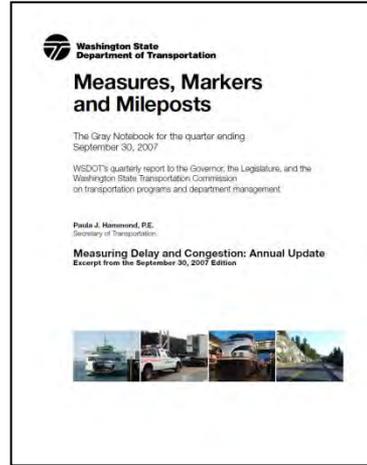
- ▶ Apprise the Legislature, partners, stakeholders, educational and research institutions, the media, and the public about highway system conditions and how we can work together to reduce congestion
- ▶ Help inform city, county and state agency policy makers, planners and engineers as they examine the multimodal capacity opportunities for state highways
- ▶ Support WSDOT's Practical Solutions and performance-based planning initiatives

Our journey: Systems performance measurement

2001



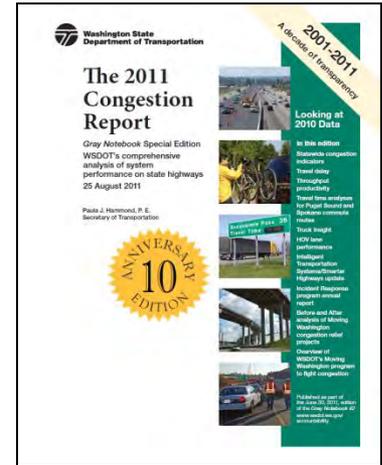
2007



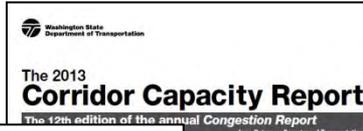
2009



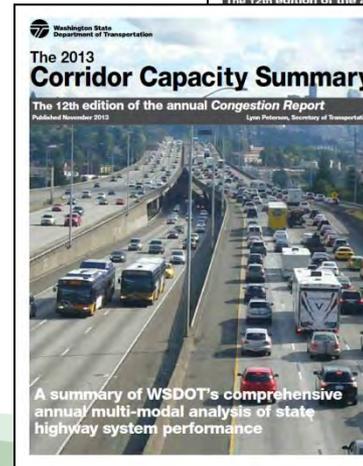
2011



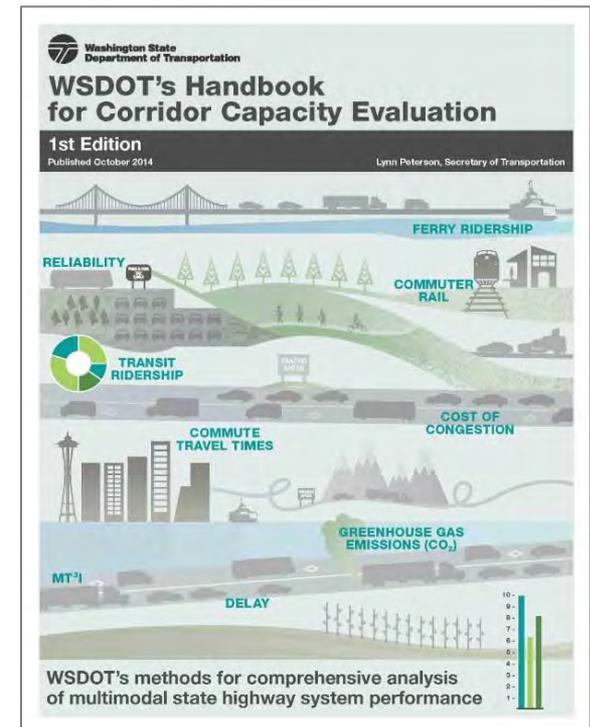
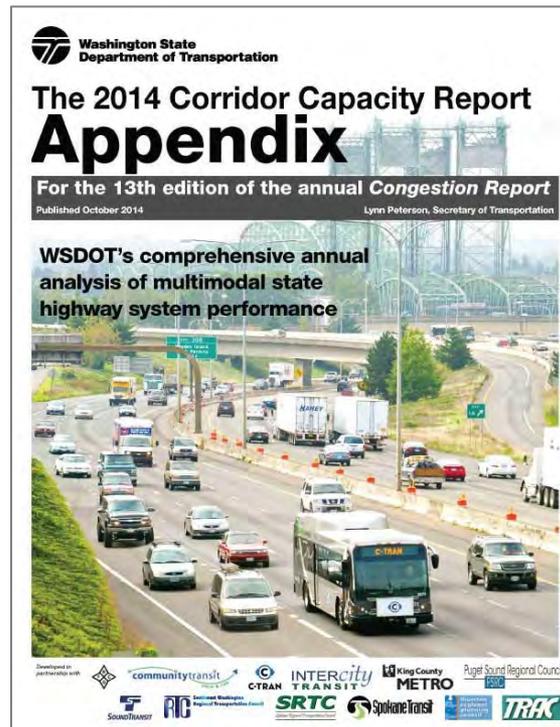
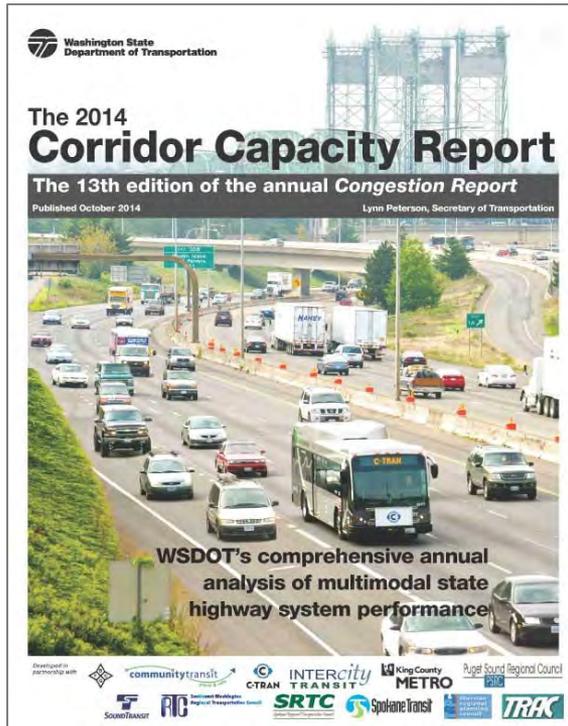
2012



2013



This year's report includes:



...in partnership with Metropolitan Planning Organizations (MPOs), Transit agencies

Ben-Franklin Council of Governments; C-Tran; Community Transit; Intercity Transit; King County Metro; Puget Sound Regional Council; Southwest Regional Transportation Council; Sound Transit; Spokane Regional Planning Council; Spokane Transit; Thurston Regional Planning Council; University of Washington

Interactive PDFs for the 2014 *Corridor Capacity Report*, the Appendix and WSDOT's *Handbook for Corridor Capacity Evaluation* can be accessed online at: <http://www.wsdot.wa.gov/Accountability/Congestion/2014.htm>

Partnerships:

- ▶ Multimodal analysis is made possible due to the partnerships with planning (MPO/RTPO) and transit agencies statewide.
- ▶ King County Metro has played a key role in efficiently incorporating transit data into the multimodal corridor analysis.
- ▶ Metro was actively engaged since the 2013 *Corridor Capacity Report* (1st edition) to accurately devise transit performance along Puget Sound region commute corridors.
- ▶ Metro helped with developing and refining key transit performance measures and provided peer review for WSDOT's *Handbook for Corridor Capacity Evaluation*.
- ▶ WSDOT's collaboration with Metro helped ask the right questions when working with other transit agencies across the state.



Our approach: Performance Journalism

- **Good Stories**– Use narrative reporting to make it real and tell the story – one of the most difficult tasks for many.
- **Good Writing**– Use a reader-friendly approach.
- **Good Data and Rigorous Systems Analysis**– Unyielding pursuit for data integrity and quality analysis.
- **Good Graphics and Visualization**– Every graph tells a story, every graph asks a question.
- **Good Format/Presentation**– The report should entice the reader to engage with the material, allow a quick grasp of the message, and not distract from the content.
- **Quality Control**– It's your credibility.
- **Good Timing**– Lead, don't follow.

The Big Picture: Dashboard

2014 Corridor Capacity Report Dashboard of Indicators

	2009	2010	2011	2012	2013	Difference '11 vs. '13
Demographic and economic indicators						
State population (thousands)	6,672	6,725	6,768	6,818	6,882	1.7%
Gasoline price per gallon (annual average) ¹	\$2.80	\$3.22	\$3.85	\$3.90	\$3.64	-5.5%
Washington total employment (thousands of workers) ²	2,863	2,837	2,873	2,922	2,990	4.1%
Taxable retail sales (billions of dollars) ¹	\$109.5	\$107.7	\$107.4	\$110.7	\$117.2	9.1%
Multimodal performance measures						
Drive alone commuting rate ³	72.1%	73.0%	73.3%	72.2%	72.7%	-0.6%
Carpooling commuting rate ³	11.3%	10.5%	10.2%	10.7%	10.1%	-0.1%
Bicycling and walking commuting rate ³	4.3%	4.4%	4.2%	4.5%	4.3%	0.1%
Public transit commuting rate ³	5.9%	5.5%	5.6%	5.8%	6.3%	0.7%
Transit ridership ⁴ (in millions)	129.9	189.8	195.1	218.1	--	--
WSDOT Ferries ridership ⁴ (in millions)	22.5	22.6	22.3	22.2	22.5	0.9%
Statewide congestion indicators						
Greenhouse gas emissions						
Million metric tons of carbon dioxide equivalents (CO ₂ e) ⁵	95.0	96.1	--	--	--	--
Transportation as percent of emissions from all sources statewide ⁵	44.8%	43.9%	--	--	--	--

The Big Picture: Dashboard

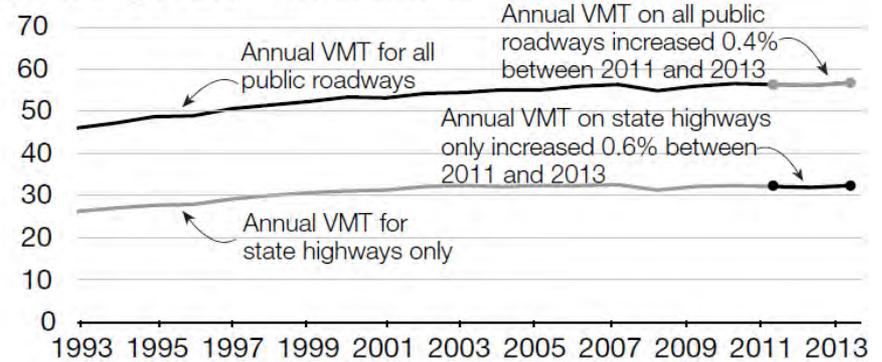
2014 Corridor Capacity Report Dashboard of Indicators

	2009	2010	2011	2012	2013	Difference '11 vs. '13
Per person, total vehicle miles traveled on all public roads, state highways only						
All public roads vehicle miles traveled (VMT) (in billions)	56.461	57.191	56.965	56.607	57.211	0.4%
All public roads per person VMT (miles)	8,462	8,505	8,417	8,303	8,313	-1.2%
State highways VMT (in billions)	31.456	31.764	31.455	31.214	31.648	0.6%
State highways per person VMT (miles)	4,714	4,724	4,648	4,578	4,598	-1.1%
Congestion on state highway system						
Total state highway lane miles	18,571	18,630	18,642	18,659	18,662	0.1%
Lane miles of state highway system congested	966	1,025	1,007	1,026	1,026	1.9%
Percent of state highway system congested ⁶	5.2%	5.5%	5.4%	5.5%	5.5%	0.1%
Per person, total, and cost of delay on state highways						
Annual hours of per person delay on state highways ⁷	4.21	4.71	4.72	4.52	4.71	-0.4%
Total vehicle hours of delay, in millions of hours ⁷	28.1	31.6	31.9	30.9	32.4	1.5%
Cost of delay on state highways (in millions) ⁷	\$742	\$837	\$845	\$817	\$858	1.5%
Corridor-specific congestion indicators (84 commutes statewide)						
Annual Maximum Throughput Travel Time Index (MT ^{3I}) ⁸	1.30	1.39	1.38	1.39	1.43	4%
Number of commute routes with MT ^{3I} > 1 ⁹	43 ⁹	47	60	58	56	-7%

Statewide: Vehicle Miles Traveled



Record high statewide vehicle miles traveled in 2013 1993 through 2013; VMT in billions



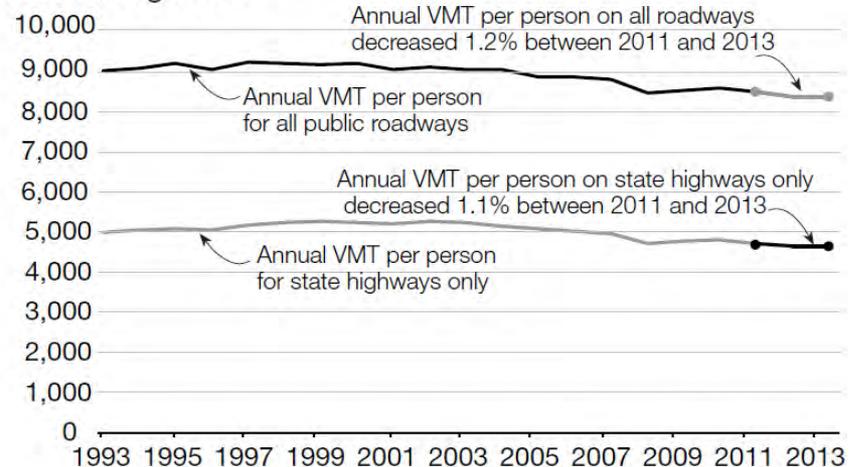
Data source: WSDOT Transportation Data and GIS Office.

Total vehicle miles traveled (VMT) on the rise while VMT per person continues near record low levels 2009 through 2013; Population in thousands

Year (population)	Total vehicle miles traveled (billions)		Vehicle miles traveled per person	
	State highways	All public roads	State highways	All public roads
2009 (6,672)	31.456	56.461	4,714	8,462
2010 (6,725)	31.764	57.191	4,724	8,505
2011 (6,768)	31.455	56.965	4,648	8,417
2012 (6,818)	31.214	56.607	4,578	8,303
2013 (6,882)	31.648	57.211	4,598	8,313
Δ 2013 vs. 2011	0.193	0.246	-50	-104
%Δ 2013 vs. 2011	0.6%	0.4%	-1.1%	-1.2%

Data source: WSDOT Transportation Data and GIS Office, Washington State Office of Financial Management.

In 2013, annual vehicle miles traveled (VMT) per person at second lowest level since 1988 1993 through 2013



Data source: WSDOT Transportation Data and GIS Office and Washington State Office of Financial Management.

Statewide and regional indicators: Delay

Hours of delay per person remains steady statewide
2009 through 2013; Annual delay in hours:minutes

Urban areas	2009	2010	2011	2012	2013	%Δ 2011 vs. 2013
Puget Sound ¹	7:26	8:19	8:23	8:03	8:23	0.0%
Spokane County	0:05	0:12	0:08	0:09	0:08	0.0%
Tri-Cities ²	0:21	0:36	0:35	0:32	0:12	-65.7%
Vancouver (Clark Co.)	0:38	0:22	0:23	0:22	0:17	-26.1%
Statewide	4:12	4:42	4:43	4:31	4:42	-0.4%

Data source: WSDOT Urban Planning Office, Washington State Office of Financial Management.
 Notes: 1 King, Snohomish, Pierce counties. 2 Benton, Franklin counties.

Estimated annual travel delay and cost of delay on state highways by urban area
2009 through 2013; Delay in hours; Cost of delay in millions in 2013 dollars

Urban area	2009	2010	2011 ¹	2012	2013	%Δ 2011 vs. 2013
Puget Sound (King, Snohomish and Pierce counties)	27,236,023	30,750,000	31,165,000	30,170,000	31,737,500	1.8%
Spokane (Spokane County)	39,000	97,500	65,000	77,500	70,000	7.7%
Tri-Cities (Benton and Franklin counties)	86,750	155,000	155,000	141,000	55,000	-64.5%
Vancouver (Clark County)	272,500	157,500	167,500	160,000	130,000	-22.4%
Other areas	450,727	485,000	417,500	351,500	457,500	9.6%
Statewide annual	28,085,000	31,645,000	31,970,000	30,900,000	32,450,000	1.5%
Annual cost of delay	\$742	\$837	\$845	\$817	\$858	1.5%

Data source: WSDOT Urban Planning Office.

Note: 1 2011 delay numbers do not match previous years' reports as segmentation changes were made in order to compare with 2013 analysis.

Corridor Example: I-5

Annual banner metrics

- ▶ Miles traveled
- ▶ Delay
- ▶ GHG emissions

Daily measures

- ▶ Travel times

Travel time->	Target	Average	Reliable	Planned
SOV	X	X	X	
HOV	X	X	X	
TRANSIT				X

- ▶ Person throughput between SOV and HOV lanes
- ▶ Routinely congested segments
- ▶ Transit ridership, capacity and utilization
- ▶ Park and ride lot location, capacity and utilization

Interstate 5 Corridor Capacity Analysis

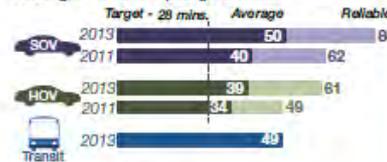


Commute travel times

2011 and 2013; Weekday travel times in minutes at the peak 5-minute interval including average and reliable² travel times for single occupant vehicle (SOV) and high occupancy vehicle (HOV) trips as well as maximum throughput (target) and planned transit³ travel times.

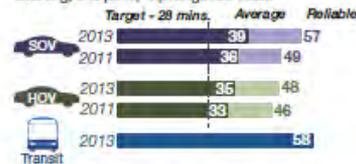
Everett to Seattle

Morning; 5-10 a.m.; Trip length 24 miles



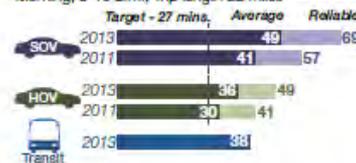
Seattle to Everett

Evening; 2-8 p.m.; Trip length 23 miles



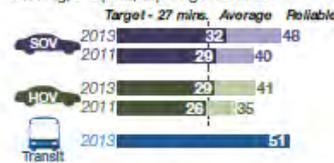
Federal Way to Seattle

Morning; 5-10 a.m.; Trip length 22 miles



Seattle to Federal Way

Evening; 2-8 p.m.; Trip length 22 miles



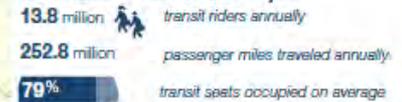
See Appendix pp. 5-15 for more commute routes



Transit system use

2013; For typical weekday morning (6-9 a.m.) and evening (3-6 p.m.) peak periods; Ridership and percent of available seats occupied on select commutes

Corridor-wide⁴ ridership



By commute peak period	Daily peak period riders	Percent of seats occupied
Morning (6-9 a.m.)		
Federal Way to Seattle (Includes Tacoma to Seattle bus routes)	10,472	89%
Everett to Seattle	8,565	64%
SeaTac to Seattle	5,748	95%
Evening (3-6 p.m.)		
Seattle to Federal Way (Includes Seattle to Tacoma bus routes)	10,411	93%
Seattle to Everett	8,036	60%
Seattle to SeaTac	6,968	110%

Park and ride capacity

2013; Parking spaces and average percent occupied for select park and rides (P&R)⁵ (see map for locations)

Everett-Seattle commute

Park and ride	Spaces	Percent occupied
Lynnwood Transit Center	1,370	100%
Ash Way P&R	1,022	100%
Mountlake Terrace P&R	877	100%
Kenmore area	693	100%
S. Everett Freeway Station	397	100%
Northgate area	1,024	99%
Mariner P&R	644	75%
Everett Station	921	35%

Federal Way-Seattle commute

Park and ride	Spaces	Percent occupied
Auburn area	633	100%
Sumner train station	302	100%
Tukwila area	655	99%
Kent area	998	97%
Tacoma Dome	2,283	95%
Puyallup area	583	94%
Lakewood area	1,093	84%
Federal Way area	2,067	73%

Data source: Washington State Transportation Center (TRAC) at the University of Washington, WSDOT Urban Planning Office, Sound Transit, King County Metro, Community Transit and WSDOT Office of Strategic Assessment and Performance Analysis.

Notes: Measures at the top of the page are for the I-5 corridor between Everett and Federal Way for SOV trips only. 1 WSDOT defines delay when average speeds are slower than 85% of the posted speed limit. 2 Reliable travel time is the travel time that will get a commuter to their destination on time or early 19 out of 20 weekdays, or 95% of the time. 3 Transit travel times by bus, Link light rail and Sounder rail include off-highway travel to stops and may not be comparable to SOV/HOV times which are highway only. 4 Peak period corridor-wide ridership includes trips on all I-5 central Puget Sound area corridors. 5 For more park and ride information, see <http://www.wsdot.wa.gov/choices/parkride.htm>. 6 Person throughput values include morning (6-9 a.m.) and evening (3-6 p.m.) peak period values.

A glimpse of a year on I-5 corridor

Annual person miles traveled

2011 vs. 2013
2,472 vs. 2,472
in millions of miles



Annual vehicle delay¹

2011 vs. 2013
1,919 vs. 3,010
in thousands of hours



Annual emissions

2011 vs. 2013
2,068 vs. 2,018
in millions of pounds of CO₂ equivalents

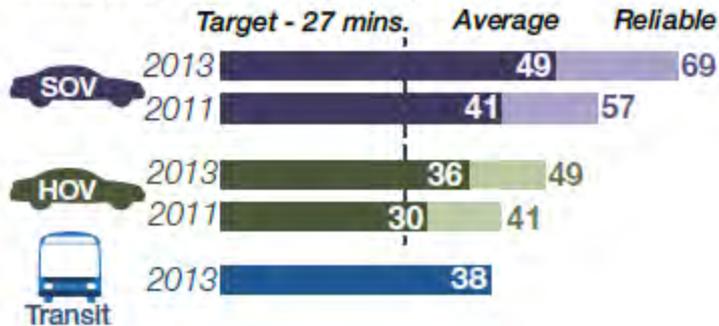


Morning Commute: Multimodal performance measures for I-5

Travel times

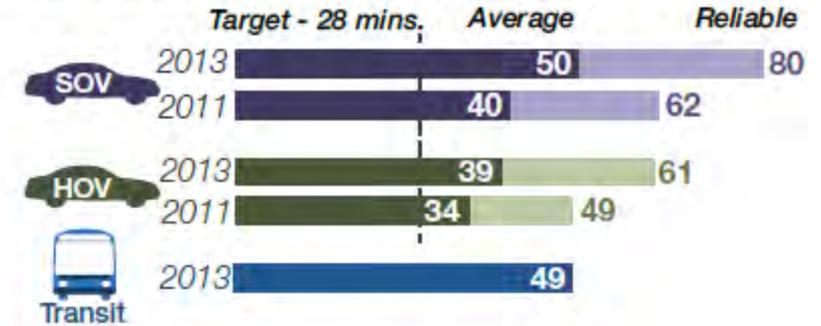
Federal Way to Seattle

Morning; 5-10 a.m.; Trip length 22 miles



Everett to Seattle

Morning; 5-10 a.m.; Trip length 24 miles



Transit ridership & percent utilized

Morning (6-9 a.m.)

Federal Way to Seattle 10,472 89%

*Includes Tacoma to Seattle bus routes

SeaTac to Seattle 5,748 95%

Morning (6-9 a.m.)

Everett to Seattle 8,565 64%

Park and ride facilities

Federal Way-Seattle commute

Park and ride	Spaces	Percent occupied
Auburn area	633	100%
Sumner train station	302	100%
Tukwila area	855	99%
Kent area	996	97%
Tacoma Dome	2,283	96%
Puyallup area	583	94%
Lakewood area	1,093	84%
Federal Way area	2,067	73%

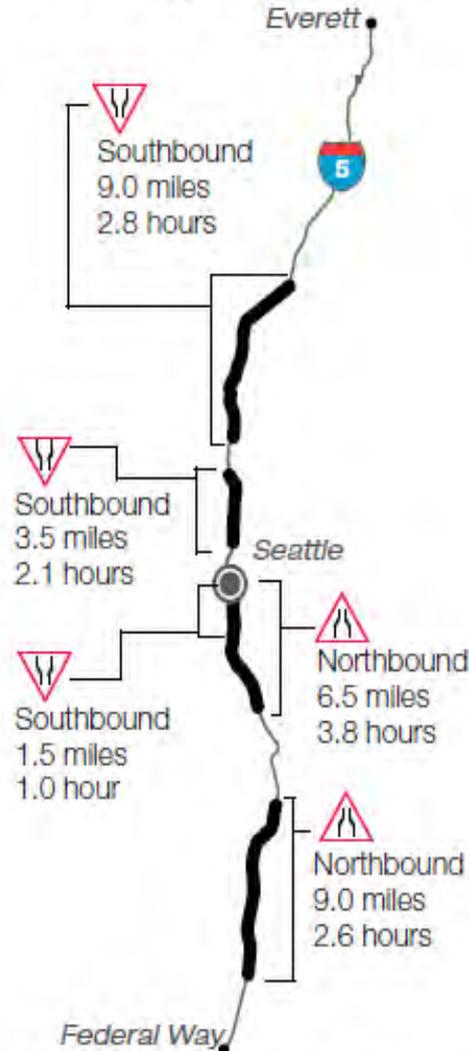
Everett-Seattle commute

Park and ride	Spaces	Percent occupied
Lynnwood Transit Center	1,370	100%
Ash Way P&R	1,022	100%
Mountlake Terrace P&R	877	100%
Kenmore area	693	100%
S. Everett Freeway Station	397	100%
Northgate area	1,024	99%
Mariner P&R	644	75%
Everett Station	921	35%

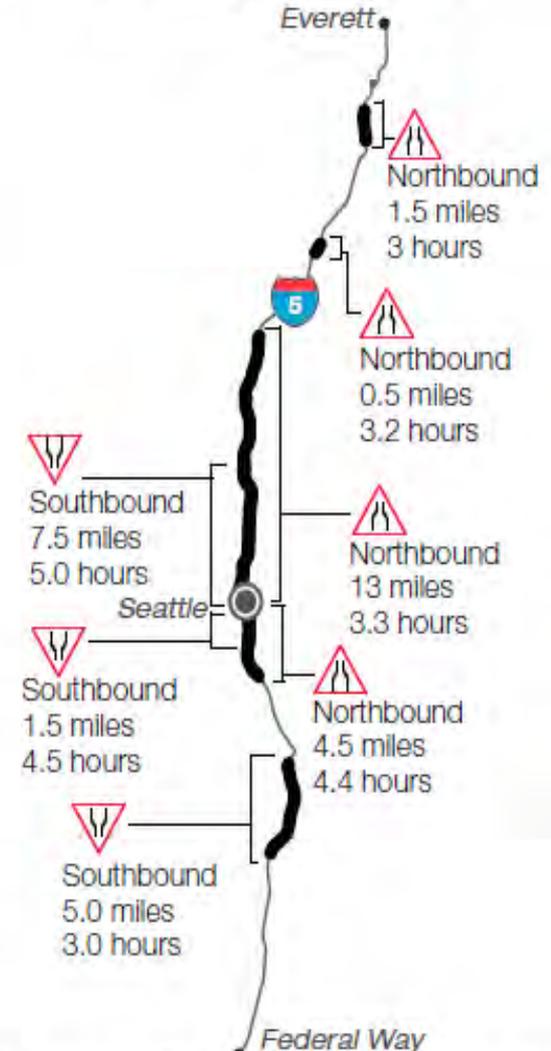
Further drilling down in performance: Routinely congested segments

 **Routinely congested segments of I-5**
 2013; For weekday morning (5-10 a.m.) and evening (2-8 p.m.) peak periods; Length of backup in miles; Daily duration of congestion in hours

Morning commute



Evening commute

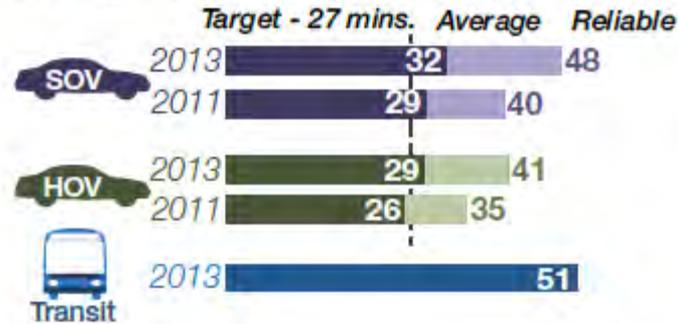


Evening Commute: Multimodal performance measures for I-5

Travel times

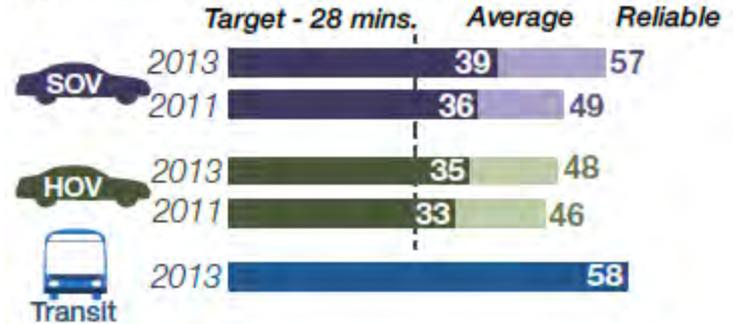
Seattle to Federal Way

Evening; 2-8 p.m.; Trip length 22 miles



Seattle to Everett

Evening; 2-8 p.m.; Trip length 23 miles



Transit ridership and percent utilized

Evening (3-6 p.m.)

Seattle to Federal Way

*Includes Seattle to Tacoma bus routes

10,411 93%

Seattle to SeaTac

6,968 110%

Evening (3-6 p.m.)

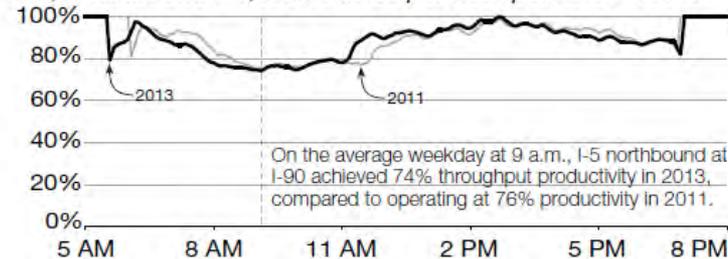
Seattle to Everett

8,036 60%

Throughput productivity

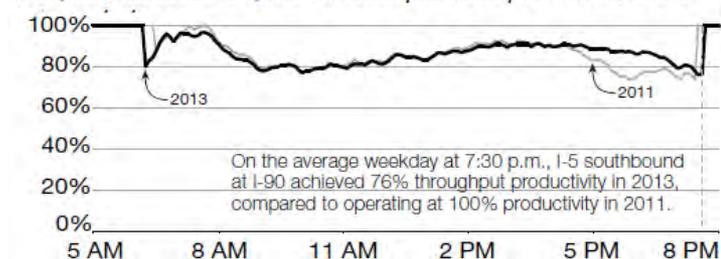
Throughput along northbound I-5 at I-90 (MP 164.0)

2011 and 2013; Based on the highest observed 5-minute flow rate; Northbound = 1,530 vehicles per hour per lane = 100%



Throughput along southbound I-5 at I-90 (MP 164.0)

2011 and 2013; Based on the highest observed 5-minute flow rate; Southbound = 1,790 vehicles per hour per lane = 100%



Data source: WSDOT Urban Planning Office.

HOV lane performance: Speed and reliability

- ▶ **Measure:** HOV lanes should maintain an average speed of at least 45 mph, 90% of the time during the peak hour of travel.
- ▶ Four of the 14 monitored HOV peak-direction corridors met the state performance standard in 2013

High occupancy vehicle lane speed and reliability performance on major central Puget Sound corridors
2009 through 2013; Goal is to maintain 45 mph for 90% of peak hour

 = Goal not met

Commute routes	2009	2010	2011	2012	2013	Commute routes	2009	2010	2011	2012	2013
Morning peak period commutes						Evening peak period commutes					
I-5, Everett to Seattle SB	69%	61%	64%	54%	42%	I-5, Seattle to Everett NB	49%	55%	76%	68%	66%
I-5, Federal Way to Seattle NB	92%	86%	72%	51%	43%	I-5, Seattle to Federal Way SB	67%	77%	82%	63%	53%
I-405, Lynnwood to Bellevue SB	94%	92%	94%	76%	54%	I-405, Bellevue to Lynnwood NB	71%	77%	74%	56%	46%
I-405, Tukwila to Bellevue NB	99%	99%	98%	93%	65%	I-405, Bellevue to Tukwila SB	70%	74%	60%	43%	41%
I-90, Issaquah to Seattle WB	96%	100%	100%	100%	100%	I-90, Seattle to Issaquah EB	95%	99%	99%	100%	99%
SR 520, Redmond to Bellevue WB	94%	94%	97%	51%	50%	SR 520, Redmond to Bellevue WB	71%	61%	70%	54%	52%
SR 167, Auburn to Renton NB ¹	99%	100%	99%	96%	94%	SR 167, Renton to Auburn SB ¹	99%	99%	99%	98%	98%

Data source: Washington State Transportation Center (TRAC) at the University of Washington.

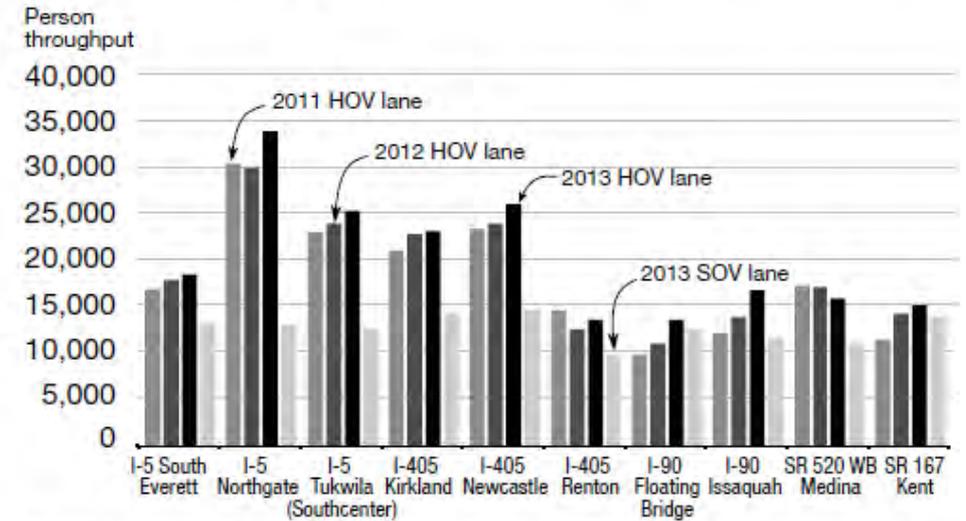
Notes: HOV reliability performance standards are based on the peak hour, the one-hour period during each peak period when average travel time is slowest. To meet the standard, a speed of 45 mph must be maintained for 90% of the peak hour. Numbers represent the percentage of the peak hour when speeds are faster than 45 mph. TRAC analyzes performance data for all complete segments of HOV lanes that have a loop detector. In some cases, data cannot be analyzed for the very beginning and ends of the lanes because there are no detectors at these locations. ¹ High occupancy toll (HOT) lanes replaced regular HOV lanes May 3, 2008.

HOV: Speed and Reliability may be suffering but “person throughput” is higher



SOV traffic
13,300 per lane

Person throughput¹ on HOV lanes outperform SOV lanes 2011 through 2013; Morning and evening peak period volumes, combined; Number of people in thousands



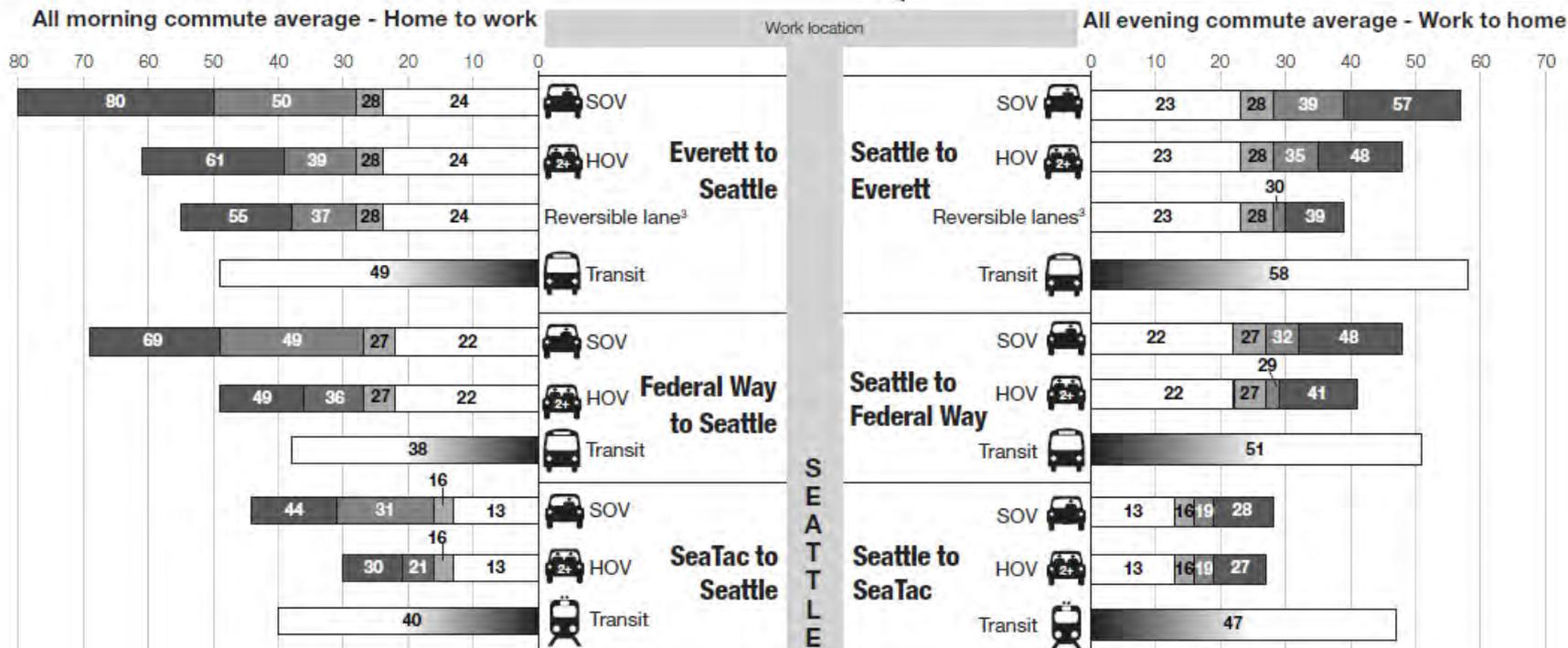
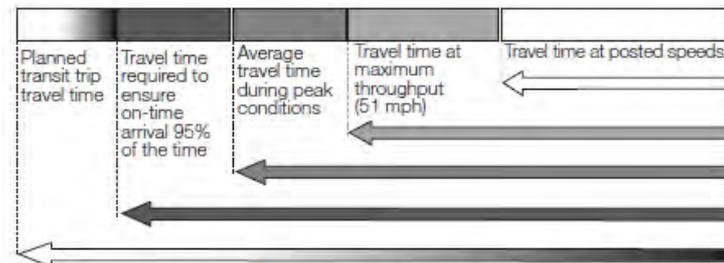
Data source: Washington State Transportation Center (TRAC) at the University of Washington.
 Note: 1 Person volume estimates are based on most recent 2011-2013 transit ridership and other data. The SOV lane volumes are the estimated person volumes for the average SOV lane at each location.

SOV traffic
12,800 per lane

Carpoolers, transit riders move faster: I-5

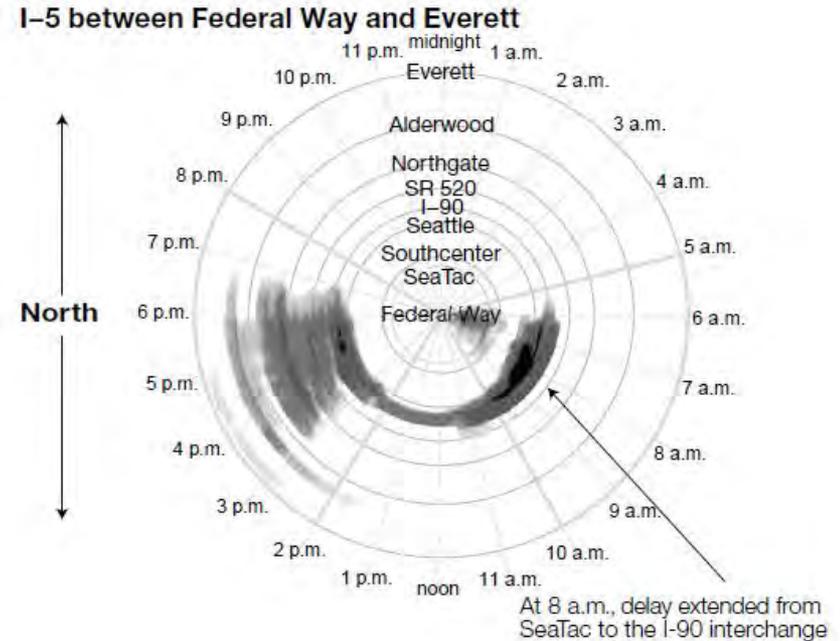
Travel times at posted speeds, maximum throughput speeds, peak travel times and 95th percentile reliable travel times

Morning and evening commutes by work location
 2013; Single occupant vehicle (SOV), high occupancy vehicle (HOV) and public transit commutes in the central Puget Sound area; Travel times in minutes



What other analysis do we do?

- ▶ Marine highways
 - Ridership
 - Trip reliability
 - Fuel usage
 - Capacity/utilization
 - On-time performance
- ▶ Before and After project analysis
 - I-5 Active Traffic Management
 - SR 167 HOT lane evaluation
 - Capacity expansion project analysis
- ▶ Incident Response analysis
- ▶ Future federal and state reporting requirements
 - Moving Ahead for Progress in the 21st Century (MAP-21)
 - Results Washington



Between 7 a.m. and 10 a.m. there was intense delay around the Seattle area. Evening delay peaked between 3:30 p.m. and 6:15 p.m. and was widespread along the entire northbound I-5 corridor.

Next steps...

- ▶ Expand partnerships
- ▶ Incorporating the data and analysis from the report as a tool for Practical Solutions training
- ▶ Develop interactive online tools for wider use of system performance data and measures (DRIVE Net)
- ▶ Expand analysis to include Accessibility measures
- ▶ Expand analysis to National Highway System as defined in MAP-21

Resources

- **WSDOT's Congestion Website:** <http://www.wsdot.wa.gov/Accountability/Congestion/>
- **WSDOT's Accountability Website:** <http://www.wsdot.wa.gov/accountability/>
- **Real Time Travel Times Website:** <http://www.wsdot.wa.gov/traffic/seattle/traveltimes/>
- **Plan Your Commute– 95% Reliable Travel Times Website:**
<http://www.wsdot.com/traffic/Seattle/traveltimes/95reliable.aspx/>
- **WSDOT's quarterly performance report: the *Gray Notebook*:**
<http://www.wsdot.wa.gov/Accountability/GrayNotebook/navigateGNB.htm>
- **Performance Measurement at WSDOT, four page folio**
http://www.wsdot.wa.gov/NR/rdonlyres/91089378-E709-49EF-AE42-AE80BC44A91C/0/TRB_Performance_Folio.pdf
- **WSDOT's Strategic Plan:** <http://www.wsdot.wa.gov/Secretary/ResultsWSDOT.htm>
- **Performance Journalism:** http://www.wsdot.wa.gov/NR/rdonlyres/F0DE7328-BA3D-45A0-95DB-641A4CE32D7B/0/2008_TRB_Performance_Journalism.pdf
- ***Making the Case for Funding: The WSDOT Experience*** (2008, Transportation Research Record)
http://www.wsdot.wa.gov/NR/rdonlyres/E5D34B36-6662-4464-B4BA-1E858BBD710D/0/2007_TRB_Making_Case_Funding.pdf
- ***Maximizing Highway System Capacity: Measuring and Communicating System Performance in an Evolving Field***–(2008, Transportation Research Forum) http://www.wsdot.wa.gov/NR/rdonlyres/5FF329ED-A840-4F8A-A798-468948BEE80B/0/Maximizing_Highway_Capacity_PM_finalvsn.pdf
- **Moving Washington Website:** <http://www.wsdot.wa.gov/movingwashington/>

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Questions?

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Corridor Capacity Report, please contact:

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A glimpse of a year on I-5 corridor

Annual person miles traveled

2011 vs. 2013
2,472 vs. 2,472
in millions of miles



Annual vehicle delay¹

2011 vs. 2013
1,919 vs. 3,010
in thousands of hours



Annual emissions

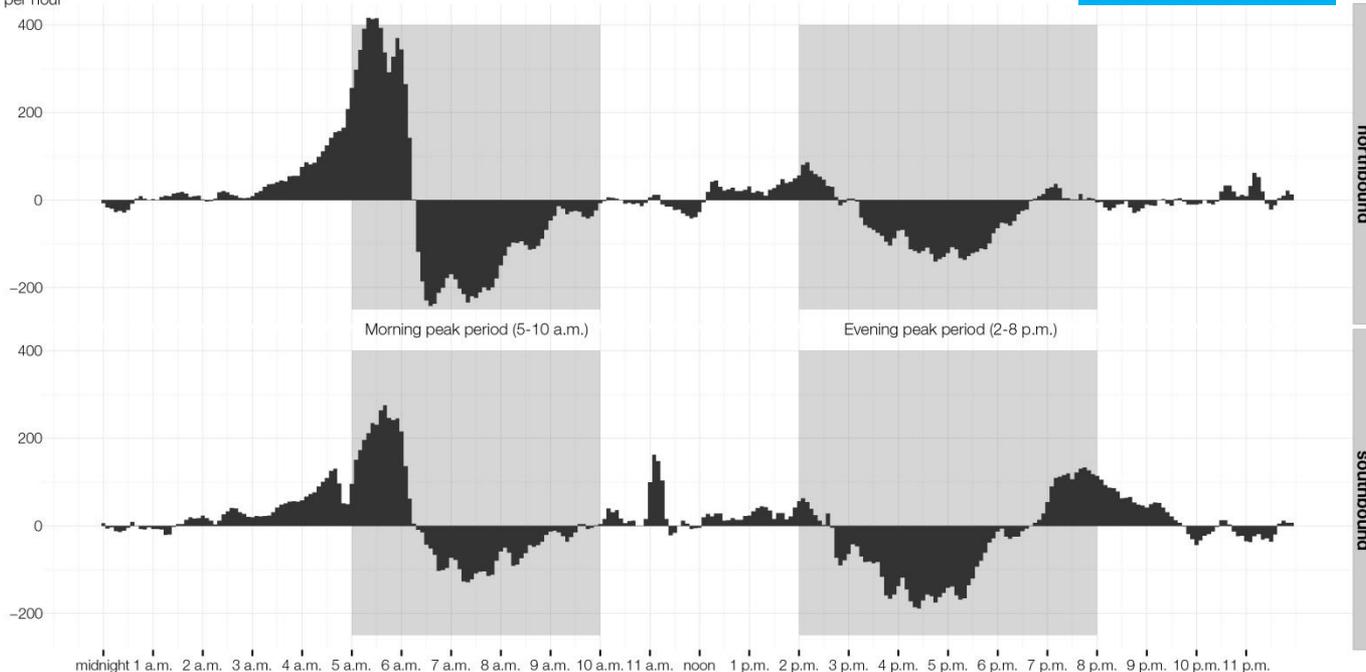
2011 vs. 2013
2,068 vs. 2,018
in millions of pounds of CO₂ equivalents



Traffic volumes increasing at edges of peak periods, reducing vehicle throughput during defined peak

Difference in average traffic volume in vehicles per hour; 2013 compared to 2011 for an average weekday (Monday through Friday) on Interstate 5 between Everett and Federal Way

Difference in vehicles per hour

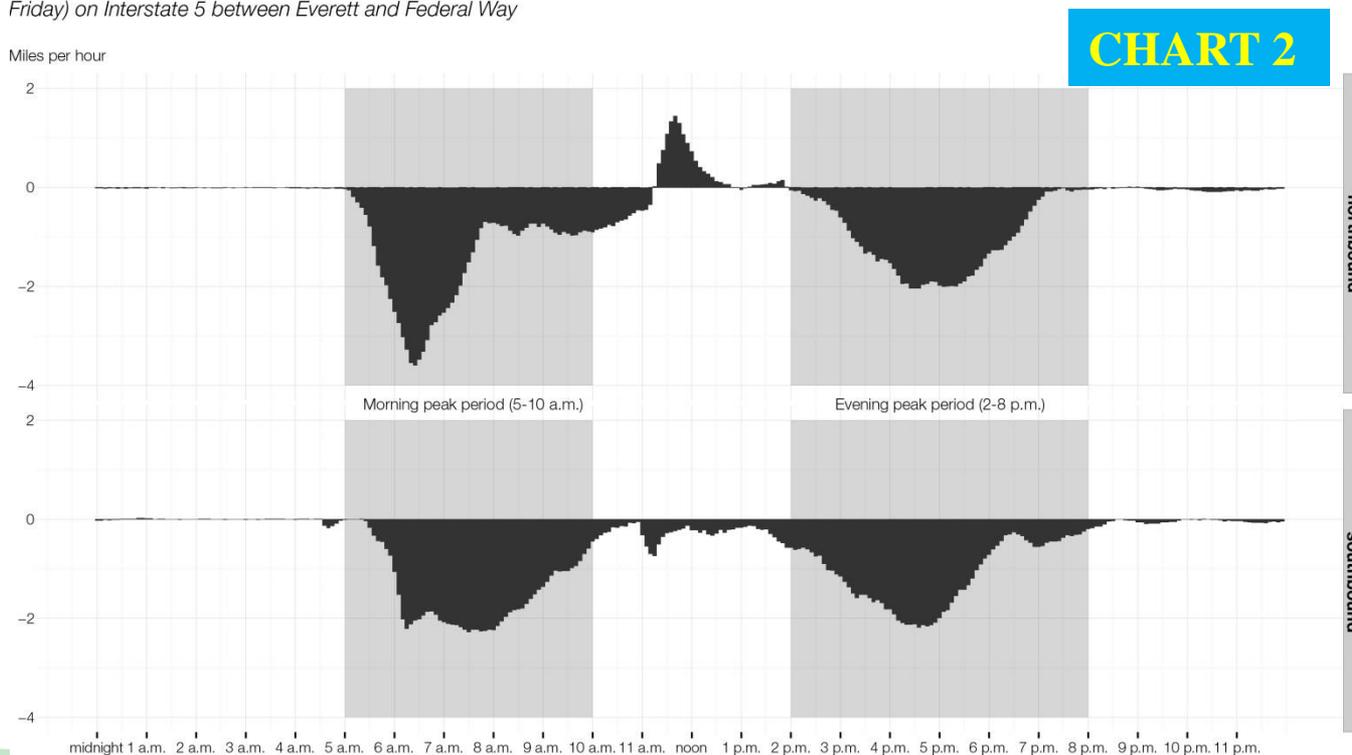


A glimpse of a year on I-5 corridor



Average traffic speeds in 2013 lower than 2011

Difference in traffic speeds in miles per hour by direction of travel and time of day; 2013 compared to 2011 for an average weekday (Monday through Friday) on Interstate 5 between Everett and Federal Way



A glimpse of a year on I-5 corridor

Annual person miles traveled

2011 vs. 2013
2,472 vs. 2,472
in millions of miles



Annual vehicle delay¹

2011 vs. 2013
1,919 vs. 3,010
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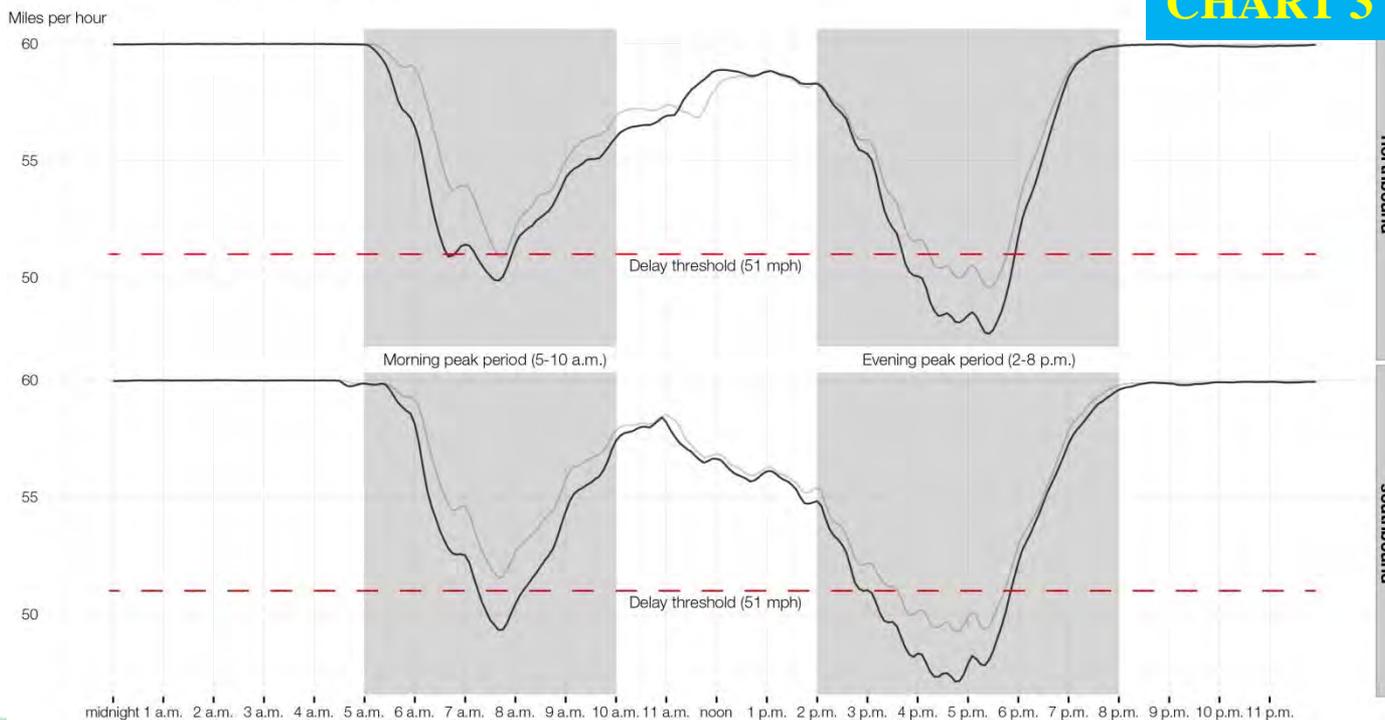
Annual emissions

2011 vs. 2013
2,068 vs. 2,018
in millions of pounds of CO₂ equivalents



Average traffic speeds dip below delay threshold for longer in 2013

Average traffic speeds in miles per hour by direction of travel and time of day; 2013 compared to 2011 for an average weekday (Monday through Friday) on Interstate 5 between Everett and Federal Way

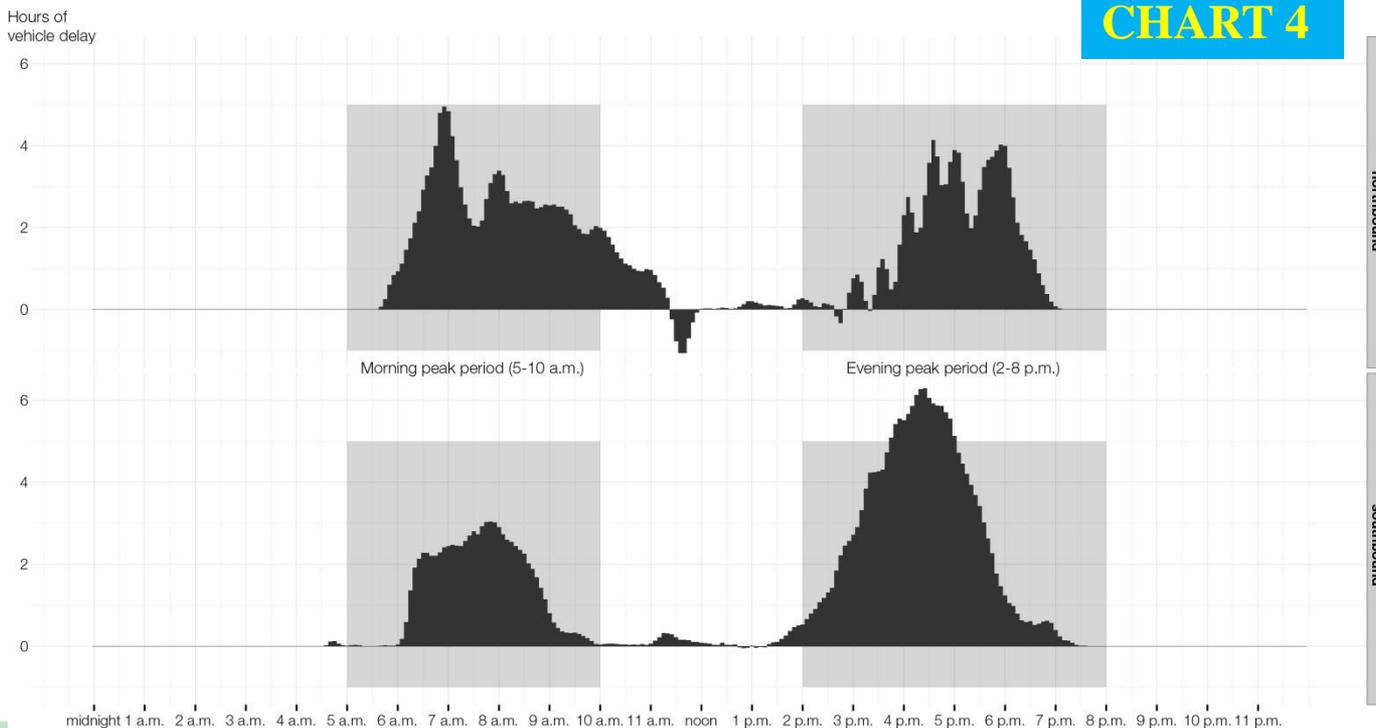


A glimpse of a year on I-5 corridor



Delay increases both within and outside of peak periods

Difference in average daily hours of vehicle delay by direction of travel and time of day; 2013 compared to 2011 for an average weekday (Monday through Friday) on Interstate 5 between Everett and Federal Way



A glimpse of a year on I-5 corridor

Annual person miles traveled

2011 vs. 2013
2,472 vs. 2,472
in millions of miles



Annual vehicle delay¹

2011 vs. 2013
1,919 vs. 3,010
in thousands of hours



Annual emissions

2011 vs. 2013
2,068 vs. 2,018
in millions of pounds of CO₂ equivalents



Delay increases not evenly distributed along corridor

Difference in average daily hours of vehicle delay by direction of travel and highway segment; 2013 compared to 2011 for an average weekday (Monday through Friday) on Interstate 5 between Everett and Federal Way

Hours of vehicle delay

CHART 5

