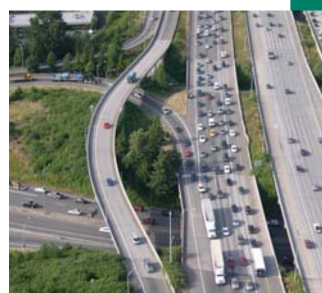
Washington State
Department of Transportation

Measuring Delay and Congestion Annual Update

GNB 31



Gray Notebook Excerpt

For the quarter ending September 30, 2008

WSDOT's quarterly performance report on transportation systems, programs and department management

Paula J. Hammond, P. E.
Secretary of Transportation

The Gray Notebook's Congestion Report:

Feature: Fuel Prices and Travel Conditions During the First Half of 2008

Looking at 2007 Annual Data:

Peak Travel Time Analysis

HOV Lane Performance

Throughput Productivity

Measuring Travel Delay

What WSDOT is doing to fight congestion:

- Add Capacity Strategically
- Operate Efficiently
- Manage Demand

Incident Response Quarterly Update

http://www.wsdot.wa.gov/Accountability/Congestion/2008

Measuring Delay and Congestion
2008 Annual Update Executive Summary

Special Report: Fuel price impacts on travel behavior – First half of 2008	
Travel times and volumes: WSDOT analyzed conditions on seven major Seattle-area commuting corridors in the first six months of 2008, as gas prices surged above $4 per gallon. Average and reliable travel times for drivers on six of seven corridors improved during the peak periods as the strong economy kept vehicle volumes high, with peak period volumes increasing by +2% to +4%. Volumes declined on weekends and evenings as drivers reduced discretionary trips, changed destinations, and cut trips to save money.	pp. 12-14
Transit and HOV lane usage: Transit agencies serving Seattle-area communities reported rising passenger boardings tied to record fuel prices. Buses, trains, and vanpools experienced greater demand as commuters sought alternatives for reaching job sites. Nearly 9,000 more people rode Sound Transit Express commuter buses daily in July 2008, compared to July 2007, an increase of 23%. With buses transporting many more people than a year ago, the sharp increases in transit ridership likely enabled HOV lanes to move more commuters in fewer vehicles.	p. 16
Fuel consumption: Overall, Washington state fuel consumption fell by 63 million gallons, or 2.9%, for the fist 6 months of 2008.	p. 12
Fatal and serious injury collisions: A drop in collisions, including fatal and serious collisions, is also likely improving travel time reliability. Preliminary data shows statewide fatal and serious injury collisions declined 4.8% in the first half of 2008, compared to the first half of 2007, including an 8.6% drop in King County.	p. 15

2008 Congestion Report Highlights – Looking at 2007 data:

Travel Times Analysis: 38 High Demand Puget Sound Commutes

Average travel times: Although many commuters experienced increasing travel times between 2005 and 2007, the rate of these increases has leveled off compared to prior years. Average travel times increased on 22 of the 38 high demand commute routes, with increases ranging from 1 and 4 minutes. Despite these marginal increases, average travel times improved by between 1 and 2 minutes on nine commutes during the same period and remained unchanged on seven.	pp. 18-21
95% reliable travel times: Between 2005 and 2007, 24 of the 38 high demand commutes saw increases in the 95% reliable travel time, with increases ranging from 1 minute (4 commutes) to 12 minutes (SeaTac to Seattle evening commute). Ten commutes saw reliable travel times improve between 1 and 4 minutes, while reliable travel times remained unchanged for four commutes.	pp. 19-21
Duration of congestion: The duration of congestion—defined as the period of time in which average speeds falls below 42 mph increased on 26 routes between 2005 and 2007. Again, although there is still an increasing trend, it is less severe than the increases observed from 2004 to 2006. Eight of the 38 commutes saw improvements, with congested periods decreasing by between 5 minutes (I-5 Seattle to Everett evening commute) and 55 minutes (SR 520 Seattle to Redmond evening commute), while one remained unchanged (SR 520 Bellevue to Seattle evening commute).	pp. 19-21
Percent of days when speeds were less than 35 mph–Stamp Graphs: The most visual evidence of peak period spreading can be seen in the graphs on pages 25-26. These "stamp graphs", comparing 2005 and 2007 data, show the percentage of days annually that observed speeds which fell below 35 mph (severe congestion).	pp. 24-26
Travel time comparison graphs: These bar graphs show four of the travel time performance indicators: travel times at posted speeds, travel time at maximum throughput speeds (51 MPH), average peak travel times, and 95% reliable travel times. For each of the 38 commutes general purpose (GP) and HOV travel times are shown. The graphs illustrate the travel time advantage HOV lane users have compared to GP lane users.	pp. 27-29

Travel Time Analysis: 14 Additional Puget Sound Commutes

In addition to the 38 high demand commute routes, WSDOT tracks 14 other commutes in the central Puget Sound where data are available. With one exception, average travel times for these 14 routes have remained relatively flat from 2001 to 2007, and average speeds on these routes never fell below the bottom of the maximum throughput range (42 mph). The 95% reliable travel time is the only measure that is showing any indications of deterioration. For the seven evening commute routes, all of the 95% reliable travel times are trending upwards.	pp. 30-31

Travel Time Analysis: Spokane Commutes

Increases in traffic demand on the two tracked Spokane commutes has resulted in moderate congestion and travel speed reductions during the afternoon commute, especially in the eastbound lanes. For the remainder of the commute, travel speed remains near what would be expected with free flow. Incidents remain the major cause of delay and congestion on the corridor as reflected in the increase in the 95% reliable travel time during the evening peak (+2 minutes/+13%).	p. 31

HOV Lane Performance

HOV Lane Reliability Standard: The reliability standard requires the HOV lane to maintain a speed of 45 mph for 90% of the peak hour. Five of the seven HOV corridors in the peak direction during the evening peak hour have high enough traffic volumes that the corridors are below the HOV performance standard, and four of the seven corridors in the peak direction during the morning peak period are below the performance standard, matching the results from 2006. The graphs on pages 36-37 compare general purpose lane performance and HOV lane performance at the HOV lane reliability speed of 45 mph.	p. 32

2008 Congestion Report Highlights – Looking at 2007 data (continued)

HOV Lane Performance (continued)

Person Throughput: Most HOV lanes continue to be more effective at moving more people during peak periods than GP lanes. At the monitoring locations, the average HOV lane carries about 35% of the people on the freeway in the morning and evening peak periods. I-5 near Northgate is an example of how effective HOV lanes are at moving people: during the morning peak period the southbound HOV lanes on I-5 move about 14,400 people, or 44% of travelers on this section of highway, in only 21% of the vehicles. p. 33

HOV Lane Travel Times: Average travel times and 95% reliable travel times are almost always faster in HOV lanes than in general purpose (GP) lanes. Of the 48 2-person HOV lanes, 3+ HOV lanes, and Express lanes that run alongside the 38 key commute routes, 39 provide between one minute (I-90 Seattle to Issaquah evening commute) and 20 minutes (I-405 Bellevue to Tukwila morning commute) of savings in average travel time. Forty provide better reliability (95% reliable travel time) than their general-purpose lane counterparts. pp. 34-37

Throughput Productivity

Throughput productivity compares the observed average vehicle flow (vehicles per lane per hour – vplph) for a selected location to the observed highest average five minute vehicle flow at that location. The eight selected Puget Sound monitoring locations, shows marginal decreases in vehicle throughput from 2005 to 2007. I-405 at SR 169 in Renton continues to experience the greatest loss in throughput productivity, where congested conditions result in an approximate 50% reduction in vehicle throughput during the morning peak period from an optimal observed maximum flow rate of 1,970 vplph. pp. 38-39

Hours of Delay and Vehicle Miles Traveled

Statewide delay, relative to maximum throughput speeds and posted speeds, increased by 3% (+643,000 weekday hours of delay annually) and 4% (+1.8 million weekday hours of delay annually) respectively between 2005 and 2007. Delay relative to maximum throughput speeds cost Washington businesses and drivers roughly $617 million in 2007—$13 million more than in 2005 ($604 million). pp. 40-41

Delay on selected Puget Sound corridors: There was a slight increase in the overall daily vehicle hours of delay on the major freeway corridors in the central Puget Sound region between 2005 and 2007. During this time period, vehicle hours of delay on the central Puget Sound corridors increased by approximately 8% relative to the posted speeds (+3,200 vehicle hours of delay per day) and 12% relative to maximum throughput speeds (+2,400 vehicle hours of delay per day). VMT decreased slightly by 0.7% on five major freeway corridors in Puget Sound. p. 41

Before and After Analysis of Selected Projects: Moving Washington Overview pp. 52-54

Add Capacity Strategically–Nickel and TPA: A study of 21 mobility projects funded by the 2003 and 2005 transportation funding packages save drivers an estimated 6,400 hours in combined travel time per day—a 10% improvement following construction. pp. 42-43

Add Capacity Strategically–Everett HOV: Southbound traffic during the morning peak saw an increase of average speed from 25 mph to free flow speeds (60 mph) in the two mile stretch north of 41st Street. General purpose travel times improved by 2-4 minutes heading southbound in the morning commute. During the evening peak, northbound general purpose traffic has seen benefits of 5-9 minutes through the eight mile stretch of I-5 between 128th St. and Marine View Drive. p. 44

Add Capacity Strategically–SR 202: This project greatly improved congestion and safety along SR 202 between SR 520 and Sahalee Way. There have been observed benefits of up to 20 minutes of travel time savings during peak hours between downtown Redmond and the Sammamish Plateau. pp. 44-45

Operate Efficiently–SR 167 HOT Lanes: Drivers paid an average of $1 to save 10 minutes of travel-time during the peak-hour commutes. Travel times for carpools and transit have been maintained. There is room in the HOT lane for additional carpool vehicles, transit, or toll-paying solo drivers. pp. 45-47

Operate Efficiently–SR 522 Signal Retiming: Nine signals were retimed along the SR 522 corridor from NE 153rd St. to 83rd Pl. NE. The SR 522 corridor carries an average of 60,000 vehicles per day. After retiming, peak period travel times generally decreased in both directions with the exception of westbound morning traffic, when travel times remained relatively unchanged during the morning peak period. pp. 47-48

Operate Efficiently–Direct Access Ramp Performance Update: Ten major HOV lane direct access ramps in the Puget Sound area have opened in the past few years. Ten more direct access ramps are planned. These direct access ramps save users between 1 to 8 minutes in travel times. p. 48

Operate Efficiently–Intelligent Transportation Systems: Active Traffic Management expands the use of ITS technology to dynamically manage traffic based on the prevailing conditions to help improve safety and traffic flow. pp. 49-50

Operate Efficiently–Incident Response Quarterly Update: In Quarter 3 of 2008, the statewide average clearance time was 12.6 minutes, up 6.8% from last quarter's historic low of 11.8 minutes. The average duration of the 74 over-90-minute lane-blocking incidents on the nine key corridors was 147 minutes during Quarter 3, 2008, and the annualized average for the three quarters of 2008 to date is 154 minutes, just below the target of 155 minutes. pp. 57-59

Manage Demand–Growth and Transportation Efficiency Centers: The GTEC program works with small businesses, neighborhoods and schools to help provide services and incentives to more than 235,000 commuters around the state who are not currently a part of a regional CTR program. The goal of the GTEC program is to reduce more than 14,000 drive-alone trips by 2011 that would otherwise be traveling on some of the state's most congested highways. Achieving this goal will mean a reduction of nearly 95 million annual VMT. p. 51

Special Report: Fuel price impacts on travel behavior

FIRST HALF 2008 DATA

Travel times improved on six major corridors

2008 Congestion Preliminary Report highlights

- High gas prices sent vehicle volumes lower, except during peak periods.
- Statewide fuel consumption fell 3.9%, or 350,000 gallons per day.
- Peak period travel times improved on six of seven key corridors.
- Average travel times improved by one to two minutes each way.
- Transit ridership increased as more commuters turned to buses.

Driving declines as gas prices reach record levels

National statistics show driving declined for the first time since the oil crises of the 1970s. Washington drivers are clearly cutting back, using 63 million fewer gallons of fuel in the first six months of 2008 compared to the first six months of 2007.

WSDOT worked with the University of Washington's Transportation Center (TRAC) to conduct a preliminary study of the effects of rising fuel costs on a sample of seven key corridors across the Puget Sound metropolitan region during the first six months of 2008.

High gas prices led many Puget Sound residents to limit their driving in early 2008.

Even as gas prices declined sharply amid the fall 2008 economic downturn, the skyrocketing gas prices of the spring and early summer presented a change in driver behavior that could result in temporary or lasting impacts. Daily and weekend vehicle volumes declined slightly as drivers trying to save money likely chose closer destinations, combined some trips and cancelled other outings.

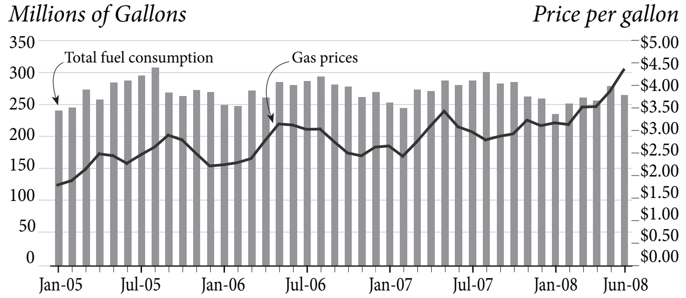
Upon close examination, Puget Sound region travel trends are somewhat different than those found nationally. The region experienced two distinct trends: the increase in peak hour travel demand due to continued employment growth in the spring and the decrease in off-peak travel demand due to the significant increase in gas prices.

Statewide fuel consumption declined
In millions of gallons sold; January-June 2007 & 2008

	Jan	Feb	Mar	Apr	May	Jun	Total
2007	254	245	274	271	287	281	1612
2008	235	252	261	257	279	265	1549
Change	-19	7	-13	-14	-8	-16	-63

Data Source: WSDOT Financial Planning and Analysis.

Gas prices and fuel consumption in Washington State
January 2005 - June 2008



Data Source: WSDOT Financial Planning and Analysis.

Confluence of events leads to improvement

King, Pierce and Snohomish Counties added 40,000 new jobs through June. The region's most highly traveled roads moved more drivers faster during peak periods, which contributed to the first overall improvement in peak period travel times since 2002. Four of the corridors experienced travel times improvements even as volume increased.

The improved travel times through some of the region's busiest corridors suggest that WSDOT's congestion relief strategies and their associated projects, combined with higher gas prices and rising transit ridership, had a positive effect on the performance of these corridors in the first six months of 2008.

Travel time reliability benefited from a reduction in major incidents, including an 8.6% drop in fatality and serious injury collisions on King County freeways and a 4.8% decline statewide in the first six months of 2008 compared to the same period in 2007.

FIRST HALF 2008 DATA

Travel times improved on six major corridors

While congestion remains heavy on several corridors, travel times on six of seven key Puget Sound corridors either improved or remained level for the first half of 2008, compared to 2007.

Four of seven major corridors saw increased traffic volumes during peak periods, yet six corridors experienced better travel times as traffic flow improved and disruptions declined.

The key trends include:

- Reliability: Most drivers experienced substantially faster commutes on the 80% and 95% reliable travel times, (a savings of one to nine minutes, depending on the route).
- More than half the 2008 peak travel times were even better than in 2005, even after years of worsening commute travel times.
- Off-peak volume on all corridors either declined or stayed the same.
- On weekends, five of seven corridors experienced a decline in volume, compared to 2007, while one corridor showed no change and one corridor experienced a slight increase.
- Overall weekday traffic volumes declined slightly in 2008 from volumes in 2006 and 2007 on four of seven corridors studied.
- Of the seven corridors reviewed, only, the Tukwila to Bellevue I-405 round-trip daily commute experienced slower travel times. The corridor experienced higher volumes and disruptions related to a major construction project at the I-90 Interchange.

Changes in average and reliable travel times: 2008 versus 2007 and 2005

Comparing January through June data for 2008, 2007, and 2005, travel times in minutes

		Average Travel Time			95% Reliable Travel Time		80% Reliable Travel Time	
		2008	Δ from 2007	Δ from 2005	2008	Δ from 2007	2008	Δ from 2007
Peak Direction - Morning Commutes								
I-5	Federal Way - Seattle	22.7	-3	+2	24.1	-4	22.8	-5
I-5	Everett – Seattle	33.0	-4	-1	54.2	-9	39	-6
I-405	Everett – Bellevue	33.2	-4	-3	53.9	-7	40.4	-5
I-405	Tukwila – Bellevue	33.5	0	+5	55.2	+2	44.1	+1
SR 167	Auburn – Renton	14.4	-1	-1	21.6	-4	16.4	-2
I-90	Bellevue – Seattle	13.0	-1	-1	18.2	-5	13.6	-2
SR 520	Bellevue – Seattle	13.6	-1	-2	20.0	-3	15.3	-3
I-90	Seattle – Bellevue	13.9	-1	0	21.2	-1	15.9	-2
SR 520	Seattle – Bellevue	16.5	-1	0	28.0	-1	21.4	-2
Off-Peak Direction Morning Commutes								
I-5	Seattle- Federal Way	22.7	0	0	24.1	0	22.8	0
I-5	Seattle – Everett	24.5	0	+1	29.4	+4	25.4	+1
I-405	Bellevue – Everett	23.6	0	0	24.8	-1	23.6	0
I-405	Bellevue - Tukwila	18.3	0	0	25.5	0	20.4	0
SR 167	Renton – Auburn	10.3	0	0	11.4	0	10.6	0
Peak Direction - Evening Commutes								
I-5	Seattle- Federal Way	28.0	-2	-2	42.7	-8	32.3	-5
I-5	Seattle - Everett	31.3	-2	-2	48.9	-3	37.7	-3
I-405	Bellevue - Everett	32.0	-2	0	49.2	-2	39.0	-2
I-405	Bellevue - Tukwila	28.1	+1	+3	45.2	+1	37.0	+3
SR 167	Renton - Auburn	13.4	-1	0	23.3	-6	16.5	-2
I-90	Bellevue - Seattle	18.1	-2	0	32.2	-6	23.7	-4
SR 520	Bellevue - Seattle	20.3	-1	-2	29.5	-3	25.6	-1
I-90	Seattle - Bellevue	12.2	-2	-2	16.5	-6	12.6	-3
SR 520	Seattle - Bellevue	14.0	-1	-2	22.3	-3	16.9	-2
Off-Peak Direction Evening Commutes								
I-5	Federal Way - Seattle	28.0	-1	0	42.7	-5	32.3	-2
I-5	Everett - Seattle	30.1	-2	0	48.4	-8	36.2	-4
I-405	Everett - Bellevue	25.2	-1	0	31.2	-2	27.7	0
I-405	Tukwila - Bellevue	17.4	0	-1	22.9	-1	19.5	0
SR 167	Auburn - Renton	10.2	0	-1	11.0	-2	10.4	0

Data Source: Washington State Transportation Center (TRAC).

Note: Average travel times in this analysis are calculated in a different manner than in the travel time analysis of annual 2005 and 2007 data on pages 20-21. This report looks at the average travel times for the entire peak period. The travel time analysis of 2005 vs. 2007 data examines travel times for the peak five minutes of each morning and evening peak period.
80% reliable travel time = The 80th percentile longest travel time out of 130 weekdays studied, which translates to an 80% likelihood (16 out of 20 trips) you will arrive at a destination on time.
95% reliable travel time = The 95th percentile longest travel time out of 130 weekdays studied, which translates to a 95% likelihood (19 out of 20 trips) you will arrive at a destination on time.

Special Report: Fuel price impacts on travel behavior

FIRST HALF 2008 DATA

Traffic volumes, gas consumption decline

Drivers reduce discretionary driving

The Puget Sound region appeared to be experiencing the effects of drivers cutting back mileage to save money as the $4.33 price of an average gallon of gas in June 2008 was 33% higher than in June 2007. Nationwide, the Federal Highway Administration estimated driving was down 2.9% over the first half of the year, or 42.9 billion vehicle miles traveled.

Driving levels experienced nearly universal declines in the Puget Sound region during non-peak periods and weekends, On weekdays, overall traffic volumes declined at 12 of 18 checkpoints reviewed, due to the drops in off-peak driving. On weekends, traffic volumes declined at 13 of 16 check points measured.

Off-peak driving is the best measure of discretionary driving because people are more likely to avoid trips, combine trips and choose closer destinations. Peak period driving includes mostly work-related trips, when such changes are more difficult.

Washington State drivers purchased 63.4 million fewer gallons of gasoline in the first six months of 2008 than in 2007, according to preliminary data, for a decline of 3.9%. While Puget Sound regional data was not available, statewide fuel consumption fell approximately 350,000 gallons per day and declined in every month except February, when the extra Leap Year day helped explain the increase.

Employment growth boosts peak volume

Peak period volumes increased, following continued growth in the economy. King County employers added about 32,200 jobs in the first six months of 2008 compared to the same period in 2007, according to data from the Washington State Employment Security Department. The 2.7% increase likely drew more drivers to the freeways. Also, employers in Snohomish and Pierce Counties added another 8,200 jobs combined, rising at rates of 2.1% and 1%, respectively. Peak volume rose 1-5% on five of seven corridors, compared to 2007. Job growth stalled in late spring as the national economic downturn grew.

Changes in traffic volumes: 2008 versus 2007 and 2006

Comparing January - June data for 2008, 2007, and 2006

		Average Daily Volumes				Average Peak Period Volumes			
		Weekday		Weekend		Average Peak Period Peak Direction (GP)		Average Peak Period Peak Direction (HOV)	
Corridor	Location and Direction	2007 vs. 2008	2006 vs. 2008	2007 vs. 2008	2006 vs. 2008	2007 vs. 2008	2006 vs. 2008	2007 vs. 2008	2006 vs. 2008
I-5	Des Moines NB	+0.5%	+2.0%	+0.5%	+2.5%	+4.0%	+2.0%	+0.2%	+0.9%
I-5	Des Moines SB	+0.5%	+2.5%	-0.5%	+2.5%	+4.0%	+5.0%	+2.1%	+5.2%
I-5	King/Snohomish Line NB	-0.5%	-0.0%	-2.0%	-1.0%	+1.0%	+3.5%	-2.2%	-3.9%
I-5	King/Snohomish Line SB	-1.0%	-1.0%	-1.5%	-0.5%	+5.5%	+2.5%	-0.4%	-0.1%
I-405	Kirkland NB	0.0%	+2.0%	-2.0%	+1.0%	+4.5%	+14.5%	-4.1%	-12.1%
I-405	Kirkland SB	-1.0%	-1.5%	-2.0%	+0.5%	+1.5%	0.0%	+0.2%	-3.5%
I-405	Newport Hills NB	+1.0%	-0.5%	+4.0%	+2.0%	+0.5%	-2.5%	+2.0%	+2.6%
I-405	Newport Hills SB	+1.0%	-0.5%	+0.5%	+1.5%	+2.0%	-0.5%	-3.6%	-3.1%
SR 167	Kent NB	-4.0%	-1.5%	-2.5%	-1.5%	-4.5%	-0.5%	-4.7%	-0.4%
SR 167	Kent SB	-5.0%	-3.0%	-1.0%	+1.0%	-2.0%	+0.5%	-3.0%	-3.6%
SR 167	Auburn NB	-2.0%	-0.5%	-2.0%	-0.5%	-3.5%	-1.0%	N/A	+3.5%
SR 167	Auburn SB	-3.5%	-0.5%	-1.5%	-0.5%	-4.0%	+1.5%	-1.9%	-4.6%
SR 520	Bellevue WB	+1.5%	+0.5%	-0.5%	+6.0%	+2.0%	+1.0%	-6.4%	-7.7%
SR 520	Bellevue EB	+1.0%	+0.0%	-1.0%	+6.5%	+4.0%	+3.0%	-5.8%	-6.4%
I-90	Bellevue/Issaquah WB	-0.5%	-1.0%	-1.5%	-0.5%	0.0%	-1.0%	-2.7%	-3.4%
I-90	Bellevue/Issaquah EB	-1.5%	-3.0%	N/A	N/A	0.0%	-1.0%	-5.1%	+1.7%
I-90	Floating Bridge WB	-1.0%	-2.5%	-3.0%	-5.0%	-0.5%	-1.5%	N/A	N/A
I-90	Floating Bridge EB	-0.5%	-1.5%	N/A	N/A	+1.5%	-0.5%	N/A	N/A

Data Source: Washington State Transportation Center (TRAC).

FIRST HALF 2008 DATA

Freeways working more efficiently, fewer collisions, improve reliability

Variety of factors causing improved travel times

The Puget Sound region experienced two distinct trends on four key routes— travel times improved from 2007 to 2008, while more vehicles used the roads during peak periods.

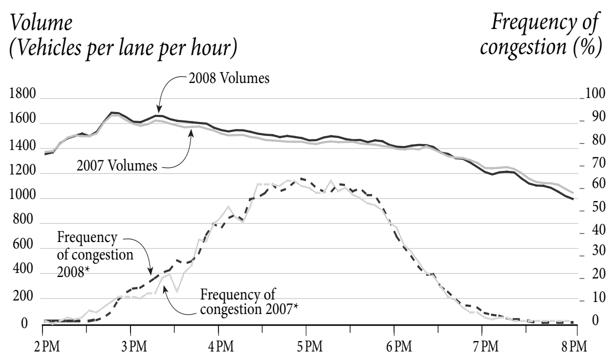
An analysis by the University of Washington Transportation Center (TRAC) reported travel times improved because vehicles were able to maintain marginally higher speeds during the peak periods.

The graph below, focusing on the I-5 evening commute northbound close to Northgate, shows a slight increase in volume while the frequency of congested conditions (when speeds drop below 42 miles per hour) remained steady and travel times improved by two minutes.

A variety of factors, including a slight decline in the number of cars trying to enter the freeway at key times, helped the corridor move vehicles more efficiently, thus allowing cars to travel faster.

Frequency of traffic congestion and average weekday traffic volumes - single corridor example

I-5 at NE 97th St., General purpose lanes, northbound
January - June, 2007 vs January - June, 2008



Data Source: Washington State Transportation Center (TRAC).
*Frequency of congestion refers to the percentage of days when speeds fell below 70% of posted speeds (42 mph)–the threshold for congestion.

Higher gas prices, improved incident response efforts, newly completed projects, declining fatality and serious injury collisions, and rising transit ridership also contributed to the improvement.

WSDOT will continue to examine these trends with full year data from 2008, including wide swings in gas prices, to look at the impact of high fuel costs and other factors on driving patterns and travel times.

Fatality and serious injury collisions decline

A drop in collisions, including fatality and serious injury collisions, is likely improving travel time reliability. For the first half of 2008, fatal and serious injury collisions declined by 5.1% to 9.1% statewide compared to the same period in 2005, 2006, and 2007, according to preliminary data. There were 1,010 fewer fatality and serious injury collisions statewide compared to 2007.

The decline was even sharper in King County, home to the majority of the corridor miles analyzed in this report. Fatality and serious injury collisions declined 8.6% to 15.2% compared to the first halves of 2005, 2006 and 2007. There were 31 fewer fatality and serious injury collisions on King County freeways compared to 2007.

One reason travel times improved was the reduction in non-recurrent delay, including incidents, weather and other events that contribute to commute times varying from day to day. Thus, the reduction in collisions, specifically the fatality and serious injury incidents, likely improved travel time reliability.

Reliable travel times on six of seven corridors improved as measured by the 80th percentile and 95th percentile longest travel times in the 130 weekday sample period. The measures suggest a 80% or 95% likelihood you will arrive on time. The 95% reliable travel times I-5 southbound from Everett to Seattle improved by nine minutes in the morning and eight minutes in the evening.

Collisions declined in early 2008

January - June, 2005-2008[1]

Fatal and serious injury collisions				
First half of	State	% change from 2008	King County	% change from 2008
2005	21,780	-9.1%	361	-8.6%
2006	22,318	-10.6%	389	-15.2%
2007	20,969	-4.8%	361	-8.6%
2008	19,959	N/A	330	N/A
Total collisions				
First half of	State	% change from 2008	King County	% change from 2008
2005	62,828	-8.5%	21,780	-9.1%
2006	62,454	-8.0%	22,318	-10.6%
2007	60,667	-5.3%	20,969	-4.8%
2008	57,465	N/A	19,959	N/A

Data Source: WSDOT Transportation Data Office and Traffic Office.
[1]2008 data is preliminary.

Special Report: Fuel price impacts on travel behavior

FIRST HALF 2008 DATA

Climbing transit ridership, congestion relief measures making impact

Transit use climbs, HOV lanes move more people

Transit agencies serving Seattle-area communities reported rising passenger boardings tied to record fuel prices. Buses, trains, and vanpools experienced greater demand as commuters sought new alternatives for reaching job sites.

Nearly 9,000 more people rode Sound Transit Express commuter buses daily in July 2008, compared to July 2007, an increase of 23%, with three of 19 routes experiencing surges of at least 50%.

Nationwide, transit ridership is significantly higher compared to 2007, but climbing at a lower rate than in the Puget Sound region. The American Public Transportation Association announced ridership increases of 3.4% and 5.2% in the first and second quarters of 2008 compared to 2007.

Sound Transit boardings increased

Figures for January 1 to June 30 of 2007 and 2008

	2007	2008	% Δ
ST Express Bus	5,179,487	5,882,975	14%
Sounder commuter rail	973,582	1,260,110	29%
Average weekday boardings[1]	46,038	53,063	15%
Total boardings	**6,153,069**	**7,143,085**	**16%**

Data Source: Sound Transit.

[1] Includes Tacoma Link boardings.

The 2008 increases in Washington followed an already rising trend of transit ridership statewide. Transit agencies provided a total of 196,206,269 trips in 2007, 6.3% higher ridership than in 2006.

In Seattle, with many commuter buses transporting 14% more people than a year ago, the sharp increases in transit ridership likely enabled HOV Lanes to move more commuters in fewer vehicles.

The data showed HOV lane vehicle volume declined at 13 of 17 checkpoints in the region at an average of about 20 to 30 cars per hour, or under 100 vehicles per peak period.

Possible conclusions include some carpool users are switching to transit and others are using general purpose lanes due to improved traffic flow. All but one of the major corridors reviewed showed increases in general purpose lane vehicle volumes.

The HOV section on pages 32-37 includes more information about HOV use and trends in 2007. There will be more analysis of transit use and HOV lane performance in the 2009 Congestion Report released next November.

Moving Washington: Congestion relief strategies being implemented statewide

While increased fuel prices have reduced volumes during off-peak hours, demand during peak congested periods is still increasing, which reduces the already limited capacity of the roadway. Committed to fighting congestion, WSDOT utilizes the three balanced strategies of *Moving Washington* to fight congestion— add capacity strategically, operate efficiently, and manage demand. These strategies are working. Projects being implemented statewide are providing the congestion relief intended as these examples demonstrate:

- **Add capacity strategically**: a before and after analysis of 21 selected Nickel and TPA congestion relief projects statewide, determined that these projects save drivers an estimated 6,400 hours in travel times per day – a 10% improvement following project completion as compared to conditions prior to construction, saving nearly $60 million each year.
- **Operating efficiently**: The Incident Response program has reduced average clearance times for 90+ minute incidents on key Puget Sound corridors by 7% during the second quarter of 2008 as compared to the same quarter in 2007.
- **Managing demand**: The Commute Trip Reduction program in the central Puget Sound made approximately 19,200 fewer vehicle trips each weekday morning in 2007 than they did when these work sites entered the program, reducing delay by an estimated 19% during the peak travel period on average mornings.

For more information on the benefits of WSDOT's congestion relief projects please see Before and After section on pages 42-51.

Gas price impacts merit further study

WSDOT will continue to assess the impact of high fuel prices on Seattle-area travel conditions. As gas prices fluctuate, further analysis will evaluate whether changes are temporary or long-lasting.

A recent separate study reported the Seattle region experienced one of the nation's largest improvements in congestion between June and August.

The 2009 Congestion Report will analyze a full year of congestion data on a broad array of routes in the September 30, 2009 *Gray Notebook*.

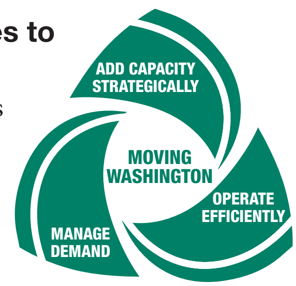
Measuring Delay and Congestion Annual Update

Introduction

Population growth, growing job markets, and an aging transportation infrastructure are stretching many of our roads and bridges beyond capacity. Fluctuating fuel prices and global climate concerns underscore the need for a more efficient transportation system. Washington's population has grown by more than 24% since 1992 with 3.5 million additional vehicles on our roads today. By 2030 the state's population will grow by another 2 million people, including 1 million more in the central Puget Sound region. According to the Office of Financial Management, between 2005 and 2007 alone, the core urban Puget Sound counties—King, Pierce, and Snohomish—saw a 4% increase in population (118,000 new residents). This increase in population has been driven by substantial economic growth and prosperity in the region. The impact of this growth has been increased demand on our roadways, resulting in congestion.

The growth in travel demand, particularly during peak periods, consumes the limited capacity of the highway system, leading to increased congestion. *Recurring congestion* occurs during peak travel periods for a simple reason—the number of vehicles trying to use the highway system exceeds the available capacity. *Non-recurring congestion*—congestion resulting from weather, roadway construction, collisions, vehicle breakdowns, etc.—further reduces the operating efficiency of the highway system.

Moving Washington: WSDOT's balanced strategies to fight congestion



Faced with these realities, WSDOT utilizes three balanced strategies to fight congestion— add capacity strategically, operate efficiently, and manage demand. By strategically adding capacity, WSDOT targets bottlenecks and chokepoints in the transportation system. However, because of limited resources, WSDOT understands that adding capacity cannot be the only solution for solving the congestion problem. That is why WSDOT uses operational strategies to maximize the efficiency of the existing transportation system (operate efficiently). Added to this, WSDOT manages demand by encouraging and providing alternatives to the traveling public between and within modes of travel. *Moving Washington* is explained in greater detail on pages 52-54.

HOV lanes are a vital part of the Puget Sound highway system by efficiently moving more people in fewer vehicles more quickly than adjacent general purpose lanes during peak periods.

Overview: 2008 Congestion Report examines 2007 calender year data

The annual congestion report examines 2007 calendar year data focusing on the most travelled commute routes in the central Puget Sound region, and where data are available. The report examines selected commute routes, so it is not representative of the entire highway system. The Congestion Report's detailed analysis shows where and how much congestion occurs, and whether it has grown on the selected commute routes. As a special feature of this year's report, WSDOT looks at the effects of surging fuel prices during the first half of 2008. An overview of specific performance measures used in the report are explained on pages 55 and 56.

2008 Congestion Report Highlights– Looking at 2007 Data:

Increases in peak-period travel times are leveling off in 2007, with nine key commute routes seeing improvements.

Overall, HOV lanes continue to outperform GP lanes in person throughput and peak period travel times.

Relative to optimal flow speeds, statewide travel delay increased by 2.6% in 2007 compared to 2005.

A study of 21 Nickel and TPA mobility projects shows a 10% improvement in travel times following construction.

Table of Contents:

Measuring Delay and Congestion: Annual Update – 2007 Data

Travel Time Analysis

The state highway system connects our communities with 20,000-plus lane-miles of roadway. Most of these statewide routes do not experience recurring congestion. WSDOT tracks congestion measures for 52 commutes in Puget Sound, including the 38 high demand commutes that have traditionally been the focus of the *Gray Notebook's* annual congestion update. New to this year's congestion annual update, WSDOT reports on HOV lane travel times, and it takes a look at the additional 14 routes that make up the 52 tracked Puget Sound commutes. Apart from the central Puget Sound, WSDOT also reports on two major commutes in Spokane.

WSDOT uses the following performance measures as part of its travel time analysis for general purpose lanes:

- Average travel time;
- 95% Reliable travel time;
- Vehicle Miles Travelled (for traffic volume);
- Average duration of congestion;
- Maximum throughput travel time index (MT^3I).

These measures are reported in the travel time tables on pages 20-21, and definitions can be found on page 55. These measures also include the percent of days when speeds fell below 35 mph, which WSDOT defines as severe congestion (see stamp graphs on pages 40-41). This report compares calendar year 2007 data with 2005 data.

Average travel times improve or stay the same on 24 of the 52 tracked Puget Sound commutes in 2007

Average peak period travel times improved or stayed the same for 24 of the 52 Puget Sound commutes between 2005 and 2007. Of the 38 most congested commutes, nine saw improvements in average travel times, and 11 saw improvements in 95% reliable travel times. This is the first time the *Gray Notebook* has reported improvements for a large portion of the tracked Puget Sound commute routes. WSDOT will continue to track travel times to see if condition continue to improve. For more information on travel time changes during the first half of 2008, please see pages 12-16.

Economic growth in the central Puget Sound remains strong but increases in travel times have leveled off in 2007

Although many commutes still showed increasing travel time measures between 2005 and 2007, the rate of these increases has leveled off from comparably higher increases across almost all measures in 2004 to 2006. Despite the leveling off of travel time increases, the central Puget Sound, which encompasses Pierce, King, Snohomish and Kitsap counties, added 122,500 people[1] and 115,448 jobs[2] between 2005 and 2007, considerably more than were added between 2004 and 2006 (107,000 residents[1] and 91,000 jobs[2]). Meanwhile, vehicle miles traveled for the 52 tracked commute routes dropped across the board during peak periods, with only one route remaining at its 2005 volume.

The explanation for this decrease in volume during peak travel times is counter-intuitive: the drop in vehicle miles traveled is a result of more cars on the highway. As more cars join the stream of vehicles on the road, speeds drop and fewer cars are able to actually travel through a corridor. The inverse of this trend is discussed on page 14, which shows peak period travel volumes increasing in 2008 as travel times improved.

Growth in average travel times on the 38 key commute routes appears to have slowed

From 2005 to 2007, the surge in growth in average travel times appears to have begun leveling out. The range of increases for average travel times was 2%-12%, a modest rate of growth compared to last year's increases for 2004 vs. 2006, which ranged from 2%-22%. Between 2004 and 2006, thirteen of the 38 high demand

Trends on other modes, 2005 and 2007

Transit boardings increasing

Between 2005 and 2007, weekday boardings on Sounder train routes increased 76%, from roughly 1.2 million to 2.1 million. Meanwhile, Sound Transit bus ridership increased from 9.6 million to 12.2 million boardings, about a 26% increase. King County Metro ridership increased to 110.6 million from 99 million, a 12% increase.

Vanpool experiencing a growth in ridership

Vanpool ridership data for the Central Puget Sound region also includes Whatcom and Island counties. From 2005 to 2007, population in these six counties increased by 3.5%, while vanpool ridership increased by 21%, or about 3,000 people per day.

HOV lanes

The change in HOV lane vehicle volumes from 2005 to 2007 varied from location to location, ranging from -3% to +5%. Travel time changes in HOV lanes were commensurate with travel time changes in GP lanes. More information on changes in HOV lane performance including changes in person throughput is available on pages 32-37.

Note: KCM data is all ridership throughout the week, including weekends. Sound Transit and Sounder numbers reflect weekday ridership throughout the day. These numbers can be refined to be more "apples-to-apples" with our peak-period-based measures.

[1] Washington State Office of Financial Management.

[2] Puget Sound Regional Council and Washington State Employment Security Department's (ESD) Quarterly Census of Employment and Wages

Travel Time Analysis of the 38 High Demand Commute Routes

Average travel times: biggest changes between 2005 and 2007

Largest percent increase in average travel time	Bellevue to Seattle I-90 evening commute	+12% / 3 minutes	-3% in VMT
Largest increase in average travel time in minutes	Tukwila to Bellevue morning commute	+11% / 4 minutes	-5% in VMT
Largest percent improvement in average travel time	Issaquah to Bellevue morning commute	-11% / -2 minutes	-1% in VMT
Largest improvement in average travel time in minutes	Everett to Bellevue morning commute Lynnwood to Bellevue morning commute	-4% / -2 minutes -5% / -2 minutes	-3% in VMT -2% in VMT

routes posted percent increases above this year's highest increase of 12%. Similarly, the actual change in average travel times was more modest in 2005 to 2007. Across the 38 routes, the change in average travel time from 2005 to 2007 ranged from -2 to 4 minutes, while the change from 2004 to 2006 was -1 to 7 minutes.

95% reliable travel time increases are consistent with increases seen last year

The 95% reliable travel time performance measure relates to the amount of time necessary to make it to a destination on time on an average of 19 out of 20 work days. The changes in 95% reliable travel times from 2005 to 2007 were consistent with changes seen between 2004 and 2006. Across the 38 routes, the change in 95% reliable travel time from 2005 to 2007 ranged from -5 to 11 minutes, the same range that occurred in 2004 to 2006.

The largest increase, both in number of minutes and percent increase, was on the Sea-Tac to Seattle evening commute, where the reliable travel time worsened by 41%, or 11 minutes. This increase was much higher than other increases this year, which ranged from 2%-21%. In last year's analysis, increases in reliable travel time ranged from 4%-30%, with five routes surpassing the 21% level (but no routes exceeding the 41% increase posted by the *Sea-Tac to Seattle evening commute* between 2005 and 2007). See www.wsdot.wa.gov/Traffic/Seattle/TravelTimes/reliability/ to calculate the 95% Reliable Travel Time for your commute.

Duration of congestion increased on most routes, but has slowed

The duration of congestion—defined as the period of time in which average speeds fall below 42 mph—is increasing on 26 routes. Again, although there is still an increasing trend, it is less severe than the increases observed from 2004 to 2006. From 2004 to 2006, 31 out of 38 commute routes had increases in duration. Nine of these 31 routes had duration increases of over one hour.

Duration of congestion[1]: biggest changes 2005 vs. 2007

Route with longest duration	Bellevue to Tukwila evening commute	5 hr. and 35 min. total duration (15 min. increase)
Route with largest increase in duration	SeaTac to Seattle morning commute	1 hr. 30 min. increase (4 hr. and 5 min. total duration)
Route with largest decrease in duration	Seattle to Redmond evening commute	55 min. decrease (2 hr. and 15 min. total duration)

[1] Duration of congestion measures the period of time in which average speeds fall below 42 mph (70% of the posted speed limit).

MT³I facilitates comparisons between different routes

When comparing travel times, the maximum throughput travel time index (MT³I) measure enables WSDOT to make "apples to apples" comparisons of travel times between routes of varying distances. For instance, the *Bellevue to Seattle I-90 evening commute* and the *Issaquah to Seattle evening commute* both have average travel times of 28 minutes. However, the first route is 11 miles long and the second is 15; using average travel times alone would not be a very meaningful comparison. By contrast, the MT³I value incorporates the expected travel time under maximum throughput conditions, which takes into account the length of the route. An MT³I of 1.0 would indicate a highway operating at maximum efficiency, and anything above that is working at lower efficiency due to congestion. As the MT³I value increases, travel time performance deteriorates. In this example, the *Bellevue to Seattle I-90 evening commute* has an MT³I of 2.23, which means that the commute route takes 123% longer than the time it would normally take at maximum throughput speeds. The *Issaquah to Seattle evening commute* has an MT³I of 1.54, which means that the commute will take 54% longer than the commute route would take at maximum throughput speeds. Therefore, the *Bellevue to Seattle I-90 evening commute* is considered to be the "worse" commute of the two.

95% Reliable travel times: Biggest changes between 2005 and 2007

Largest percent increase in 95% reliable travel time	SeaTac to Seattle evening commute	+41% / 11 minutes	-4% in VMT
Largest increase in 95% reliable travel time in minutes	SeaTac to Seattle evening commute	+41% / 11 minutes	-4% in VMT
Largest percent improvement in 95% reliable travel time	Bellevue to Seattle SR 520 morning commute	-12%/ -3 minutes	-3% in VMT
Largest improvement in 95% reliable travel time in minutes	SeaTac to Seattle morning commute	-10% / -4 minutes	-4% in VMT

Travel Time Analysis of the 38 High Demand Commute Routes (continued)

Morning commutes: changes in travel time performance on the 38 high demand commutes

2005 A.M. peak vs. 2007 A.M. peak

			Travel Time (minutes)		Average Peak Travel Time, Based on Peak Time (minutes)			95% Reliable Travel Time (in minutes)			Ratio of Peak Travel Time to Maximum Through-put Travel Time		Traffic Volume Peak Period	Duration of Congestion (hours and minutes that average speed falls below 70% of posted speeds)		
											MT³I					
Route/Route Description	Peak time	Length (Miles)	At Peak Efficiency	At Posted Speed	2005	2007	%Δ	2005	2007	%Δ	2005	2007	VMT %Δ	2005	2007	%Δ
To Seattle																
I-5–Everett to Seattle	7:25 AM	23.7	28	24	46	47	+2%	68	76	+12%	1.65	1.69	-4%	2:15	2:20	+0:05
I-5–Federal Way to Seattle	7:00 AM	21.8	26	22	43	47	+9%	59	65	+10%	1.68	1.84	-4%	2:25	3:20	+0:55
I-90/I-5–Issaquah to Seattle	7:40 AM	15.5	18	15	26	25	-4%	37	37	0%	1.43	1.37	-2%	1:00	1:10	+0:10
SR 520/I-5–Redmond to Seattle	7:40 AM	14.8	17	15	22	22	0%	33	31	-6%	1.27	1.27	-2%	0:20	0:10	-0:10
I-5–SeaTac to Seattle	7:35 AM	12.9	15	13	25	27	+8%	40	36	-10%	1.64	1.77	-4%	2:35	4:05	+1:30
I-405/I-90/I-5–Bellevue to Seattle	8:15 AM	10.7	13	11	16	17	+6%	24	29	+21%	1.28	1.36	-3%	*	0:40	+0:40
I-405/SR 520/ I-5–Bellevue to Seattle	7:50 AM	10.5	12	10	18	18	0%	26	23	-12%	1.46	1.46	-3%	1:15	1:20	+0:05
To Bellevue																
I-5/I-405–Everett to Bellevue	7:25 AM	23.4	28	23	51	49	-4%	79	78	-1%	1.85	1.78	-3%	2:25	2:35	+0:10
I-405–Lynnwood to Bellevue	7:35 AM	16.0	19	16	41	39	-5%	64	62	-3%	2.18	2.08	-2%	2:40	2:50	+0:10
1-405–Tukwila to Bellevue	7:45 AM	13.5	16	13	38	42	+11%	54	58	+7%	2.40	2.65	-5%	3:40	4:10	+0:30
I-5/I-90/I-405–Seattle to Bellevue	8:40 AM	10.6	12	11	17	17	0%	25	25	0%	1.37	1.37	-1%	1:10	1:35	+0:25
I-5/SR 520/ I-405–Seattle to Bellevue	8:35 AM	10.1	12	10	22	23	+5%	31	33	+6%	1.86	1.94	-2%	2:35	2:50	+0:15
I-90/I-405–Issaquah to Bellevue	7:45 AM	9.5	11	9	19	17	-11%	26	26	0%	1.71	1.53	-1%	1:55	2:40	+0:45
SR 520/I-405–Redmond to Bellevue	7:55 AM	7.1	8	7	9	9	0%	10	10	0%	1.07	1.07	-1%	*	*	N/A
To Other Locations																
I-405–Bellevue to Tukwilla	7:40 AM	13.5	16	13	21	22	+5%	30	31	+3%	1.33	1.39	-4%	0:30	0:40	-0:10
SR 167–Auburn to Renton	6:25 AM	9.8	12	10	17	18	+6%	25	30	+20%	1.48	1.56	-6%	1:55	2:35	+0:40
I-5/I-90–Seattle to Issaquah	8:40 AM	15.7	18	16	20	20	0%	26	27	+4%	1.08	1.08	-1%	*	*	N/A
I-5/SR 520–Seattle to Redmond	8:35 AM	14.7	17	15	26	27	+4%	36	37	+3%	1.50	1.56	-2%	1:50	2:25	+0:35

Data Source: WSDOT Traffic Operations and the Washington State Transportation Center (TRAC) at the University of Washington.
Note: An asterisk (*) indicates that speeds did not fall below 70% of posted speed on a route.
2005 figures have been recalculated since their last publication in the 2006 annual congestion update, using a more refined data quality control process.

Maximum throughput travel time index (MT³I) increases on 22 of the 38 commute routes

The MT³I is a measure that was developed by WSDOT to compare peak travel times to travel times observed at maximum throughput speeds: speeds that allow the largest number of cars to pass along a route at one particular time. For more information on WSDOT's use of maximum throughput as a basis for measuring congestion, please see the gray box on page 19. As the MT³I goes higher than 1.0, the efficiency of the road drops: traffic is moving at speeds that are lower than maximum throughput levels, and congestion increases.

The route with the highest MT³I was the *Tukwila to Bellevue morning commute*, at 2.65. This means that in peak congestion, it takes 2.65 times longer to complete this trip than it would when traveling at 85% of the posted speed.

Volumes drop or remain steady

Between 2005 and 2007, traffic volumes during the peak period decreased on 37 of the 38 most congested Puget Sound routes, while one remained unchanged. The overall trend is about a 2% drop in volumes. Some locations on eastside routes do show a growth in spot volumes (Issaquah and Redmond). However, when those spots are weighed in with the rest of the route, there

Travel Time Analysis of the 38 High Demand Commute Routes (continued)

Evening commutes: changes in travel time performance on the 38 high demand commutes

2005 P.M. peak vs. 2007 P.M. peak

			Travel Time (minutes)		Average Peak Travel Time, Based on Peak Time (minutes)			95% Reliable Travel Time (in minutes)			Ratio of Peak Travel Time to Maximum Through-put Travel Time MT³I		Traffic Volume Peak Period	Duration of Congestion (hours and minutes that average speed falls below 70% of posted speeds)		
Route/Route Description	Peak time	Length (Miles)	At Peak Efficiency	At Posted Speed	2005	2007	%Δ	2005	2007	%Δ	2005	2007	VMT %Δ	2005	2007	change (min.)
From Seattle																
I-5–Seattle to Everett	4:20 PM	23.7	28	24	44	43	-2%	68	63	-7%	1.58	1.54	-2%	2:50	2:45	-0:05
I-5–Seattle to Federal Way	4:10 PM	22.1	26	22	36	37	+3%	54	55	+2%	1.38	1.42	-1%	1:45	1:50	+0:05
I-5–Seattle to SeaTac	4:10 PM	12.9	15	13	18	20	+11%	25	30	+20%	1.18	1.31	-1%	*	0:05	+0:05
I-5/I-90/I-405–Seattle to Bellevue	5:30 PM	10.6	12	11	18	17	-6%	31	29	-6%	1.45	1.37	-3%	0:50	*	-0:50
I-5/SR 520/I-405–Seattle to Bellevue	5:30 PM	10.1	12	10	20	19	-5%	32	29	-9%	1.69	1.60	-3%	2:45	2:30	-0:15
I-5/SR 520–Seattle to Redmond	5:35 PM	14.7	17	15	29	29	0%	42	40	-5%	1.68	1.68	-3%	3:10	2:15	-0:55
I-5/I-90–Seattle to Issaquah	5:30 PM	15.7	18	16	23	22	-4%	35	33	-6%	1.25	1.19	-1%	*	*	N/A
From Bellevue																
I-405/I-5–Bellevue to Everett	4:30 PM	23.4	28	23	42	45	+7%	60	63	+5%	1.53	1.64	-3%	2:55	3:10	+0:15
I-405–Bellevue to Lynnwood	5:20 PM	16.0	19	16	31	34	+10%	43	52	+21%	1.65	1.81	-3%	3:00	3:15	+0:15
1-405–Bellevue to Tukwilla	4:20 PM	13.5	16	13	31	34	+10%	42	46	+10%	1.96	2.15	-4%	5:20	5:35	+0:15
I-405/I-90/I-5–Bellevue to Seattle	5:20 PM	10.7	13	11	25	28	+12%	40	45	+13%	1.99	2.23	-3%	3:05	3:55	+0:50
I-405/SR 520/ I-5–Bellevue to Seattle	5:30 PM	10.5	12	10	26	26	0%	34	37	+9%	4.00	2.11	-3%	4:35	4:35	0:00
I-405/I-90–Bellevue to Issaquah	5:30 PM	9.3	11	9	17	18	+6%	22	24	+9%	1.55	1.65	0%	3:00	3:15	+0:15
I-405/SR 520–Bellevue to Redmond	5:35 PM	6.8	8	7	14	15	+7%	22	24	+9%	1.76	1.88	-3%	3:25	3:20	-0:05
To Other Locations																
I-5–Everett to Seattle	3:35 PM	23.7	28	24	38	41	+8%	54	62	+15%	1.37	1.47	-3%	2:05	2:40	+0:35
I-90/I-5–Issaquah to Seattle	5:20 PM	15.5	18	15	26	28	+8%	44	49	+11%	1.43	1.54	-3%	0:35	1:25	+0:50
SR 520/I-5–Redmond to Seattle	5:25 PM	14.8	17	15	36	37	+3%	59	62	+5%	2.07	2.13	-4%	3:45	4:05	+0:20
SR 167–SeaTac to Seattle	5:20 PM	12.9	15	13	20	21	+5%	27	38	+41%	1.31	1.38	-4%	0:10	1:55	+1:45
I-5–Renton to Auburn	4:20 PM	9.8	12	10	18	19	+6%	30	34	+13%	1.56	1.65	-3%	2:55	3:00	+0:05
I-405–Tukwilla to Bellevue	5:20 PM	13.5	16	13	21	20	-5%	28	27	-4%	1.33	1.26	-3%	0:50	0:20	-0:30

Data Source: WSDOT Traffic Operations and the Washington State Transportation Center (TRAC) at the University of Washington.
Note: An asterisk (*) indicates that speeds did not fall below 70% of posted speed on a route.
2005 figures have been recalculated since their last publication in the 2006 annual congestion update, using a more refined data quality control process.

is an overall drop. Only one route sustained its volume, the Bellevue to Issaquah evening commute (0%). The biggest drop was posted on the Auburn to Renton morning commute (-6%).

At first glance, it seems paradoxical that volumes are dropping during the peak hour while travel times are worsening on the majority of routes. Some of this is explained by the physical limitations of the highway. As more cars try to access the highway during peak times, crowding caused by these additional vehicles causes slower travel times and allows fewer cars actually traverse the route.

The reverse phenomenon can be seen during the first 6 months of 2008 on pages 12-16. During this time, rising gas prices in the first half of 2008 lead to a decrease in single occupancy vehicles on the road. This contributed to improved travel times and higher volumes during very congested peak periods, as vehicles are able to move more freely due to less crowding.

Travel Time Analysis of the 38 High Demand Commute Routes (continued)

Eastbound evening commutes from Seattle improve

Four commutes head eastbound across Lake Washington in the evening. All four routes show a dropping or steady average travel time, improved reliability, and decreased duration of congestion. Volume drops on these routes ranged from -1% to -3%. Three of the four commutes also showed improvement in severe congestion (see stamp graphs on page 25-26). Also, the duration of congestion on the Seattle to Bellevue I-90 evening commute went from 50 minutes to 0, indicating that the route is performing at non-congested speeds. Morning commutes in to Seattle from the east show changes of -1 minute to 1 minute in average travel time, and did not experience significant increases across the other measures.

Job growth in Seattle was modest from 2005 to 2007, only increasing by 13,066 jobs (2.8%). However, population growth was strong to the east of Seattle, growing by 15,160 people (9.6%). Sound Transit bus routes heading eastbound out of Seattle had a ridership increase of 22.7% over this period, while King County Metro buses traveling in the same direction experienced a 12% ridership growth.

It is possible that the increase in population was absorbed by transit, leading to less use of this commute route by single occupancy vehicles. And, given the minimal employment growth in Seattle, it is also possible that the majority of new residents in the eastern part of the county did not take jobs in Seattle.

Tukwila to Bellevue morning commute ranks worst of all commutes monitored

Commuters on the *Tukwila to Bellevue morning commute* experience the most congested conditions of the commutes measured. The average travel time for this commute at the peak travel time is 42 minutes, which is more than two and a half times as long as the peak efficiency travel time of 16 minutes. The result is that this commute has the highest MT^3I ratio of any of the 38 commute routes at 2.65. Between 2005 and 2007, the four minute increase from 38 to 42 minutes in travel time was the biggest increase observed in the central Puget Sound. Interestingly, volume dropped by -5% for the same time period on this route. Construction along this commute route is likely influencing travel time performance. The duration of congestion for this route is 4 hours 10 minutes, which represents the longest duration of congestion for any morning commute.

Not surprisingly, the return home commute (Bellevue to Tukwila evening commute) is very congested as well. On the average weekday, speeds fall below 70% of the posted speeds for 5 hours 35 minutes during the evening commute, which represents the longest duration of congestion for any commute route in the central Puget Sound. Volume decreased -4% for this route from 2005 to 2007.

Morning and evening commutes worsen for commuters living south of Seattle

The two evening commutes to Federal Way and Sea-Tac heading southbound on I-5 out of Seattle both worsened for average travel time and 95% reliable travel time, while worsening only mildly on duration (5 minutes increase on both). Volumes on both of these routes dropped marginally by -1%. Similarly, morning commutes into Seattle from Federal Way and Sea-Tac worsened across all measures, including the percent of days with severe congestion (see stamp graphs on page 25), and had drops in volume of -4%

Transit and train services running along these routes are also showing substantial increases: boardings on Sound Transit buses heading south from Seattle increased by 22%, and boardings on Sounder trains for cities south of Seattle increased 76%.

Job growth in Seattle was modest from 2005 to 2007, increasing by 13,066 jobs (2.8%). By contrast, areas to the north and south of Seattle experienced greater increases in employment (see table on p. 23).

While population growth in the areas immediately south of Seattle grew by a relatively small by 8,190 people (2.7%), the counties further south showed greater population expansion: Pierce County gained 34,600 new residents (4.6%), and Thurston County gained 13,900 new residents (6.2%).* While it is not entirely certain that a substantial proportion of these new residents are working in Seattle, it is one possible explanation for the increase in traffic into and out of Seattle on southern I-5 commute routes.

Evening commutes out of Bellevue worsen on all measures

The seven evening commutes out of Bellevue showed a near-uniform worsening across all types of measures. Average travel time increased on six commutes and stayed steady on the seventh, 95% reliable travel time worsened on all seven commutes, and average duration increased on five commutes, stayed steady on one, and improved by only five minutes on the last. The "stamp graphs" on pages 25-26, show severe

* An analysis by the Puget Sound Regional Council showed that the average distance to work for a resident of Tacoma/Pierce Co. grew by 13% from 1999 to 2006, from 10.8 miles to 12.3 miles. An analysis of Census data (American Community Survey Public Use Microdata Sample) by the Thurston Regional Planning Council found that the number of commuters who live in Thurston County and work in King County increased from about 3,000 to about 5,000 from 2005 to 2007.

Travel Time Analysis of the 38 High Demand Commute Routes (continued)

August 2007 construction on I-5 did not affect annual average travel times

A review by University of Washington's Transportation Research Center found that the August 2007 closure on I-5 did not have a significant effect on the annual average travel time. The annual average for the morning northbound commute on I-5 into Seattle was increased by about 20 seconds, and the annual average for the same commute in the evening was decreased by about 15 seconds. These changes are not enough to cause any major effects to the annual average travel time, and therefore data from the days of the closure is being kept in the annual average travel times. Construction during the 14-day closure, which was completed ahead of time, replaced worn expansion joints and repaved the highway with durable polyester concrete which will extend the life of that section of I-5 by another 30 years. More information about the direct effects of the project on traffic is available in the September 30, 2007, *Gray Notebook*, p. 79.

congestion occurring on more days, and starting earlier, on six routes, while staying steady on the seventh. Volume either dropped or stayed steady on these routes, experiencing a -4% to 0% change. Morning trips in to Bellevue show no pattern in the measures, worsening on some and improving or staying steady on others.

Between 2005 and 2007, employment in Bellevue increased by 11,000 jobs, an increase of 9.7%. Transit and train services running along this route are also showing substantial increases. This increase implies that there has been an increase in workers leaving Bellevue. Boardings on Sound Transit bus routes leaving Bellevue in all directions increased by 23.9% during this time, and evening time King County Metro boardings on westbound afternoon trips across I-90 and SR 520 increased 18.5%.

In addition to increased employment, Bellevue also had a complicating factor of construction. In March 2007, the South Bellevue project from 112th Ave to SE 8th St began on I-405. I-405 Kirkland Nickel Stage One Project started in December 2005 and ended January 2008.* All seven routes run at least in part along I-405, so these construction pressures likely directly affected travel times on the routes.

Population and employment change at selected Puget Sound locations
2005 vs. 2007

	Population			Number of Jobs		
	2005	**2007**	**% Δ**	**2005**	**2007**	**% Δ**
Seattle	573,000	586,200	+2.30%	465,689	478,755	+2.81%
Bellevue	115,500	118,100	+2.25%	113,306	124,347	+9.74%
Southwestern King County cities						
Des Moines	28,960	29,090	+0.45%	5,553	5,539	-0.25%
Federal Way	85,800	87,390	+1.85%	28,818	31,254	+8.45%
Kent	84,920	86,660	+2.05%	60,258	64,977	+7.83%
Renton[1]	56,840	60,290	+6.07%	48,304	51,637	+6.90%
SeaTac	25,140	25,530	+1.55%	26,045	28,746	+10.37%
Tukwila	17,110	18,000	+5.20%	40,628	46,972	+15.62%
Total	**298,770**	**306,960**	**+2.74%**	**209,607**	**229,125**	**+9.31%**
Eastern King County cities						
Issaquah[1]	17,060	24,710	+44.84%	17,482	19,209	+9.88%
Kirkland	45,740	47,890	+4.70%	31,648	32,398	+2.37%
Newcastle	8,890	9,550	+7.42%	1,206	1,724	+43.00%
Redmond	47,600	50,680	+6.47%	82,073	85,775	+4.51%
Sammamish	38,640	40,260	+4.19%	4,304	5,054	+17.43%
Total	**157,930**	**173,090**	**+9.60%**	**136,713**	**144,160**	**+5.45%**
Snohomish County						
Snohomish	655,800	686,300	+4.65%	216,811	247,670	+14.23%

Source: Puget Sound Regional Council and Washington State Office of Financial Management.

[1] Part of the population growth in Renton and Issaquah was due to annexation, not an actual increase in the number of people living in the area. Renton gained 949 resident from annexation, and Issaquah gained 3,712 residents.

Duration patterns are more balanced between morning and evening commutes out of Seattle

In the past, across all routes, duration has typically been shorter on the morning routes and longer on the evening routes. In 2007, evening duration was clearly longer than morning duration on the seven Bellevue work site commutes. Removing the lowest and highest values, morning durations ranged from one hour and 35 minutes to two hours and 50 minutes, while evening durations ranged from three hours and 15 minutes to four hours and 35 minutes.

However, many of the seven Seattle-worksite morning routes gained in duration, while the corresponding evening routes generally dropped or

* The ongoing Renton Stage 1 Project began in September 2007.

Travel Time Analysis of the 38 High Demand Commute Routes (continued)

stayed steady. Again removing the lowest and highest values, evening durations on Seattle-based commutes ranged between five minutes and two hours and 30 minutes, while morning durations ranged between 40 minutes and three hours and 20 minutes.

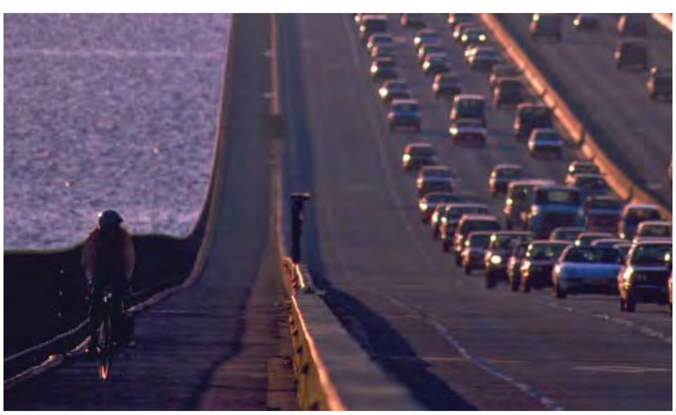
Evening trips into Seattle are worsening

Five of the six evening commutes into Seattle show an increase in average travel time and duration, with the sixth (*Bellevue to Seattle SR 520 evening commute*) holding steady. All six show worsened reliability, and the stamp graphs for all six show severe congestion beginning earlier in the day and occurring more frequently. At the same time, volume on the roads dropped from -3% to -4%. These increases are all consistent with patterns found in last year's analysis.

Between 2005-2007, the cities surrounding Seattle gained jobs. Employment in cities south of Seattle increased by 19,500 jobs (9.3%), north of Seattle in Snohomish county increased by 30,000 jobs (14.2%), and in Bellevue and other cities to the east of Seattle by 11,000 jobs (9.7%) and 7,400 jobs(5%), respectively. Population in Seattle only grew 2.3% during this period. Sound Transit routes heading in to Seattle posted a 19.7% gain in boardings. King County Metro routes heading in to Seattle from these directions increased 17.8%.

All three evening commutes into Bellevue, meanwhile, improved on average travel time, reliability, duration, and severe congestion (as represented in the stamp graphs on pp. 25-26).

It appears that employment is growing around Seattle and not in the city itself. More people are commuting back into Seattle in the evenings, resulting in worsening commutes. Some of this increase is being absorbed by buses.



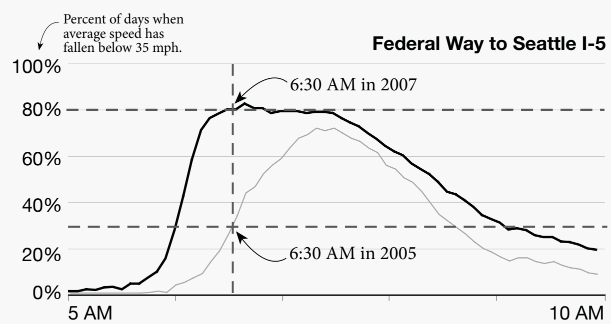
Traffic moving across the I-90 floating bridge on Lake Washington.

Stamp graphs show how the duration of peak period congestion is spreading

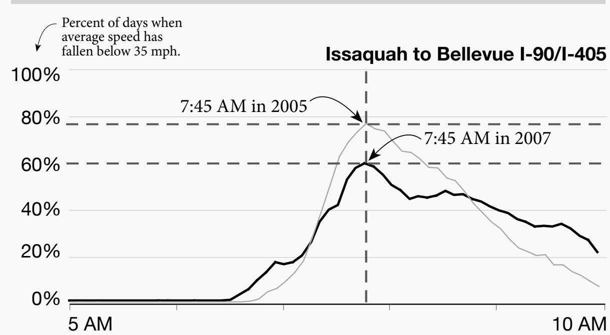
The most visual evidence of peak spreading can be seen in the stamp graphs on the following two pages. The "stamp graphs" that show severe congestion on the 38 high demand central Puget Sound commute routes. These graphs, comparing 2005 and 2007 data, show the percentage of days annually that observed speeds fell below 35 MPH on the key highway segments. For specific information on how to read stamp graphs, see the illustrations below.

**How to Read a Stamp Graph:
Percent of Days When Speeds Were Less Than 35 MPH**

How frequently (and when) did the average trip speed drop under 35 mph? How have those conditions changed from 2005 to 2007?



At 6:30 am in 2005, you had about a 30% chance that traffic would be moving less than 35 mph. In 2007, the situation became worse (black line above the gray line); your chance that traffic would be moving slower than 35 mph was about 80% in 2007.

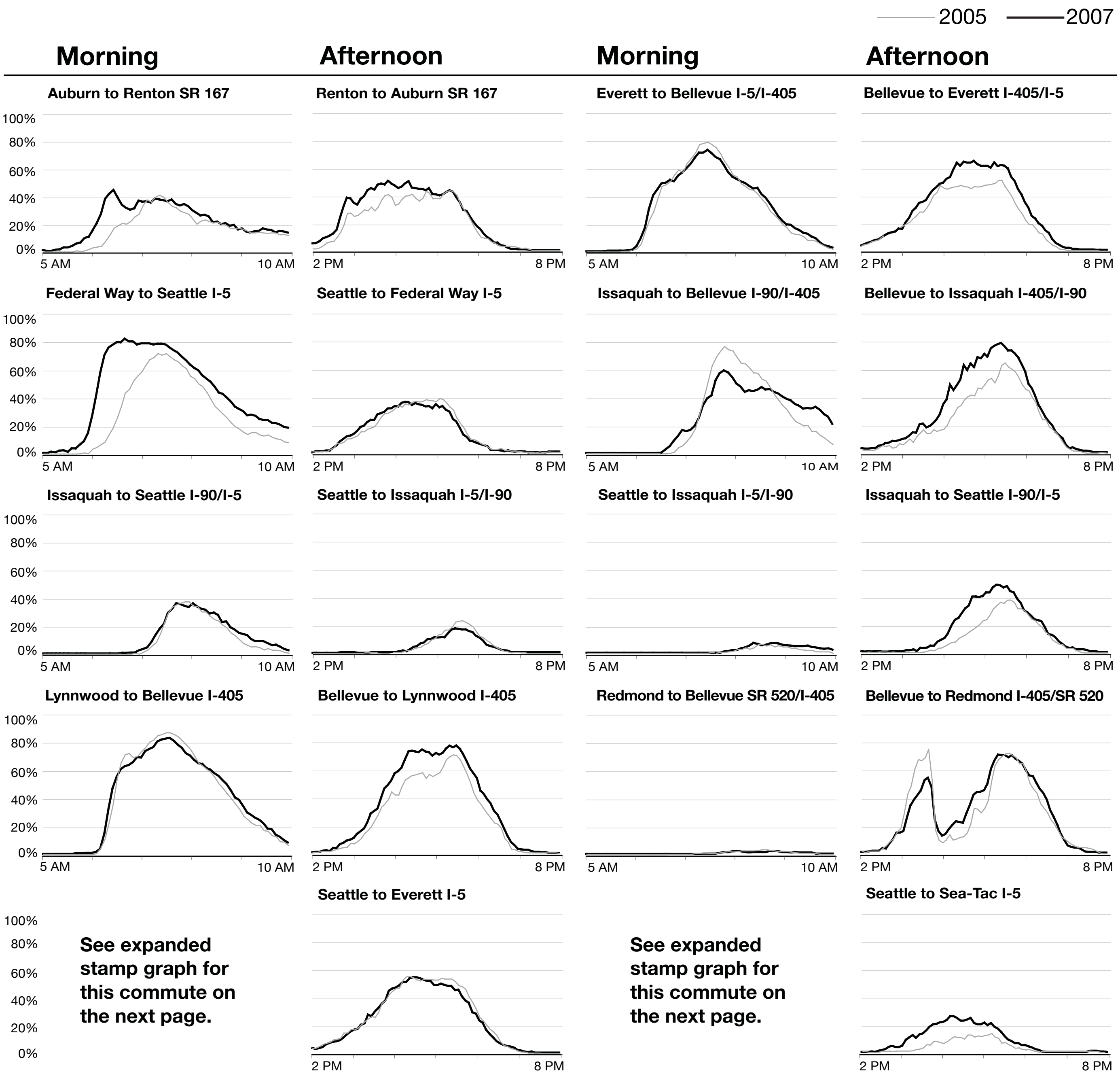


At 7:45 am in 2005, you had about a 78% chance that traffic would be moving less than 35 mph. In 2007, the situation was better (black line below the gray line); your chance that traffic would be moving slower than 35 mph was about 60%.

Travel Time Analysis of the 38 High Demand Commute Routes (continued)

Stamp Graphs: Percentage of weekdays with average speeds of 35 mph or less

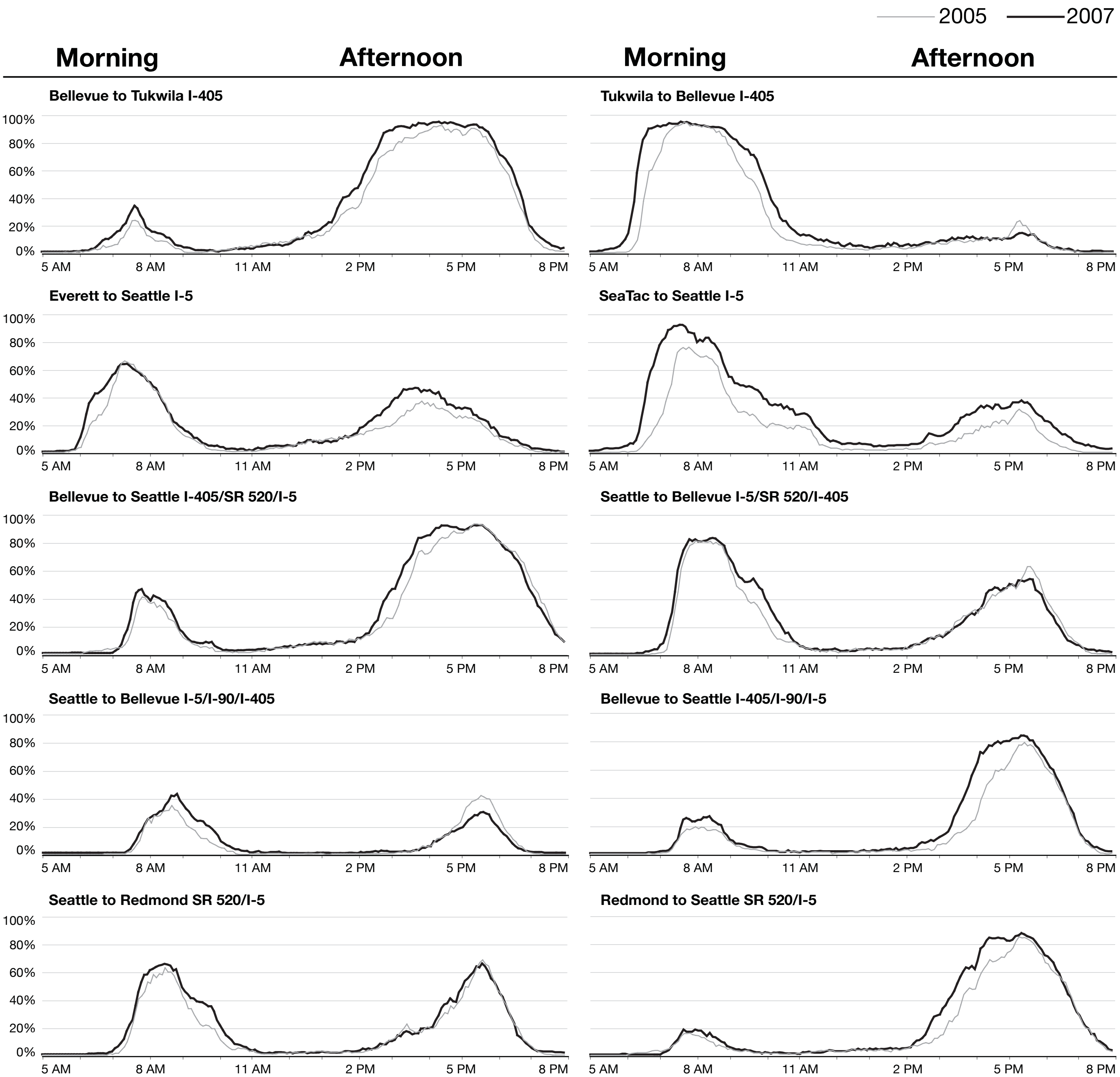
The following "stamp graphs" show how often severe congestion occurs on the 38 key central Puget Sound commute routes that are shown in the tables on pages 20 and 21. These graphs, comparing 2005 and 2007 data, show the percentage of days annually when speeds fell below 35 mph on these key commute routes. For more on how to read a stamp graph please see the illustration on page 24.



Travel Time Analysis of the 38 High Demand Commute Routes (continued)

Stamp Graphs: Percentage of weekdays with average speeds of 35 mph or less

The following expanded "stamp graphs" show how often severe congestion occurs on the 38 key central Puget Sound commute routes that are shown in the tables on pages 20 and 21. Like the graphs on the previous page, these graphs, comparing 2005 and 2007 data, show the percentage of days annually when speeds fell below 35 mph on these key commute routes. The commutes presented on this page are expanded since severe congestion on these commutes is occurring beyond the typical peak periods of 6 am to 10 am in the morning and 3 pm to 7 pm in the evening. For more on how to read a stamp graph please see the illustration on page 24.



Travel Time Analysis of the 38 High Demand Commute Routes (continued)

Below is a graphical representation of the tables from pp. 20-21, showing four of the travel times performance indicators: travel times at posted speeds, travel time at maximum throughput speeds (51 MPH), average peak travel times, and 95% reliable travel times. For each commute general purpose (GP) and HOV travel times are shown. For more information on HOV lane travel times please see pages 32-37.

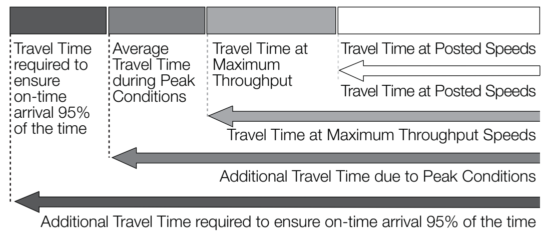
Travel times at posted speeds, maximum throughput speeds, peak travel times, and 95% reliable travel times

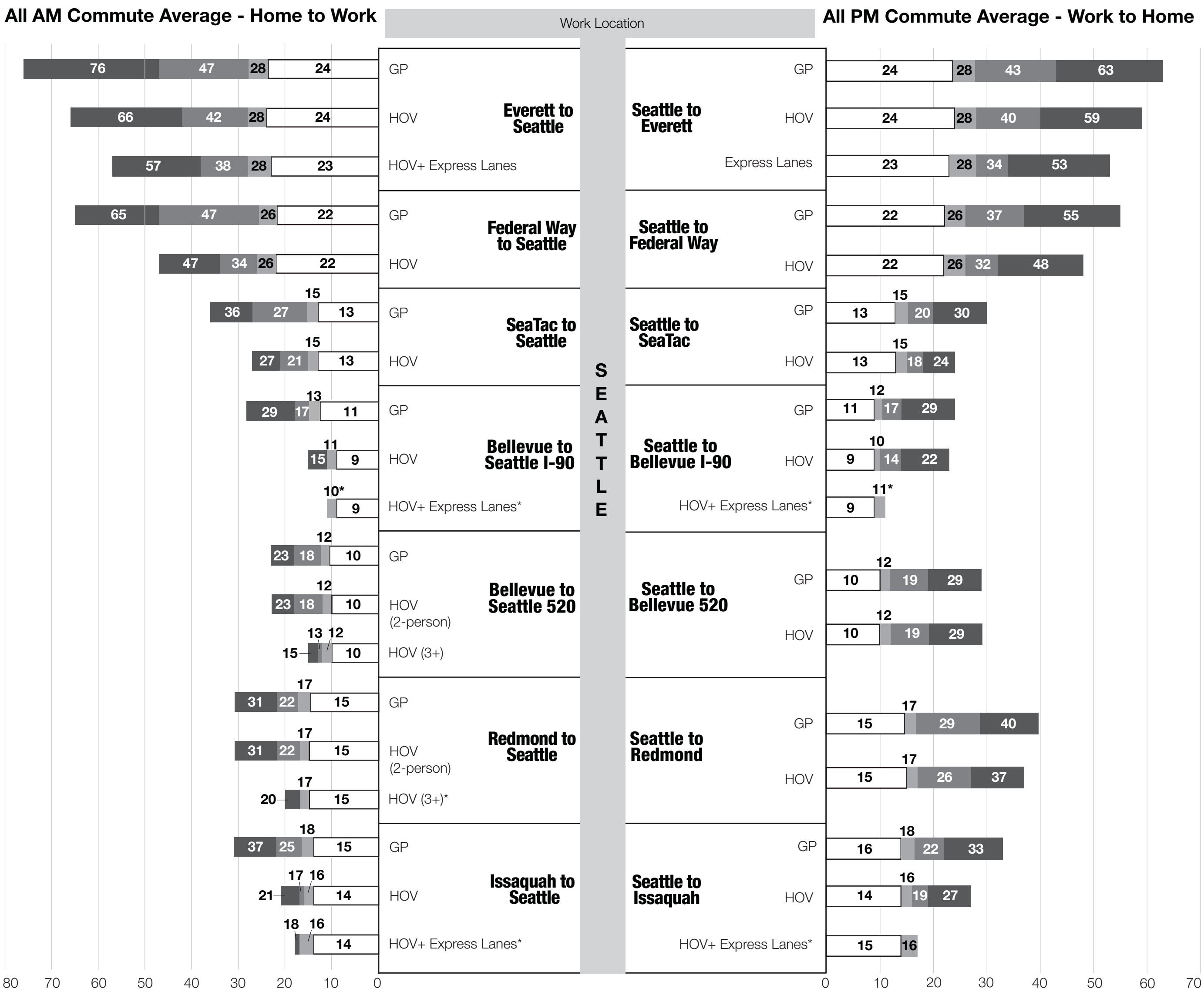
Morning and afternoon commutes by work location

Central Puget Sound area, 2007

General Purpose (GP) and High Occupancy Vehicle (HOV) Commutes; Travel time in minutes

- Travel Time at Posted Speeds with no congestion (in minutes)
- Travel Time due to Peak Condition (in minutes)
- Travel Time at Maximum Throughput Speeds 51 mph (in minutes)
- Travel Time required to ensure on-time arrival 95% of the time (in minutes)





* Note: Average Travel Times and/or 95% Reliable Travel Times were equal or faster than maximum throughput travel times on this route.

Measuring Delay and Congestion: Annual Update – 2007 Data

Travel Time Analysis of the 38 High Demand Commute Routes (continued)

Below is a graphical representation of the tables from pp. 20-21, showing four of the travel time performance indicators: travel times at posted speeds, travel time at maximum throughput speeds (51 MPH), average peak travel times, and 95% reliable travel times. For each commute general purpose (GP) and HOV travel times are shown. For more information on HOV lane travel times please see pages 32-37.

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

Morning and afternoon commutes by work location

Central Puget Sound area, 2007

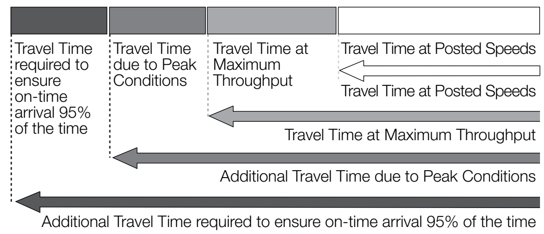
General Purpose (GP) and High Occupancy Vehicle (HOV) Commutes; Travel time in minutes

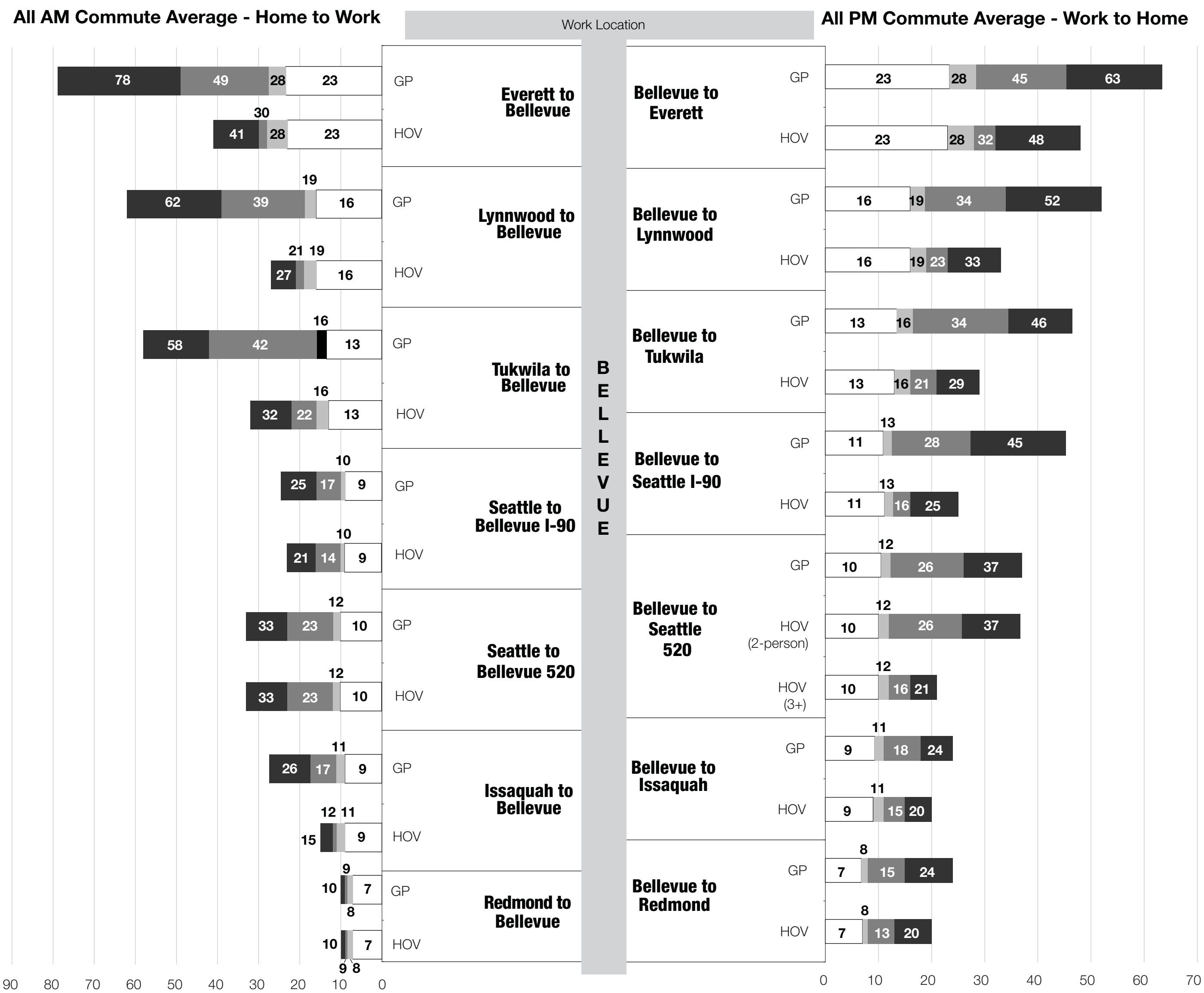
Travel Time at Posted Speeds with no congestion (in minutes)

Travel Time due to Peak Condition (in minutes)

Travel Time at Maximum Throughput Speeds 51 mph (in minutes)

Travel Time required to ensure on-time arrival 95% of the time (in minutes)



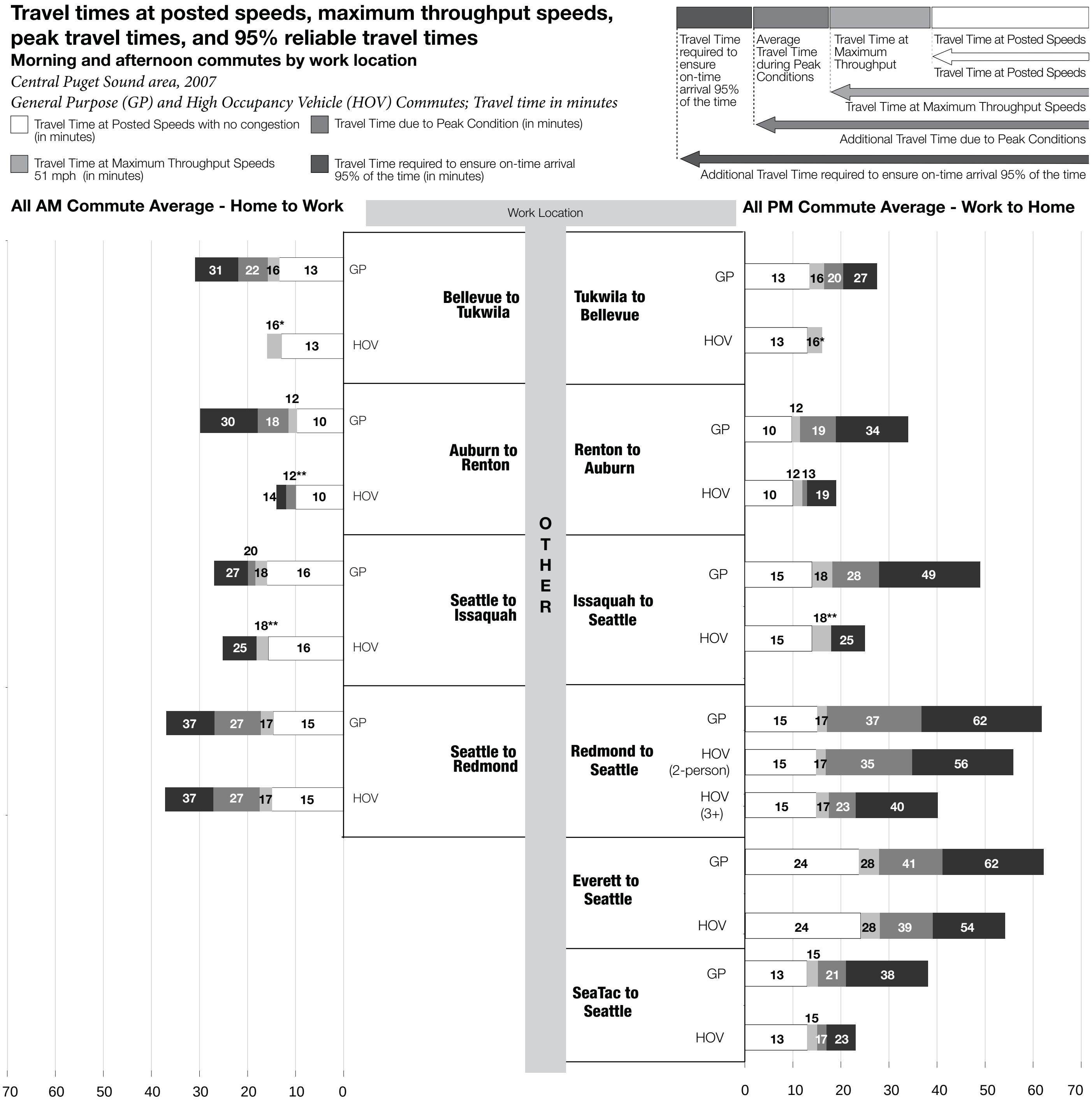


* Note: Average Travel Times and 95% Reliable Travel Times were equal or faster than maximum throughput travel times on this route.

Travel Time Analysis of the 38 High Demand Commute Routes (continued)

Below is a graphical representation of the tables from pp. 20-21, showing four of the travel times performance indicators: travel times at posted speeds, travel time at maximum throughput speeds (51 MPH), average peak travel times, and 95% reliable travel times. For each commute general purpose (GP) and HOV travel times are shown. For more information on HOV lane travel times please see pages 32-37.

Travel times at posted speeds, maximum throughput speeds, peak travel times, and 95% reliable travel times
Morning and afternoon commutes by work location
Central Puget Sound area, 2007
General Purpose (GP) and High Occupancy Vehicle (HOV) Commutes; Travel time in minutes



Measuring Delay and Congestion: Annual Update – 2007 Data

Travel Time Analysis: 14 Additional Puget Sound Commute Routes

WSDOT tracks 14 additional routes for congestion – and finds none

WSDOT tracks a total of 52 commute routes annually representing morning and evening commutes between major population and work centers. Thirty-eight of those routes regularly experience serious congestion (pp. 25-26). The additional 14 routes, listed on this page, represent the non-congested routes for which WSDOT tracks travel time and volume data.

With one exception, these 14 routes share the following characteristics:

- The average travel times are nearly flat from 2001 to 2007;
- Peak 5-minute periods fluctuate because they are easily influenced by heavily congested days;
- At their worst average 5-minute peaks throughout the year, these route operate at the top of the maximum throughput travel time range (51 mph);
- Average speeds on these routes never fell below the bottom of the maximum throughput range (42 mph).

The 95% reliable travel time is the only measure that is showing any indications of congestion. For the seven evening routes, all of the 95% reliable travel times are trending upwards. Only two of the eight morning commutes are trending upwards – *Seattle to Everett morning commute* and *Seattle to Issaquah morning commute*. The rest are generally flat, or trending downward. Because the 95% reliable travel time is heavily influenced by a few "very bad days", it is likely that overall conditions on the routes are not changing much, as evidenced by the flat average travel times on all routes.

WSDOT routinely tracks these commutes to see if they are developing congested characteristics. Two years ago, several routes that had previously been considered "non-congested" moved to the "congested list" as housing sales boomed in the Puget Sound region. No additional routes have developed significant congestion problems in the past year, so the list of congested routes did not grow this year. WSDOT will continue to monitor these 14 routes.

Redmond to Bellevue evening commute impacted by Redmond to Seattle commute

The one exception is the *Redmond to Bellevue evening commute*, which experiences substantial travel time and reliability issues. However, most of the trouble on this route is caused by backups from the *Redmond to Seattle evening commute*. Further,

Changes in travel time performance on the "other 14" central Puget Sound commute routes
2005 peak periods versus 2007 peak periods

Route/Commute		Peak time	Length (Miles)	Travel Time (minutes): At Peak Efficiency	Travel Time (minutes): At Posted Speed	Average Peak Travel Time, Based on Peak Time (minutes): 2005	2007	% Δ	95% Reliable Travel Times (minutes): 2005	2007	% Δ	Ratio of Peak Travel Time to Maximum Through-put Travel Time (MT³I): 2005	2007	Traffic Volume Peak Period: VMT % Δ	Duration of Congestion (hours and minutes that average speed falls below 70% of posted speeds): 2005	2007	change (min.)
Morning																	
I-5	Seattle to Everett	8:50 AM	23.7	28	24	26	27	+4%	31	32	+3%	0.93	0.97	-2%	*	*	N/A
I-5	Seattle to SeaTac	8:00 AM	12.9	15	13	14	14	0%	16	16	0%	0.92	0.92	-2%	*	*	N/A
I-405	Bellevue to Lynnwood	9:05 AM	16.0	19	16	17	18	+6%	18	19	+6%	0.90	0.96	-3%	*	*	N/A
SR-167	Renton to Auburn	9:45 AM	9.8	12	10	11	11	0%	13	12	-8%	0.96	0.96	-2%	*	*	N/A
I-90	Seattle to Issaquah	8:40 AM	15.7	18	16	20	20	0%	26	27	+4%	1.08	1.08	-1%	*	*	N/A
I-90	Bellevue to Issaquah	8:35 AM	9.3	11	9	11	10	-9%	15	13	-13%	1.01	0.91	-4%	*	*	N/A
I-5	Seattle to Federal Way	8:00 AM	22.1	26	22	23	23	0%	25	25	0%	0.88	0.88	-2%	*	*	N/A
I-405	Bellevue to Everett	9:25 AM	23.4	28	23	25	26	+4%	26	27	+4%	0.91	0.95	-2%	*	*	N/A
Evening																	
I-405	Lynnwood to Bellevue	5:15 PM	16.0	19	16	21	22	+5%	28	31	+11%	1.12	1.17	-3%	*	*	N/A
SR 167	Auburn to Renton	2:00/5:35 PM	9.8	12	10	12	12	0%	15	21	+40%	1.04	1.04	-5%	*	*	N/A
SR 520	Redmond to Bellevue	5:25 PM	7.1	8	7	14	16	+14%	34	35	+3%	1.67	1.91	-3%	1:40	2:50	+1:10
I-90	Issaquah to Bellevue	5:20 PM	9.5	11	10	12	12	0%	17	16	-6%	1.08	1.08	-4%	*	*	N/A
I-5	Federal Way to Seattle	5:10 PM	21.8	26	22	29	30	+3%	37	46	+24%	1.13	1.17	-3%	*	*	N/A
I-5	Everett to Bellevue	5:15 PM	23.4	28	23	30	30	0%	39	39	0%	1.09	1.09	-3%	*	*	N/A

Data Source: WSDOT Traffic Operations and the Washington State Transportation Center (TRAC) at the University of Washington.

Note: An asterisk (*) indicates that speeds did not fall below 70% of posted speed on a route; and n/a means that no information is available for a route.

2005 figures have been recalculated since their last publication in the 2005 annual congestion update, using a more refined data quality control process.

Travel Time Analysis: Spokane

there are several local roads between Redmond and Bellevue which offer non-highway alternatives to commuters so they can avoid the congestion altogether.

Spokane travel time analysis: traffic volumes increase on I-90 during the evening peak

Spokane traffic volumes continue to grow with a peak flow near Altamont Street of 114,000 vehicles per day. This is an increase of 4.6% since 2005. The effect of this growth has primarily impacted the duration of the evening peak period. Traffic volumes that were present at 3:00 pm are now being seen at 2:00 pm. This growth has resulted in moderate congestion and travel speed reductions during the afternoon commute, especially in the eastbound lanes. For the remainder of the commute, travel speed remains near what would be expected with free flow. Incidents remain the major cause of delay and congestion on the corridor as reflected in the increase in the 95% reliable travel time during the evening peak.

Intermittent back-ups of traffic moving off of I-90 have noticeably increased through several interchanges on the corridor. This appears to be the result of traffic impacts from several arterial street construction projects combined with the additional traffic on the I-90 corridor.

Changes in travel time performance on Spokane commute routes*

2005 peak periods versus 2007 peak periods

			Travel Time (minutes)		Average Peak Travel Time, Based on Peak Time (minutes : seconds)			95% Reliable Travel Times (minutes : seconds)			Traffic Volume Peak Period	Duration of Congestion (hours and minutes that average speed falls below 70% of posted speeds)		
Route/Commute	Peak time	Length (Miles)	At Peak Efficiency	At Posted Speed	2005	2007	% Δ	2005	2007	% Δ	% Δ	2005	2007	change (min.)
I-90: Argonne Rd. to Division St.	7:50 AM	7.5	8	7	7:44	8:20	+8%	8:58	10:10	+13%	+2%	-	-	N/A
I-90: Division St. to Argonne Rd.	5:20 PM	7.5	8	7	8:24	8:10	-3%	10:51	10:48	0%	0%	-	-	N/A

Source: WSDOT Eastern Region Traffic Office.

*The travel time data collection by PeMS began in December 2004. Thus, baseline travel time data will be based on the reliable data collected after March 2005 for 12-month period.

Note: For duration of congestion, speeds did not fall below 70% of posted speed on these routes.

Buses and trucks during congested conditions

Heavy trucks and buses move differently in congested traffic than passenger vehicles. Trucks and buses need to leave a longer headway (space) between themselves and vehicles in front of them for safe braking and stopping. Because these vehicles are longer, it takes cars more time to pass them, and the longer vehicles need more room to change lanes. They are also slower accelerating on hills than passenger vehicles.

While overall vehicle volumes decreased on congested central Puget Sound routes between 2005 and 2007 (pp. 25-26), truck traffic stayed steady or increased. Only one segment saw a drop in truck volumes. The largest increase in truck volumes has been on I-90 between Seattle and SR 18.

Truck traffic is somewhat constrained by the same needs that commuters face. While some trucks have the luxury of traveling outside of peak period traffic, many are on schedules for delivery during business hours and have to travel during congested periods. Existing data shows that, generally, there is less traffic on the road during the evening peak hour. WSDOT is conducting a Truck Performance Measurement Pilot Project which uses GPS tracking systems to determine the travel time, delay, and reliability for truck trips in Central Puget Sound. The final report is due in April 2010.

Bus travel generally correlates with peak period commuting, carrying thousands of commuters who would otherwise have to use passenger cars. WSDOT has attempted to mitigate the effect of buses weaving through traffic by providing Direct Access Ramps to left-hand HOV lanes. (See page 48 for more information on Direct Access Ramps).

Average annual daily truck volumes on congested highway segments in the central Puget Sound region

Route description	2005	2007	% Δ
I-5: King/Pierce Co. line to I-90	15,000	14,000	-7%
I-5: I-90 to King/Snohomish Co. line*	11,000	11,000	0%
I-90: 4th to I-5 (Seattle)	2,800	2,800	0%
I-90: I-5 (Seattle) to SR 18*	7,000	8,000	+14%
SR-167: Pierce/King Co. line to I-405	11,000	11,000	0%
I-405: I-5 (Tukwila) to SR 522	7,600	7,700	+1%
I-405: SR 522 to King/Snohomish Co. line	3,700	3,900	+5%
I-405: King/Snohomish Co. line to I-5	3,700	3,900	+5%
SR-520: I-5 (Seattle) to SR 202	2,600	2,700	+4%

Source: WSDOT Traffic Data Office and WSDOT Freight Systems Division.

* Includes Express Lanes.

Measuring Delay and Congestion Annual Update – 2007 Data

HOV Lane Performance

High Occupancy Vehicle (HOV) lanes remain a vital part of the Puget Sound region's transportation system. The goal of the HOV lane network is to enhance the efficiency of the freeway network by moving more people in fewer vehicles. The HOV network is designed to provide a less-congested alternative to general purpose lanes that encourages the use of buses, carpools and vanpools, provide a more reliable travel option, and help reduce associated environmental effects. Approximately 235 miles of HOV lanes have been constructed in the central Puget Sound since 1970, of a planned 310-mile HOV network. More information about the HOV lane system can be found at http://www.wsdot.wa.gov/hov/.

WSDOT monitors two important aspects of HOV lane performance: 1) travel time and reliability benefits, and 2) number of people traveling via HOV lanes as compared to the general purpose lanes (person throughput).

Reliability: Nine HOV corridors do not meet the reliability standard in 2007

In 1996 the Washington State Transportation Commission, in consultation with WSDOT and Puget Sound region stakeholders, adopted policies that provide guidance for operation of the Freeway HOV lanes. Those policies include the following speed and reliability standard: "HOV lane vehicles should maintain or exceed an average speed of 45 mph or greater at least 90% of the time they use that lane during the peak hour."

The 2007 performance results for the Puget Sound HOV lane system indicate that significant portions of the freeway HOV lane system are experiencing increasing usage and reduced performance during the peak hours, continuing a trend seen during the past few years. Five of the seven HOV corridors in the peak direction during the evening peak hour have high enough traffic volumes that the corridors fail the HOV performance standard, and four of the seven corridors in the peak direction during the morning peak period fail the performance standard, matching the results from 2006. In addition, 6 of the 9 HOV corridors that do not meet the performance standard experienced a further decline in travel reliability in 2007 compared to 2006. The accompanying table illustrates which corridors in the peak direction of travel meet or fail the performance standard during the morning peak period and evening peak hour.

Although HOV travel time reliability is below the state performance goal on a number of Puget Sound corridors, HOV lanes continue to provide substantial travel time savings during peak periods compared to the adjacent general purpose lanes (see pp. 34-37). Also, the state HOV standard is based on peak hour performance, and does not reflect conditions at other times of the day. Outside of the peak period, all HOV corridors surpass the reliability standard.

HOV lane reliability performance on central Puget Sound corridors

2005 - 2007, based on reliability goal of the HOV lane maintaining a speed of 45 mph for 90% of the peak hour[1]

Did Not Meet the Standard[2] = **x**

Numbers represent percentage of peak hour when the 45 mph goal is met.	2005	2006	2007
Morning peak direction commutes			
I-5, SR 526 (S Everett) to NE 110th St (Seattle) SB	49% **x**	35% **x**	35% **x**
I-5, S 298th St (Federal Way) to Columbian Way (Seattle) NB	61% **x**	47% **x**	33% **x**
I-405, SR 524 (Lynnwood) to NE 4th/8th St (Bellevue CBD) SB	88%* **x**	70% **x**	76% **x**
I-405, Andover Park E (Tukwila) to NE 4th Street (Bellevue CBD) NB	70% **x**	49% **x**	31% **x**
I-90, SR 900 (Issaquah) to I-90 Reversible (Seattle) WB	100%	100%	99%
SR 520, W Lake Sammamish Pkwy NE (Redmond) to 84th Ave NE (Bellevue) WB	98%	97%	97%
SR 167, 15th St NW (Auburn) to S 34th St (Renton) NB	100%	99%	96%
Evening peak direction commutes			
I-5, Northgate Way (Seattle) to 112th St SW (S Everett) NB	73% **x**	54% **x**	51% **x**
I-5, S Spokane St (Seattle) to S 308th St (Federal Way) SB	55% **x**	46% **x**	47% **x**
I-405, NE 4th St (Bellevue CBD) to SR 524 (Lynnwood) NB	81% **x**	69% **x**	53% **x**
I-405, NE 4th/8th St (Bellevue CBD) to Andover Park E (Tukwila) SB	59% **x**	44% **x**	30% **x**
I-90, I-90 Reversible (Seattle) to193rd Pl SE (Issaquah) EB	100%	100%	100%
SR 520, W Lake Sammamish Pkwy NE (Redmond) to 84th Ave NE (Bellevue) WB	66% **x**	61% **x**	59% **x**
SR 167, S 23rd St (Renton) to 43rd St NW (Auburn) SB	98%	93%	91%

Data Source: Washington State Transportation Center (TRAC).

Data Notes: TRAC analyzes performance data for all complete segments of HOV lanes that have a loop detector. In some cases, data is not analyzed for the very beginning and ends of the lanes because there are not detectors at the very beginnings and ends of the HOV lanes.

NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

[1]HOV reliability performance standards are based on the peak hour. Peak hour is the one-hour period during each peak period when average travel time is slowest.

[2]Numbers represent the percentage of the peak hour when speeds are above 45 mph.

*Performance on this corridor was close to the standard; the corridor's failed performance was borderline.

HOV Lane Performance: Person Throughput

HOV lanes outperform general purpose lanes in person throughput

The WSDOT HOV lane monitoring program tracks peak period vehicle and person volumes in the HOV and general purpose lanes at 10 locations around the central Puget Sound area that are representative of freeway use on all major freeway corridors in the region. Vehicle and person volumes are measured in both directions for both HOV and general purpose lanes at each of these locations during the peak periods.

Looking at all the locations combined, total GP and HOV vehicle volumes remained steady from 2006 to 2007. The magnitude of the one-year change in vehicle volume (in the direction of peak travel, during the combined AM and PM peak periods) varied from location to location, ranging from -3% to +5% for HOV lanes, and -3% to +3% for GP lanes. It should be noted that these figures represent spot location volumes for 2006 and 2007, unlike what is reported in the travel time analysis which examines changes in VMT along commute routes between 2005 and 2007 (pp 18-31).

The percentage of vehicles in the HOV lane that did not meet the HOV occupancy requirement is relatively low compared to other locations around the country. While HOV compliance varies from location to location in the system, average observed violation rates were about 2% during both the AM and PM peak periods.

HOV lanes continue to be effective at moving more people compared to general purpose lanes

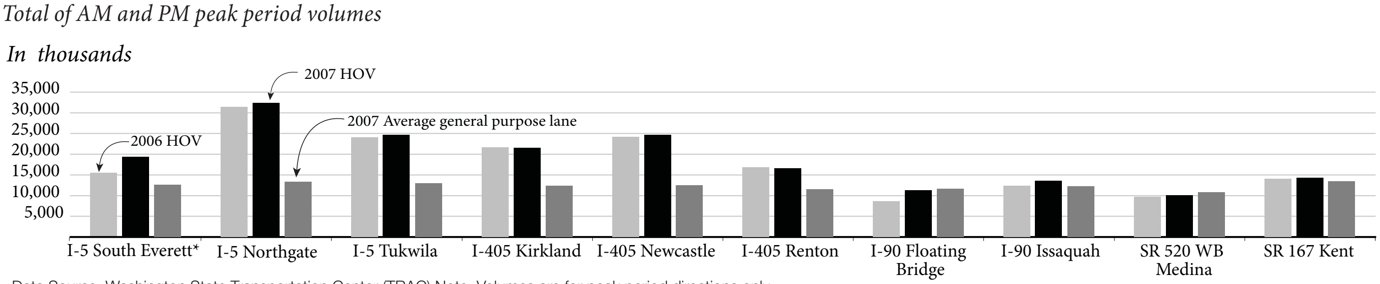
HOV lanes are designed to move more people in fewer vehicles, by providing incentives that encourage people to share rides, either in carpools and vanpools or by using transit. The HOV lane system generally succeeds in attracting large numbers of users, despite consisting of only one lane in each direction on each freeway route. At the monitoring locations, the average HOV lane carries about 35% of the people on the freeway in the morning and evening peak periods.

HOV lanes are not equally used throughout the region. The highest HOV lane use occurs where HOV lanes have a time advantage over general purpose lanes or where excellent transit service is provided. I-5 near Northgate is an example of the person moving capability of comprehensive transit service. In the morning peak period the southbound HOV lanes move about 14,400 people, or 44% of the people on that section of I-5, in only 21% of the vehicles. The HOV lane carries an average of 3.5 people in each vehicle, making it nearly three times as effective at moving people as the average general purpose lane next to it. Not all HOV lanes in the region carry such high percentages of freeway travelers. However, nearly every monitoring location has experienced increasing person volumes in the HOV lane from 2006 to 2007; this continues a trend seen from 2004 to 2006. The graph below compares person throughput for HOV lanes to general purpose lanes on the major corridors during the peak periods.

Previous *Gray Notebook* reports on HOV lanes (2005 and 2006) noted that HOV lane person throughput was not exceeding general purpose lane throughput at four monitoring locations: the I-90 Floating Bridge, I-90 in Issaquah, SR 520 Westbound at Medina, and SR 167 in Kent. From 2004 to 2006, those locations all experienced increased HOV use, and this trend continued in 2007. On I-90, the number of persons using the I-90 HOV lane near Issaquah in the peak direction during peak periods has grown by 9% from 2006 to 2007. At the Issaquah I-90 location and at SR 167 near Kent, HOV person volumes now exceed the person throughput of the average adjacent general purpose lane.

The two remaining locations that have not met the person throughput goal are I-90's Floating Bridge, a two-lane HOV/express facility that has a limited number of access points and allows single-occupant vehicles to travel between Mercer Island and Seattle; and SR 520 Westbound at Medina, where the 3+ occupancy restriction reduces the number of vehicles eligible to use that HOV lane. Both locations saw an increase in person volume from 2006 to 2007.

2007 HOV lane and general purpose lane person throughput comparison
Total of AM and PM peak period volumes



Data Source: Washington State Transportation Center (TRAC) Note: Volumes are for peak period directions only.
* In 2007 the monitoring location changed because of construction.

HOV Lane Performance: HOV Lane Travel Times for Morning Commutes

The new HOV lane performance section looks at average and 95% reliable travel times for HOV commute routes in comparison to adjacent general purpose lane commute travel times. The tables on this page and the next show travel times for HOV lanes along the 38 key Puget Sound commutes. In some cases, additional travel times are provided to reflect the use of the reversible Express Lanes. On four westbound routes across SR 520, travel times are provided for both 2-person and 3+ HOVs, since part of the HOV system on that highway is open only to 3+ person HOVs.

2007 average travel times in HOV lanes are better than GP lanes for 39 out of 48 HOV commutes

Average Travel Times and 95% Reliable Travel times are almost always faster in HOV lanes than in general purpose (GP) lanes. Of the 48 2-person HOV lanes, 3+ HOV lanes, and Express lanes that run alongside the 38 key commute routes, 39 provide between one minute and 20 minutes of savings in average travel time. Forty provide better reliability (95% reliable travel time) than their general-purpose counterparts.

HOV lane travel time performance compared to general purpose lanes

A.M. peak

		Average Travel Times (minutes)					95% Reliable Travel Times (minutes)				
		HOV Lanes		Change	GP Lanes	Difference	HOV Lanes		Change	GP Lanes	Difference
Commute Route	Peak time	2005	2007	2005 HOV vs. 2007 HOV	2007	2007 HOV vs. 2007 GP	2005	2007	2005 HOV vs. 2007 HOV	2007	2007 HOV vs. 2007 GP
To Seattle											
I-5–Everett to Seattle - Regular HOV lane[2]	7:25 AM	40	42	+2	47	-5	60	66	+6	76	-10
Reversible lanes[2]	7:25 AM	35	38	+3	47	-9	51	57	+6	76	-19
I-5–Federal Way to Seattle	7:00 AM	31	34	+3	47	-13	40	47	+7	65	-18
I-90–Issaquah to Seattle - HOV & GP lanes[1]	7:45 AM	17	17	0	22	-5	22	21	-1	31	-10
HOV & reversible lanes[1]	7:45 AM	16	16	0	22	-6	19	18	-1	31	-13
SR-520–Redmond to Seattle-2-person[3 (a,b)]	7:40 AM	22	22	0	22	0	30	31	+1	31	0
3+	7:40 AM	17	17	0	22	-5	20	20	0	31	-11
I-5–SeaTac to Seattle	7:35 AM	17	21	+4	27	-6	25	27	+2	36	-9
I-90–Bellevue to Seattle - HOV & GP lanes[1]	7:50 AM	11	11	0	13	-2	15	15	0	19	-4
HOV & reversible lanes[1]	7:50 AM	9	9	0	13	-4	11	10	-1	19	-9
SR-520–Bellevue to Seattle - 2-person[3 (a,c)]	7:50 AM	18	18	0	18	0	25	23	-2	23	0
3+	7:50 AM	13	13	0	18	-5	16	15	-1	23	-8
To Bellevue											
I-405–Everett to Bellevue	7:25 AM	27	30	+3	49	-19	36	41	+5	81	-40
I-405–Lynnwood to Bellevue	7:35 AM	19	21	+2	39	-18	24	27	+3	62	-35
I-405–Tukwila to Bellevue	7:45 AM	18	22	+4	42	-20	28	32	+4	58	-26
I-90–Seattle to Bellevue - HOV & GP lanes[1]	8:45 AM	14	14	0	15	-1	20	21	+1	22	-1
SR-520–Seattle to Bellevue[3 (a,c)]	8:35 AM	20	23	+3	23	0	30	33	+3	33	0
I-90–Issaquah to Bellevue	7:45 AM	14	12	-2	17	-5	17	15	-2	26	-11
SR 520–Redmond to Bellevue[3 (b,c)]	7:50 AM	9	9	0	9	0	10	10	0	10	0
To other locations											
I-405–Bellevue to Tukwila	7:40 AM	14	14	0	22	-8	14	15	+1	31	-16
SR 167–Auburn to Renton	6:25 AM	10	11	+1	18	-7	12	14	+2	30	-16
SR 520–Seattle to Redmond[3 (a,b)]	8:25 AM	25	27	+2	27	0	33	37	+4	37	0
I-90–Seattle to Issaquah - HOV & GP lanes[1, 3 (a,b)]	8:40 AM	18	18	0	18	0	23	25	+2	25	0

Source: WSDOT Traffic Operations and the Washington State Transportation Center (TRAC) at the University of Washington.

[1] Trips that are to/from Seattle on I-90 in the general purpose lanes are slightly shorter than those used for the traditional routes. This allows for an apples-to-apples comparison of the GP and HOV lanes on I-90. However, travel times for trips in the GP lanes will not match travel times in the tables on pages 18-31.

[2] The I-5 trips between Everett and Seattle using the reversible lanes are shorter by 0.3 miles than their GP counterparts. No adjustment was made to the travel time calculations.

[3] This HOV lane does not provide travel time benefits over GP lanes because: a) The HOV lane does not run along the entire route; b) There is no congestion in the general purpose lanes on some segments of this route; and/or c) The HOV lane is inconveniently located for use on this commute route.

Note: HOV Trips with the same endpoints as GP lane trips, but differing lengths, do not require any adjustment, since the difference in lengths is the result of HOVs using different roadways than GPs (e.g., an HOV-only interchange ramp).

HOV Lane Performance: HOV Lane Travel Times for Evening Commutes

Nine trips offer no HOV travel time benefit for either the average and/or 95th percent travel times. For these trips, it is not necessarily an overloaded HOV lane that is causing the lack of benefit:

- On nearly every one of the nine trips, there is no HOV lane along some or the entire trip route; therefore high-occupancy vehicles would be traveling in the general purpose lanes. For those segments, there would be no HOV time savings vs. GP travel times.
- On some trips, some segments of the HOV lane are parallel to GP lanes that have no congestion for that time of day, and therefore there is no HOV time savings.
- On some trips, an HOV user would not use the HOV lane even when it is available on that trip, because it would not be a logical choice. For example, on the Seattle to Bellevue

HOV lane travel time performance compared to general purpose lanes

P.M. peak

		Average travel times (minutes)					95% Reliable travel times (minutes)				
		HOV Lanes		Change 2005 HOV vs. 2007 HOV	GP Lanes	Difference 2007 HOV vs. 2007 GP	HOV Lanes		Change 2005 HOV vs. 2007 HOV	GP Lanes	Difference 2007 HOV vs. 2007 GP
Commute Route	Peak time	2005	2007		2007		2005	2007		2007	
From Seattle											
I-5–Seattle to Everett - Regular HOV lanes [2]	4:20 PM	41	40	-1	43	-3	62	59	-3	63	-4
Reversible lanes [2]	4:20 PM	34	34	0	43	-9	55	53	-2	63	-10
I-5–Seattle to Federal Way	4:10 PM	32	32	0	37	-5	48	48	0	55	-7
I-5–Seattle to SeaTac	4:10 PM	18	18	0	20	-2	25	24	-1	30	-6
I-90–Seattle to Bellevue - HOV & GP lanes[1, 3(a)]	5:30 PM	15	14	-1	14	0	23	22	-1	24	-2
HOV & reversible lanes[1]	5:30 PM	10	10	0	14	-4	11	10	-1	24	-14
SR-520–Seattle to Bellevue[3 (a,c)]	5:30 PM	20	19	-1	19	0	32	29	-3	29	0
SR 520–Seattle to Redmond	5:35 PM	26	26	0	29	-3	38	37	-1	40	-3
I-90–Seattle to Issaquah - HOV & GP lanes[1]	5:30 PM	20	19	-1	20	-1	27	27	0	29	-2
HOV & reversible lanes[1]	5:30 PM	14	15	+1	20	-5	15	16	+1	29	-13
From Bellevue											
I-405–Bellevue to Everett	4:30 PM	31	32	+1	45	-13	46	48	+2	63	-15
I-405–Bellevue to Lynnwood	4:20 PM	20	23	+3	34	-11	27	33	+6	52	-19
I-405–Bellevue to Tukwila	4:20 PM	19	21	+2	34	-13	26	29	+3	46	-17
I-90–Bellevue to Seattle - HOV & GP lanes[1]	5:15 PM	15	16	+1	23	-7	23	25	+2	36	-11
SR-520–Bellevue to Seattle - 2 person[3(a,c)]	5:30 PM	26	26	0	26	0	34	37	+3	37	0
3+	5:30 PM	16	16	0	26	-10	20	21	+1	37	-16
I-90–Bellevue to Issaquah	5:30 PM	13	15	+2	18	-3	16	20	+4	24	-4
SR 520–Bellevue to Redmond	5:35 PM	11	13	+2	15	-2	15	20	+5	24	-4
To Other Locations											
I-5–SeaTac to Seattle	5:20 PM	16	17	+1	21	-4	20	23	+3	38	-15
I-5–Everett to Seattle - Regular HOV lane [2]	3:35 PM	36	39	+3	41	-2	49	54	+5	62	-8
I-405–Tukwila to Bellevue	5:20 PM	14	15	+1	20	-5	15	15	0	27	-12
SR 167–Renton to Auburn	4:20 PM	11	13	+2	19	-6	15	19	+4	34	-15
SR-520–Redmond to Seattle - 2 person	5:25 PM	34	35	+1	37	-2	55	56	+1	62	-6
3+	5:25 PM	22	23	+1	37	-14	39	40	+1	62	-22
I-90–Issaquah to Seattle - HOV & GP lanes[1]	5:20 PM	18	18	0	23	-5	23	25	+2	40	-15

Source: WSDOT Traffic Operations and the Washington State Transportation Center (TRAC) at the University of Washington.

[1] Trips that are to/from Seattle on I-90 in the general purpose lanes are slightly shorter than those used for the traditional routes. This allows for an apples-to-apples comparison of the GP and HOV lanes on I-90. However, travel times for trips in the GP lanes will not match travel times in the tables on pages 18-31.

[2] The I-5 trips between Everett and Seattle using the reversible lanes are shorter by 0.3 miles than their GP counterparts. No adjustment was made to the travel time calculations.

[3] This HOV lane does not provide travel time benefits over GP lanes because: a) The HOV lane does not run along the entire route; b) There is no congestion in the general purpose lanes on some segments of this route; and/or c) The HOV lane is inconveniently located for use on this commute route.

Note: HOV Trips with the same endpoints as GP lane trips, but differing lengths, do not require any adjustment, since the difference in lengths is the result of HOVs using different roadways than GPs (e.g., an HOV-only interchange ramp).

HOV Lane Performance: HOV Lane vs. GP Lane Travel Times

via SR 520 route, there is an HOV lane on southbound 405 in Bellevue. But an HOV user would not weave to the inside to use that HOV lane, because the Bellevue exit is coming up shortly. So HOV drivers would stay in the GP lanes on I-405, and therefore there is no HOV travel time benefit vs. GP travelers there.

Changes in average HOV travel times from 2005 to 2007 consistent with changes for GP lanes

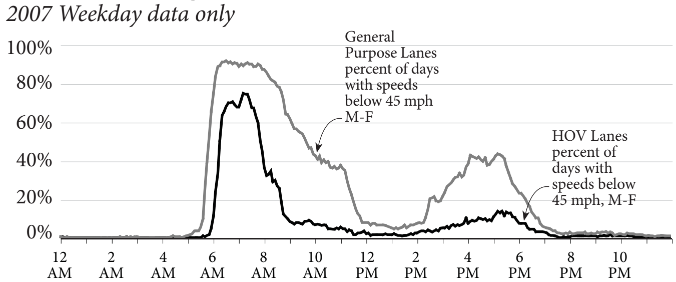
Decreases or increases in average travel times for HOV lane and Express lanes are consistent with their general purpose counterpart trips, within one to two minutes. This implies that the same changes in congestion pressures that are faced by the GP lanes are also experienced by the HOV lanes.

How do HOV lane travel time data compare with the HOV lane reliability performance goal?

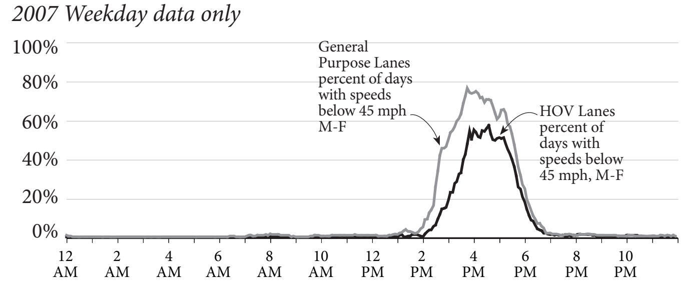
The table on page 34 presents performance data showing whether or not HOV lanes meet the standard of achieving 45 mph speed at least 90% of the time. Typically, when travel times in HOV lanes are even with the travel times in congested GP lanes during peak periods, the HOV lane fails the reliability standard. The comparison of travel times to performance data is not perfect, because the travel time data on this page is for full routes, which might include more than one highway and the transitions between them, while the reliability data on page 36 are based on the performance of an HOV lane on a single highway segment.

The graphs below show the existing HOV lane system's performance versus the performance of the general purpose (GP) lanes for selected Puget Sound commutes. The line graphs represent the percent of days when average vehicle speeds fell below 45 mph (the HOV lane reliability performance standard), throughout the course of the day. The dark line represents the HOV lanes, while the gray line represents the general purpose lanes.

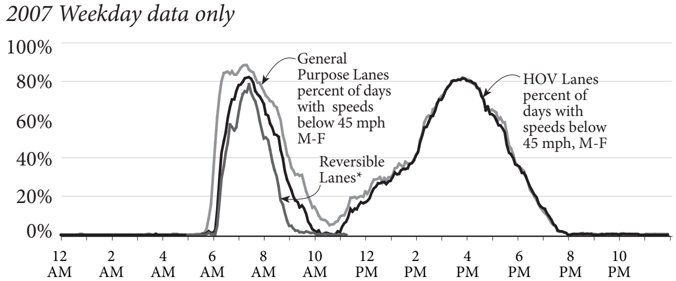
I-5 Federal Way to Seattle
2007 Weekday data only



I-5 Seattle to Federal Way
2007 Weekday data only

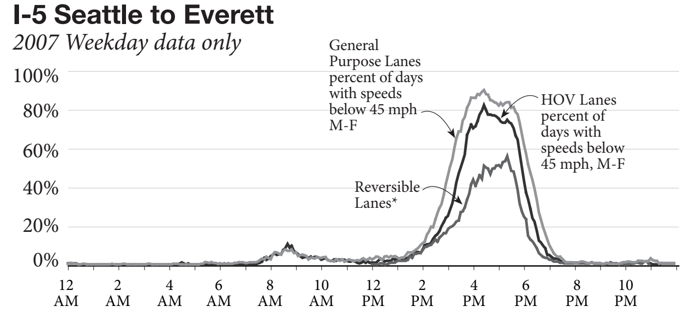


I-5 Everett to Seattle
2007 Weekday data only



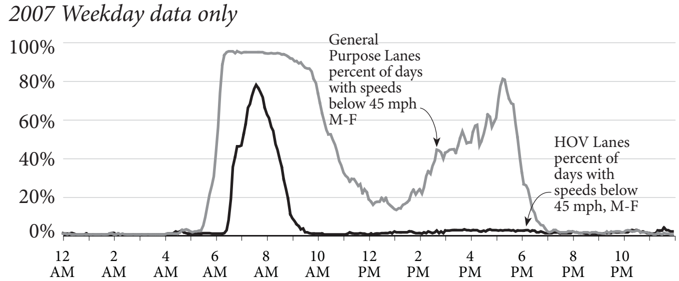
* Monday-Friday Hours of Operation: Southbound - 5 am to 11:15 am; Northbound - Noon to 11 pm; Closed - 11 pm to 5 am.

I-5 Seattle to Everett
2007 Weekday data only

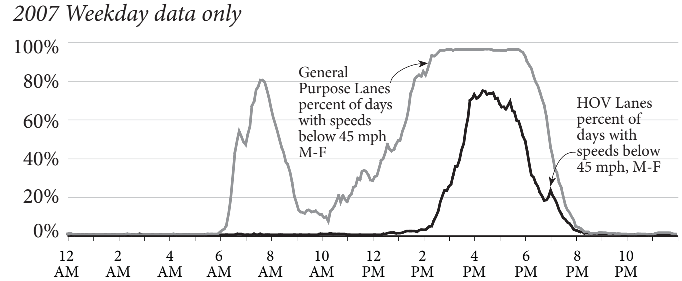


* Monday-Friday Hours of Operation: Southbound - 5 am to 11:15 am; Northbound - Noon to 11 pm; Closed - 11 pm to 5 am.

I-405 Tukwila to Bellevue
2007 Weekday data only



I-405 Bellevue to Tukwila
2007 Weekday data only

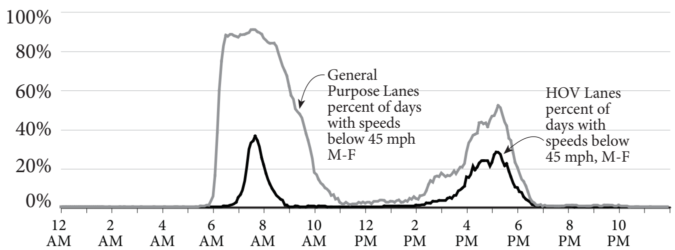


HOV Lane Performance: HOV Lane vs. GP Lane Travel Times

The graphs below show the existing HOV lane system's performance versus the performance of the general purpose (GP) lanes for selected Puget Sound commutes. The line graphs represent the percent of days when average vehicle speeds fell below 45 mph (the HOV lane reliability performance standard), throughout the course of the day. The dark line represents the HOV lanes, while the gray line represents the general purpose lanes.

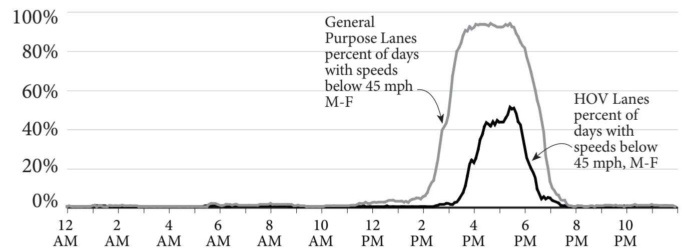
I-405 Lynnwood to Bellevue

2007 Weekday data only



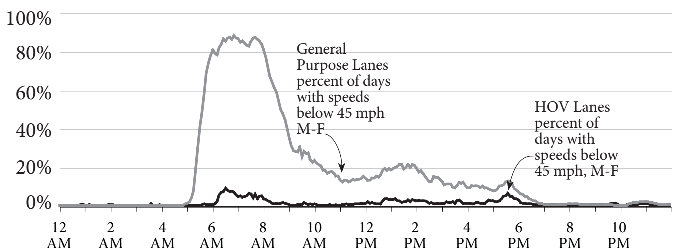
I-405 Bellevue to Lynnwood

2007 Weekday data only



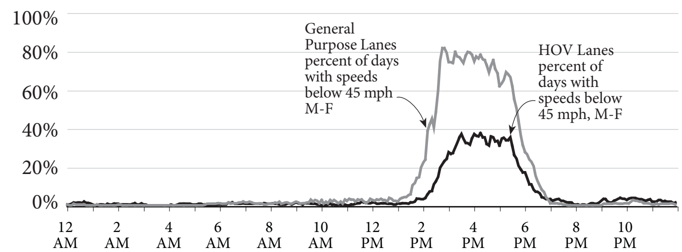
SR 167 Auburn to Renton

2007 Weekday data only



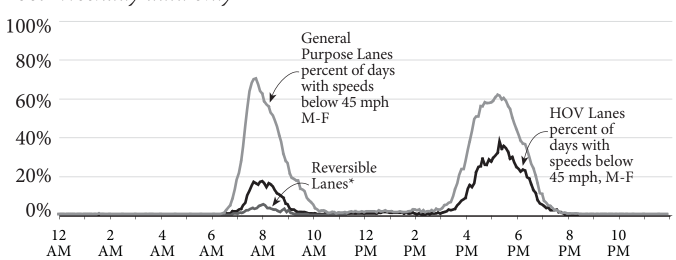
SR 167 Renton to Auburn

2007 Weekday data only



I-90/I-5 Issaquah to Seattle

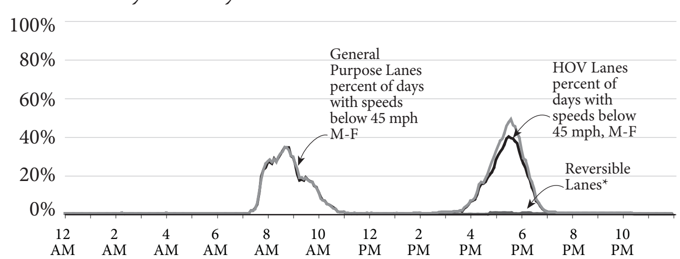
2007 Weekday data only



* Monday-Friday Hours of Operation: Westbound - 1am to 12:30 pm; Eastbound - 2 pm to Midnight.

I-5/I-90 Seattle to Issaquah

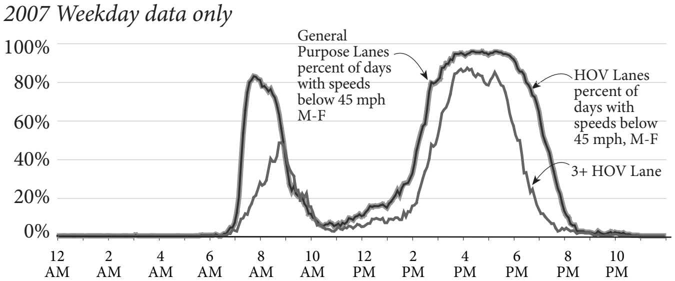
2007 Weekday data only



* Monday-Friday Hours of Operation: Westbound - 1am to 12:30 pm; Eastbound - 2 pm to Midnight.

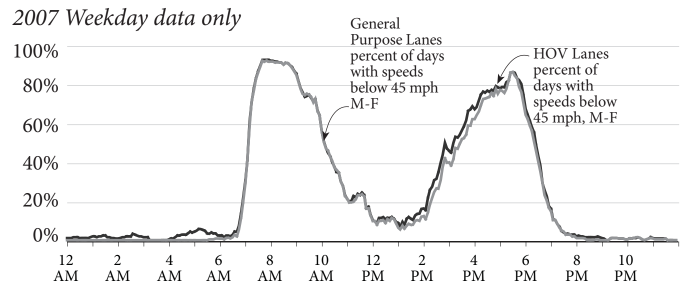
I-405/SR 520/I-5 Bellevue to Seattle

2007 Weekday data only



I-5/SR 520/I-405 Seattle to Bellevue

2007 Weekday data only



Throughput Productivity

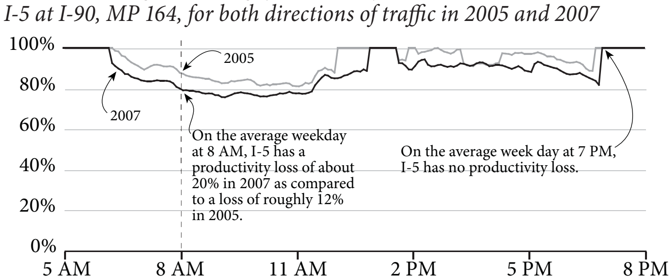
When a highway is congested it is serving fewer vehicles than it is designed to carry. Lost throughput productivity measures the percentage of a highway's vehicle throughput capacity that is lost due to congestion. This is calculated as the difference between the optimal capacity of the roadway observed at maximum throughput speeds as compared to the number of vehicles that the road is actually serving at a particular time of day. Under ideal conditions, the maximum throughput of vehicles moving through a freeway segment can be as high as 2,000 vehicles per lane per hour (vplph). This is observed when traveling at speeds in the range of 70%-85% of the posted speed (42-51 mph). Under congested conditions (41 mph and below), however, the volume of traffic moving through a given freeway segment can be as low as 700 vehicles per lane per hour. For more information on the concept of maximum throughput and why WSDOT uses it as a basis for measuring congestion please see the gray box to the right.

WSDOT uses highest observed optimal flow rate used to determine lost throughput productivity

In past editions of the *Gray Notebook* lost throughput productivity was determined based on the ideal maximum throughput capacity of 2000 vplph. However, not all lanes can achieve a maximum throughput of 2,000 vplph because highway capacity varies depending on prevailing roadway design and traffic conditions. For this reason, the congestion annual update uses the highest average five minute flow rate recorded for 2005 and 2007 as the basis for measuring lost throughput productivity. By using the highest observed optimal flow rate as the maximum throughput standard for each monitoring location, the lost throughput analysis can more accurately determine the loss in throughput productivity owed to increases in congestion between 2005 and 2007.

Lost vehicle throughput productivity: example

Based on the highest average five minute flow rates observed on I-5 at I-90, MP 164, for both directions of traffic in 2005 and 2007



Major Puget Sound freeways continue to see decreased throughput productivity during peak periods

The graphs on the following page compare observed average flow rates to the observed highest average five minute flow rate to show the loss in vehicle throughput productivity for each monitoring location. All evaluated locations show marginal decreases in vehicle throughput from 2005 to 2007.

I-405 at SR 169 in Renton continues to experience the greatest loss in throughput productivity, whereby congested conditions result in an approximate 50% reduction in vehicle throughput during the morning peak period. On I-405 in Kirkland increases in lost throughput productivity seen in 2007, particularly during the evening peak period, is likely due to construction activity in the area.

Maximum throughput as a basis for congestion measurement

From the perspective of operating the highway system as efficiently as possible, speeds at which the most vehicles can move through a highway segment (maximum throughput) is the most meaningful basis of measurement for WSDOT's management needs. It is logical for WSDOT to aim towards providing and maintaining a system that yields the most productivity (or efficiency) versus providing a free flowing system where not as many vehicles are passing through a segment during peak travel periods.

Maximum throughput is achieved when vehicles travel at speeds between 42-51 mph (roughly 70% and 85% of posted speeds). At maximum throughput speeds, highways are operating at peak efficiency because more vehicles are passing through the segment than there would be at posted speeds. This happens because drivers at maximum throughput speeds can safely travel with a shorter following distance between vehicles than they can at posted speeds.

Maximum throughput speeds vary from one highway segment to the next depending on prevailing roadway design and traffic conditions, such as lane width, slope, shoulder width, pavement conditions, traffic compositions, conflicting traffic movements, heavy truck traffic, presence or lack of median barriers, etc. It should also be noted that maximum throughput speed is not static and can change over time as conditions change. Ideally, maximum throughput speeds for each highway segment should be determined through comprehensive traffic studies and validated based on field surveys. For surface arterials, maximum throughput speeds are difficult to predict due to the fact that they are heavily influenced by conflicting traffic movements at intersections.

WSDOT uses the maximum throughput standard as a basis for measurement to assess travel delay relative to a highway's most efficient condition at optimal flow speeds (approximately 51 mph). For more information on changes in travel delay performance please see pp. 40-41.

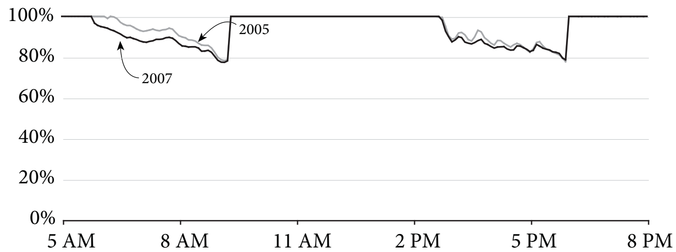
Throughput Productivity

Lost throughput productivity at selected central Puget Sound freeway locations

Based on highest observed five minute flow rates, 2005 vs. 2007

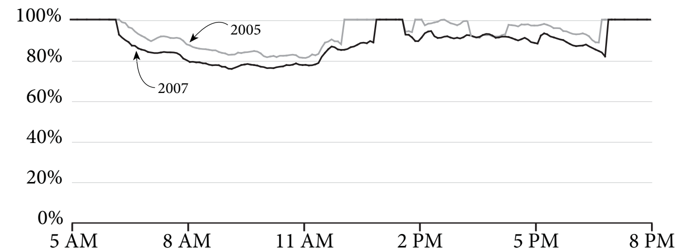
I-5 at S 188th Street, near Sea-Tac (MP 153.0)

Based on A.M. northbound 1,950 vplph and P.M. southbound 1,650 vplph



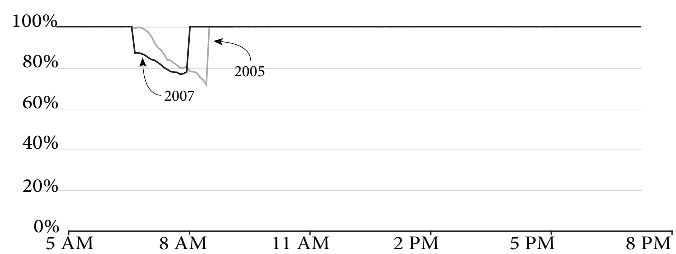
I-5 at I-90 (MP 164.0)

Based on A.M. northbound 1,730 vplph and P.M. southbound 1,500 vplph



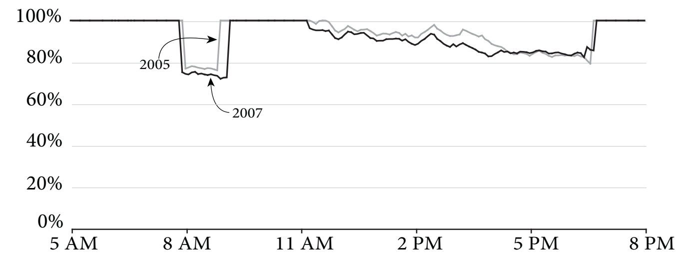
I-90 at SR 900, in Issaquah (MP 16.5)

Based on A.M. westbound 1,600 vplph and P.M. eastbound 1,660 vplph



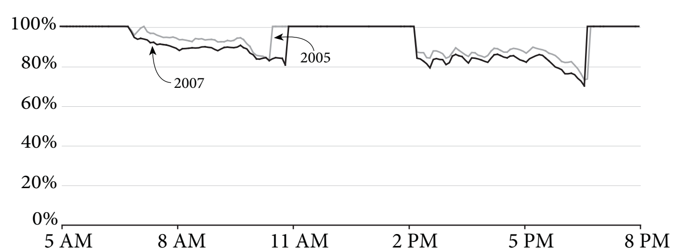
I-5 at NE 103rd Street, near Northgate (MP 172.0)

Based on A.M. southbound 1,560 vplph and P.M. northbound 1,620 vplph



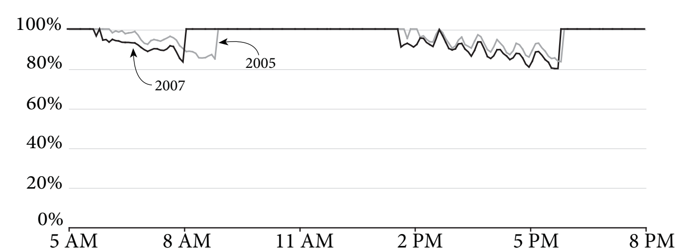
SR 520 at Evergreen Point Floating Bridge (MP 1.5)

Based on A.M. westbound 1,800 vplph and P.M. eastbound 1,800 vplph



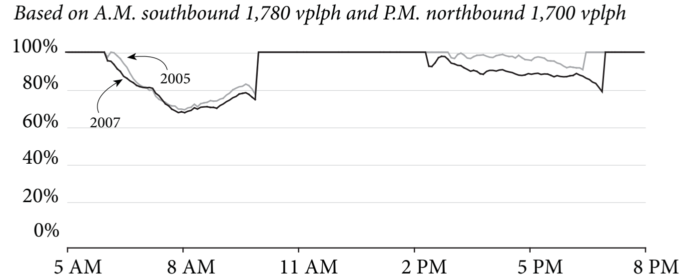
SR 167 at 84th Avenue SE (MP 21.5)

Based on A.M. northbound 1,600 vplph and P.M. southbound 1,600 vplph



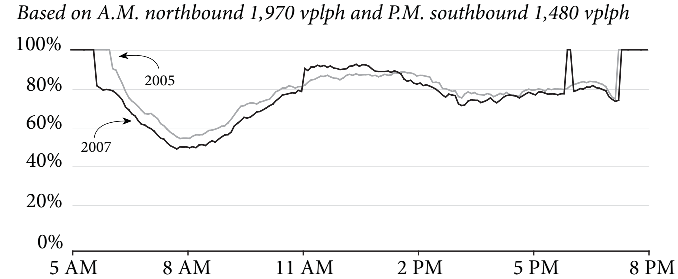
I-405 at NE 160th Street, in Kirkland (MP 22.5)

Based on A.M. southbound 1,780 vplph and P.M. northbound 1,700 vplph



I-405 at SR 169, in Renton (MP 4.0)

Based on A.M. northbound 1,970 vplph and P.M. southbound 1,480 vplph



Measuring Delay and Congestion Annual Update – 2007 Data

Measuring Travel Delay: Statewide

Drivers experience delay when congestion occurs. Simply put, delay is the extra period of time it takes a driver to get to her or his destination of choice. Delay is typically calculated as the difference between actual travel times and posted speed travel times. WSDOT uses the maximum throughput standard as a basis for measurement to assess delay relative to a highway's most efficient condition at optimal flow speeds. For the purpose of this analysis, delay is estimated based on both standards: relative to the posted speed limit and relative to maximum throughput speed. For both standards, WSDOT measures the sum of vehicle delay (in hours) across an average twenty-four hour day as one of the most basic measures for assessing congestion. The measure is used to demonstrate the extent, severity, and duration of congestion.

Statewide delay increases marginally between 2005-2007

Overall, there has been a slight increase in the amount of delay on state highways between 2005 and 2007. Statewide delay, relative to maximum throughput speeds and posted speeds, increased by 3% and 4% respectively. The increase relative to maximum throughput speeds indicate that many congested highways across the state became slightly more congested between 2005 to 2007.

Relative to optimal flow speeds, statewide delay cost drivers and businesses $617 million in 2007

In 2007, delay, relative to maximum throughput speeds, cost Washington businesses and drivers roughly $617 million—$13 million more than in 2005 ($604 million).

Relative to posted speeds, delay cost drivers and businesses $1,096 million in 2007, an increase of $42 million compared to 2005 ($1,054 million).

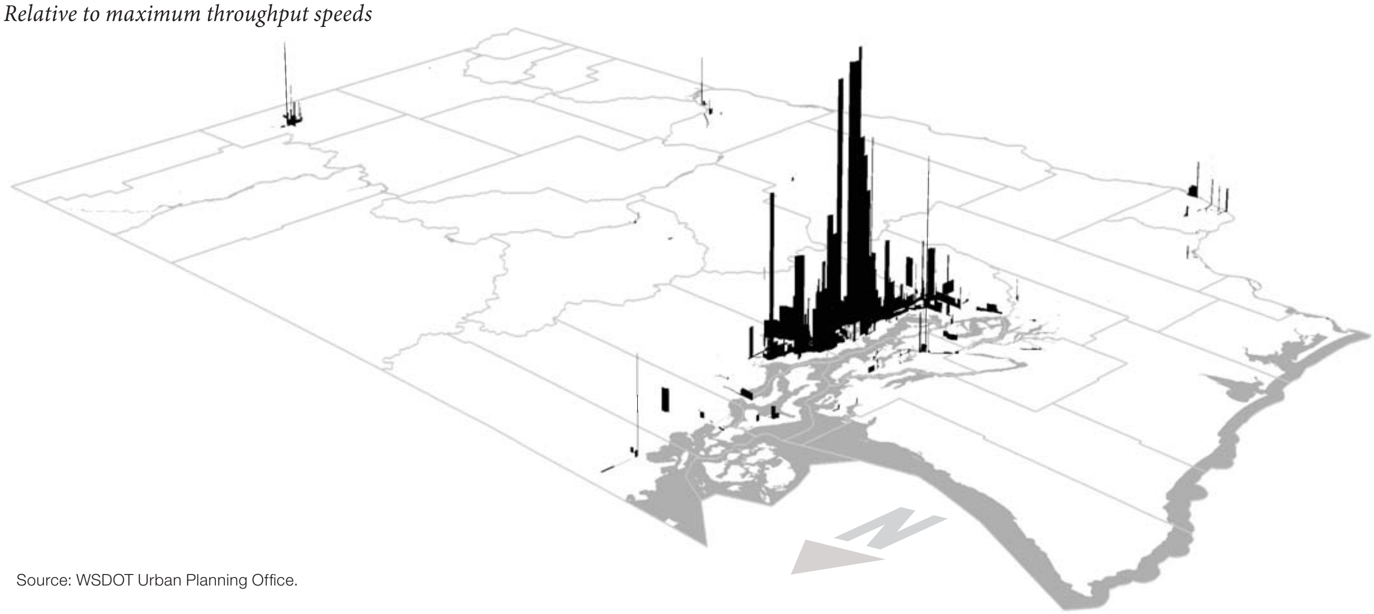
The cost of delay is calculated by applying monetary values to the estimated hours of delay incurred in passenger and truck travel plus additional vehicle operating costs. The value of time for passenger

All state highways: average weekday delay comparison (daily and annual) and estimated cost of delay on state highways (annual), 2005 and 2007

	Daily average vehicle hours of delay (weekdays)			**Total annual weekday vehicle hours of delay** (in thousands)			**Annual cost of delay on state highways** (in millions of 2007 dollars)		
Actual travel compared to	**2005**	**2007**	**%Δ**	**2005**	**2007**	**%Δ**	**2005**	**2007**	**%Δ**
Maximum throughput speeds (Approx. 51 mph)	99,400	101,960	+2.6%	24,847	25,490	+2.6%	$604	$617	+2.2%
Posted Speeds (60 mph)	173,800	181,020	+4.2%	43,450	45,255	+4.2%	$1,054	$1,096	+4.0%

Data Source: WSDOT Urban Planning Office.

Daily vehicle hours of delay per mile in Washington State
Relative to maximum throughput speeds



Source: WSDOT Urban Planning Office.

Measuring Travel Delay: Puget Sound

trips was assumed to be half of the average wage rate. Prior to the September 30, 2007 *Gray Notebook*, cost of delay was calculated by applying values to the estimated hours of delay incurred in passenger and truck travel plus additional vehicle operating costs; and the value of time for passenger trips was assumed to be half of the average wage rate.

Congestion, or delay, imposes costs for the lost time of travelers, higher vehicle operating costs from such things as wasted fuel, and other effects of stop and go driving. Truckers and shippers and their customers also bear large costs from traffic delay. It is generally recognized that delay has a variety of direct and indirect impacts, including:

- Increased travel time for personal travel.
- Increased travel time for business travel.
- Increased vehicle operating expense.
- Direct shipper/recipient productivity lost.
- Indirect (downstream) productivity lost.
- Local income/economy suffered from lost opportunities to attract new businesses.
- Increased vehicle emissions due to stop and go conditions.

Only the first three items were included in this year's delay estimates.

Increases in delay on major central Puget Sound corridors begin levelling off

There was a slight increase in the overall daily vehicle hours of delay on the major freeway corridors in the central Puget Sound region between 2005 and 2007. During this time period, vehicle hours of delay relative to the posted speeds (60 mph) and maximum throughput speeds increased by approximately 8% and 12% respectively. The increase in delay between 2005 and 2007 was much less severe than the increase experienced between 2004 and 2006. As was reported in last year's annual congestion report, comparing 2004 and 2006, overall delay on the central Puget Sound freeways increased by nearly 35% relative to maximum throughput speeds and by 20% relative to the posted speed limits.

Individual corridors experienced increases in delay ranging from 6% to 13% relative to posted speeds, and between 3% and 28% relative to maximum throughput speeds. Relative to posted speeds, I-90 saw the largest increase in delay at 12.6% between 2005 and 2007. Relative to maximum throughput speeds, SR 167 saw the largest increase in delay during this same time period at 28%. Because the lengths and widths of these corridors are different, it is not meaningful to compare and rank the corridors. The higher percentage increase relative to the maximum free flow speed indicates some of the most congested freeway sections became worse between 2005 and 2007.

Overall, VMT drops slightly in the central Puget Sound

Vehicle miles traveled (VMT) between 2005 and 2007 has dropped slightly overall in the central Puget Sound. This is a continuing trend seen in the prior two annual congestion reports. Increased travel demand associated with population and job growth from 2005 to 2007 may have been offset by rising gas prices that had the effect of dampening travel demand. The slight increase in travel delay in the absence of obvious VMT increases perhaps can be explained by the impacts from increased construction activities during the time period.

Central Puget Sound freeways: average weekday delay comparison, 2005 and 2007

		Vehicle hours of delay per day						Vehicle miles travelled[1] (in thousands)		
		Relative to posted speed limit (60 mph)			Relative to maximum throughput speed (approx. 51 mph)					
State Route	Lane Miles	2005	2007	% Δ 2005 vs. 2007	2005	2007	% Δ 2005 vs. 2007	2005	2007	% Δ 2005 vs. 2007
I-5	369	18,752	19,802	+5.6%	9,478	10,284	+8.5%	7,524	7,385	-1.8%
I-90	95	2,156	2,427	+12.6%	795	817	+2.8%	1,686	1,759	+4.4%
SR 167	41	2,660	2,916	+9.6%	957	1,223	+27.8%	997	970	-2.7%
I-405	152	13,108	14,421	+10.0%	7,753	8,841	+14.0%	3,640	3,605	-1.0%
SR 520	52	3,020	3,340	+10.6%	1,808	2,020	+11.7%	1,008	1,028	+1.9%
Total	**709**	**39,696**	**42,905**	**+8.1%**	**20,791**	**23,184**	**+11.5%**	**14,856**	**14,749**	**-0.7%**

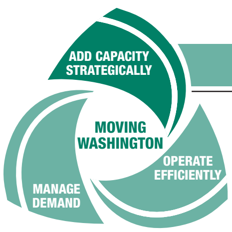
Source: WSDOT Urban Planning Office.

Note: Because both the lengths and widths of these corridors are different, it is not possible to use the delay numbers to rank the corridors.

[1] VMT for delay was calculated differently than the VMT in the travel time analysis on pp. 18-31: VMT for delay looks at daily VMT, while the travel time analysis looks at peak period VMT; the delay article examines individual corridors while the travel time analysis examines commutes which can include multiple corridors; and the delay article examines VMT for all weekdays, while the travel time analysis looks at VMT for Tuesday-Thursday.

What WSDOT is doing to fight congestion: Add Capacity Strategically

WSDOT's program for addressing congestion is *Moving Washington*—a three part strategy comprised of adding highway capacity strategically, operating the system more efficiently, and managing demand. WSDOT performs before and after studies to assess the effectiveness of *Moving Washington* projects and strategies in reducing congestion and to report their impacts to the public. In April 2008, Governor Gregoire challenged WSDOT to broaden its reporting of Nickel and TPA project outcomes important to Washington citizens, specifically, measuring the results from the driver's perspective for each completed project. This includes measuring congestion benefits.



Moving Washington

Add Capacity Strategically

As our state continues to grow, it is necessary to develop additional traffic capacity. To get the most from limited resources, WSDOT plans projects wisely by targeting the worst traffic-flow chokepoints and bottlenecks in our system. The following project examples show that this strategy is working to ease congestion.

Delivering congestion relief on state highways: Benefits of the 2003 and 2005 funding packages

Highway mobility projects funded by the 2003 and 2005 transportation funding packages include 116 projects statewide valued at over $10 billion, of which 35 have been completed. In the central Puget Sound alone, WSDOT has delivered 22 congestion relief projects valued at over $1 billion as of 9/30/2008. However, much more work remains to be done:

- 19 projects worth $1.4 billion are currently under construction.
- 14 projects worth $1.5 billion will be advertised by this same time next year.

These projects are having an impact: a study of 21 completed Nickel and TPA projects statewide save over 6,400 hours in combined travel times per day – a 10% improvement after construction was completed. These 21 projects, shown in the graph on the next page, do not include all completed mobility projects, but are limited to those with the data needed to perform the analysis. Highlights include the following projects:

I-405/SR 520 to SR 522 - Widening (King Co.)

This $82 million project, the first of the multi-stage Kirkland Nickel project, was completed in October 2007. This project added northbound lane from NE 70th Street to NE 124th Street and a southbound from SR 522 to SR 520.

Result: Based on travel speeds before and after the project was completed, drivers' speed have increased by 16%, from 37 mph to 43 mph.

SR 161/Jovita Blvd to S 360th St, Stage 2 (King Co.)

This project widened SR 161 to five lanes through the commercial area between Milton and Military Road in Federal Way, and to four lanes in residential areas in order to reduce congestion and accidents. This $26 million project was completed in July 2006.

Result: Speeds improved 133% from 15 mph before construction, to 35 mph. The project saves drivers an estimated 625 vehicle hours per day in travel times, a 34% improvement.

SR 24/I-82 to Keys Rd - Add Lanes (Yakima Co.)

This $50 million project was completed in June 2007, and added a lane to SR 24 (from I-82 to Riverside Road), reconstructed the SR 24/Nob Hill Boulevard interchange, and built a new, wider bridge over I-82 and the Yakima River.

Result: Drivers' travel speeds have improved 22% from 35 mph to 45 mph.

I-5/Salmon Creek to I-205 - Widening (Clark Co.)

This $44 million project, completed in October 2006, widened two miles of I-5 in Clark County to six through lanes, plus an extra lane in each direction between interchanges. In addition, the NE 129th Street overpass and the Salmon Creek/NE 117th Street bridges were replaced with structures that meet current design, safety and seismic standards. This project was one of several aimed at improving traffic flow in the I-5 corridor between the Main Street interchange in Vancouver and the I-205 junction.

Result: Speeds have improved 19% from 42 mph to 50 mph.

SR 9/SR 522 to 228th St SE, Stages 1a and 1b - Add Lanes (Snohomish Co.)

To improve safety and reduce congestion and the number and severity of accidents, this $25 million project widened SR 9 to four or five lanes from SR 522 to 228th Street SE, widened the westbound on-ramp to SR 522 to two lanes, and installed one new traffic signal and upgraded two existing signals.

Result: The project was completed in November 2007, and improved drivers' speed from 18 mph to 40 mph – a 122% increase.

I-90/Argonne Rd to Pines Rd and I-90/Pines Rd to Sullivan Rd – Add Lanes (Spokane Co.)

These projects added an additional lane in each direction of I-90 between Pines Road and Sullivan Road to reduce congestion on this major freight route.

Result: These two projects, worth $33.7 million, were delivered in November 2005. Upon completion, they improved travelers' speeds by 22% and travel times by 11%.

What WSDOT is doing to fight congestion: Add Capacity Strategically

Before and After analysis of 21 selected Nickel and TPA congestion relief projects statewide

Dollars in thousands.		Estimated minimum speed (MPH)			Vehicle hours per day		
	Cost	Before	After	% Δ	Before	After	% Δ
SR 240/I-182 to Richland Y - Add lanes (Benton Co.)	$22,616	30	38	27%	2,114	1,888	-11%
SR 240/Richland Y to Columbia Center I/C - Add lanes (Benton Co.)	$43,159	42	50	19%	1,105	1,012	-8%
I-5/Salmon Creek to I-205 - Widening (Clark Co.)	$43,951	42	50	19%	2,817	2,502	-11%
SR 17/Pioneer Way to Stratford Rd - Widen to four lanes (Grant Co.)	$21,025	43	47	11%	810	736	-9%
I-5/NE 175th St to NE 205th St - Add northbound lane (King Co.)	$8,733	35	35	0%	2,219	2,037	-8%
SR 161/Jovita Blvd to S 360th St, Stage 2 - Widen to five lanes (King Co.)	$26,159	15	35	133%	1,819	1,194	-34%
I-405/SR 520 to SR 522 - Widening (King Co.)	$81,762	37	43	16%	34,862	32,081	-8%
I-90/Highline Canal to Elk Heights (Kittitas Co.)	$4,961	51	52	2%	918	891	-3%
I-90/Ryegrass Summit to Vantage (Kittitas Co.)	$9,615	55	56	1%	2,672	2,623	-2%
SR 161/204th St to 176th St - Widen roadway (Pierce Co.)	$15,264	30	42	40%	1,593	1,274	-20%
SR 161/234th St to 204th St E - Add lanes (Pierce Co.)	$15,634	36	44	24%	962	831	-14%
SR 9/SR 522 to 228th St SE, Stages 1a and 1b - Add lanes (Snohomish Co.)	$24,471	18	40	122%	649	478	-26%
SR 9/228th St SE to 212th St SE (SR 524), Stage 2 - Add lanes (Snohomish Co.)	$31,319	28	41	46%	577	470	-19%
SR 527/132nd St SE to 112th St SE - Add lanes (Snohomish Co.)	$20,528	43	45	5%	592	575	-3%
I-90/Pines Rd to Sullivan Rd - Add lanes (Spokane Co.)	$15,821	38	46	22%	3,731	3,326	-11%
I-90/Argonne Rd to Pines Rd - Add lanes (Spokane Co.)	$17,844	38	46	22%	3,090	2,752	-11%
US 12/SR 124 to McNary Pool - Add lanes (Walla Walla Co.)	$12,091	47	55	18%	915	809	-12%
US 12/Attalia Vicinity - Add lanes (Walla Walla Co.)	$16,200	53	57	9%	250	236	-6%
SR 270/Pullman to Idaho State Line - Add lanes (Whitman Co.)	$31,188	39	53	37%	1,778	1,522	-14%
SR 24/I-82 to Keys Rd - Add lanes (Yakima Co.)	$50,233	37	45	22%	710	498	-30%
SR 543/I-5 to Canadian Border - Add lanes (Whatcom Co.)	$50,806	39	46	18%	154	139	-10%
Total					**64,336**	**57,874**	**-10%**

*Dollars in thousands

Note: Volume information is based on traffic counts and speed information is based on modelled data. These 21 projects are those completed mobility projects with the necessary data to support a Before and After analysis. WSDOT received funding to purchase additional equipment to perform a greater number of and more precise Before and After studies in the future, and began actively collecting data this summer.

What WSDOT is doing to fight congestion: Add Capacity Strategically

I-5 – Everett, SR 526 to US 2 HOV lanes

I-5 in Everett between SR 526 and US 2 was a major traffic chokepoint, prone to rear-end collisions when the highway and ramps backed-up. To relieve congestion and improve safety, WSDOT extended the northbound and southbound HOV lanes, modified the I-5/41st Street interchange, added an auxiliary lane, and built a direct access ramp.

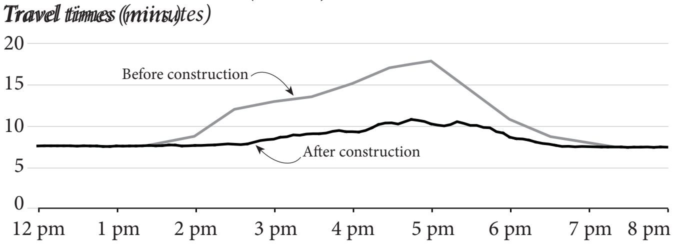
In the northbound direction, six miles of high occupancy vehicle (HOV) lane was constructed from near Highway 526 to US 2. Over four miles of HOV lane were added in the southbound direction from Marine View Dr. to near Highway 526. These HOV lanes were completed in June 2008. A general purpose lane was added in each direction from 41st Street to US 2.

The interchange at 41st Street was redesigned as a “single point urban interchange” (SPUI), where through traffic and freeway on and off-ramp traffic is controlled by a single signal. Embedded traffic loops/sensors and seventeen new traffic cameras were installed. Nine ramp meters were added to new and existing ramps in the area to further improve traffic flow.

The previous left-side ramps at Broadway Ave. were modified to an HOV direct access interchange and were opened to traffic in June 2008. The direct access ramps connect the new HOV lanes directly with Broadway, thus reducing the need to weave though three lanes of traffic. More than 2,500 HOVs use the ramps each day, including five transit routes.

Southbound traffic during the morning peak saw an increase of average speed from 25 mph to free flow speeds in the two mile stretch north of 41st Street. General purpose travel times improved by 2-4 minutes heading southbound in the morning commute. During the evening peak, northbound general purpose traffic has seen benefits of 5-9 minutes through the eight mile stretch of I-5 between 128th St. and Marine View Drive. The graph below shows northbound general purpose travel times before and after construction through the evening hours.

I-5 in Everett: Northbound travel times
128th St. to Marine Drive (8 miles)
Travel times (minutes)



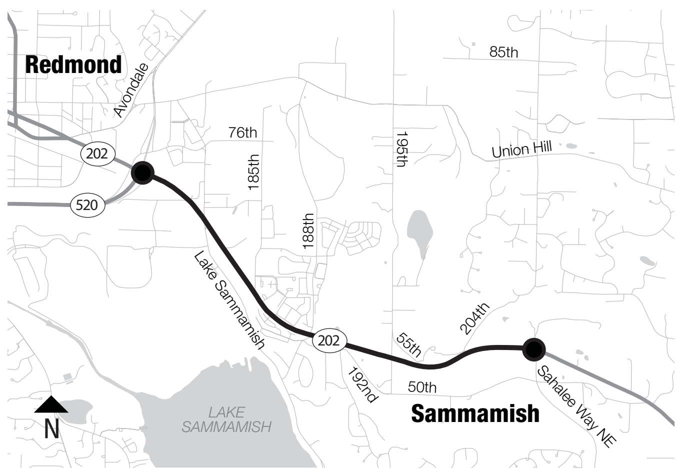
Data Source: WSDOT Northwest Region Traffic Office.

This project has provided a necessary increase in capacity on I-5, a reduction in traffic congestion, and is expected to improve safety by reducing congestion-induced rear-end collisions.

SR 202 – SR 520 to Sahalee Way widening

Commuters driving between downtown Redmond and the Sammamish Plateau via SR 202 have faced heavy congestion for more than a decade. One lane in each direction was not enough to accommodate the tens of thousands of vehicles that were using it each day. This project addressed the needs of this growing area by widening almost three miles of SR 202 from SR 520 to Sahalee Way NE, building a flyover ramp connecting westbound SR 202 to westbound SR 520 and coordinating signal timings along the corridor.

SR 202 project location



One lane was added in each direction to widen SR 202 from SR 520 to Sahalee Way NE. This doubled the capacity of the highway, resulting in saving drivers time and frustration. The westbound lanes carry nearly 500 more cars per hour than before the construction.

The flyover ramp connecting westbound SR 202 to westbound SR 520 avoids long queues at the left turn bay on-ramp signal by allowing drivers to directly access SR 520. The ramp eliminates the chokepoint on SR 202 and NE 76th St and reduces collisions caused by drivers running the red light through the intersection. An additional 500 vehicles per hour now enter onto westbound SR 520 from westbound SR 202, bringing the peak volume on the ramp to 2500 vph. The images on the following page show the intersection of SR 202 and SR 520 before and after construction of the flyover ramp.

What WSDOT is doing to fight congestion: Operate Efficiently

WSDOT and the city of Redmond coordinated efforts to synchronize all nine signals along the widened portion of SR 202. The results caused reduced travel times during peak congestion times from SR 520 to Sahalee Way NE and vice versa.

These combined projects have greatly improved congestion and safety along SR 202 between SR 520 and Sahalee Way. There have been observed benefits of up to 20 minutes of travel time savings during peak hours between downtown Redmond and the Sammamish Plateau.

Before: SR 202 at SR 520 was a major chokepoint prior to construction.

After: Drivers see benefits of up to 20 minutes of travel time savings during peak hours between downtown Redmond and the Sammamish Plateau.

Moving Washington

Operate Efficiently

Efficiency means taking steps to smooth traffic flow and avoid or reduce situations that constrict road capacity. Collisions account for at least 25% of traffic backups, so making our roads safer will go a long way toward easing congestion. Technology, such as driver information signs, enables WSDOT to react quickly to unforeseen traffic fluctuations. Among the tools that provide this efficiency are metered freeway on-ramps, incident response teams, variable speed-limit systems, variable tolling and integrated traffic signals.

SR 167 HOT Lanes

The state's first-ever high occupancy toll (HOT) lanes opened to SR 167 drivers on Saturday, May 3, 2008. This four-year pilot project, located in south King County, provides a new option for solo drivers on SR 167, while WSDOT can evaluate how effectively HOT lanes and variable tolling can improve traffic flow and ease congestion.

A single HOT lane runs in each direction of SR 167 for approximately nine miles between Renton and Auburn. The highway's two general purpose lanes in each direction remain toll-free and open to all vehicles.

Carpools of two or more people, vanpools, transit and motorcycles use HOT lanes toll-free as they do with standard HOV lanes, and they do not need a transponder. HOT lanes operate daily between 5 a.m. to 7 p.m.

Toll rates automatically increase and decrease with the level of congestion to ensure that traffic in the HOT lane always flows smoothly, so that buses and carpools enjoy the same fast and reliable trip they depended on in SR 167's HOV lanes before the lanes were converted to HOT lanes.

This summary includes data from the first three months of HOT lanes operations, May 3 through July 31, 2008.

- Drivers paid an average of $1 to save 10 minutes of travel-time during the peak-hour commutes.
- Travel times for carpools and transit have been maintained.
- There is room in the HOT lane for additional carpool vehicles, transit, or toll-paying solo drivers.
- Collisions did not measurably increase or decrease.
- The average number of peak-hour toll transactions has increased each month.

Measuring Delay and Congestion Annual Update

What WSDOT is doing to fight congestion: Operate Efficiently

The HOT lanes still have capacity for additional vehicles; just short of 1,000 total vehicles per hour are using each HOT lane during the peak hour. Because each lane has the capacity to move more than 1,400 vehicles per hour without becoming congested, roadway space exists for transit, carpool vehicles and toll-paying solo drivers.

SR 167 HOT Lanes average weekday performance by month

Tuesday -Thursday	May 2008	June 2008	July 2008
Average toll paid	$1.00	$1.25	$1.00
Highest toll paid	$5.75	$9.00	$9.00
Average number of daily toll trips	1,050	1,080	1,210
Highest number of daily toll trips	1,220	1,260	1,390
Daily northbound toll trips	580	590	680
Daily southbound toll trips	470	490	570
Average peak-hour toll trips	100	140	160

Source: WSDOT Northwest Region Traffic Office.

Travel time performance

WSDOT measured travel times in the three-month period for the HOT and general purpose lanes on SR 167. The HOT lanes do not run the full length of the corridor between Auburn and Renton, so HOT lanes travel times in this report were calculated using the lengths of the HOT lanes (11 miles Northbound, eight miles southbound) plus additional travel in the general purpose lanes. This analysis shows that average travel times between the two cities in using the HOT lanes in about 40% faster than in the general purpose lanes only; 95% reliable travel times are 45%-57% faster.

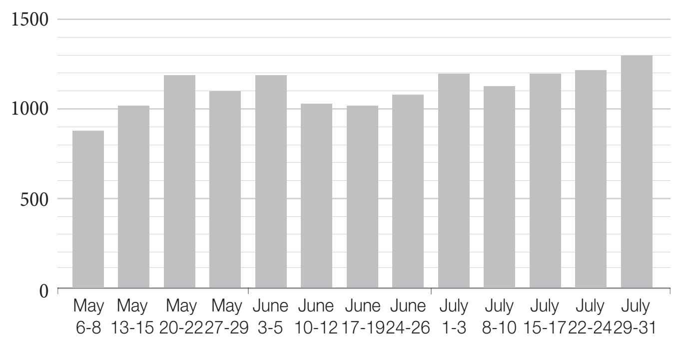
Corridor Performance

One anticipated benefit of HOT lanes was an increase in the overall efficiency of the SR 167 corridor. The HOT lanes have not been open long enough for definitive conclusions to be reached, and the contractor is currently evaluating corridor performance. Performance updates on the SR 167 HOT lanes pilot project will be reported in upcoming editions of the *Gray Notebook*. Some preliminary performance results include:

- During the morning peak-hour for the first three months of operation, northbound toll customers accounted for nearly four percent of the SR 167 traffic. Toll customers accounted for three percent of the afternoon peak-hour commuters.
- Transit and carpool vehicles continue to operate at free-flow speeds greater than 90% of the time.

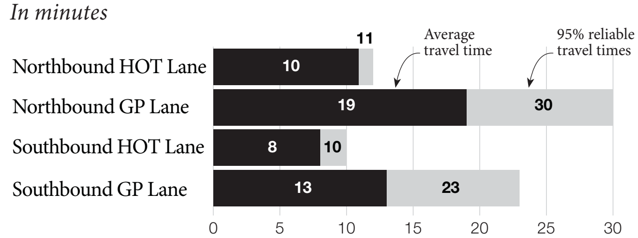
For more information about the SR 167 HOT Lanes pilot project, please see: http://www.wsdot.wa.gov/Projects/SR167/HOTLanes/VariableTolling.htm

SR 167 HOT lanes average daily tolled trips
May-July, 2008



Source: WSDOT Northwest Region Traffic Office

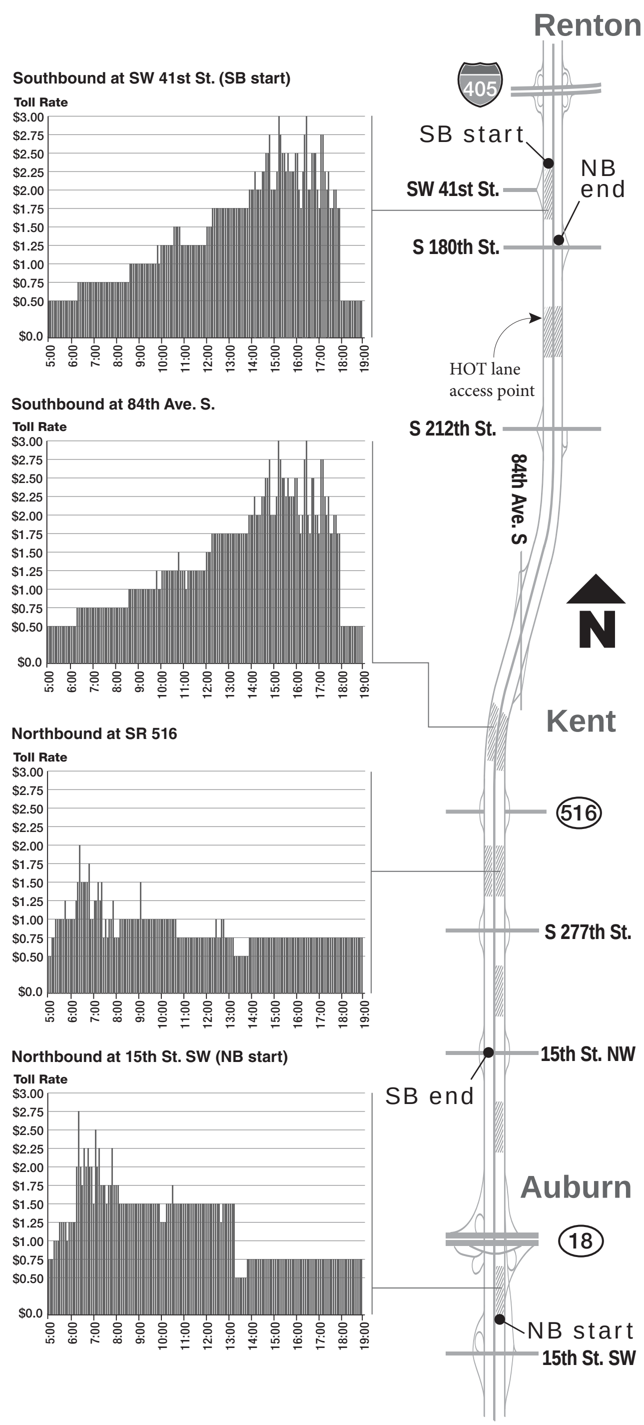
SR 167 travel times: HOT lanes vs. GP lanes
Average and reliable peak hour travel times for May 2008 - July 2008
In minutes



NB travel times were calculated from SR 18 (MP 14.31) to S. 34th St. (MP 25.07)
SB travel times were calculated from S. 34th St. (MP 25.07) to 43rd St. NW (MP 17.38)
Peak hour used: 7:00 - 8:00 am for NB and 4:00 - 5:00 pm for SB
Data used: May - July 2008, Monday - Friday
Data Source: NW Region Traffic Operations.

What WSDOT is doing to fight congestion: Operate Efficiently

SR 167 HOT lanes: average daily toll rates at selected HOT lane access points



Source: WSDOT Northwest Region

SR 522 signal retiming

Signal coordination is a technique used to move vehicles through a series of signalized intersections in the shortest amount of time by timing the signals to work together so that vehicles make the least number of stops. The SR 522 corridor is an important route that carries an average of 60,000 vehicles per day and connects northeastern King County cities with Seattle. It is also an alternate route around Lake Washington opposed to crossing the SR 520 or I-90 bridges. The SR 522 corridor from NE 153rd St. to 83rd Pl. NE was analyzed and nine signals were retimed. The following graphs at the bottom of this page show the before and after trip times through the corridor.

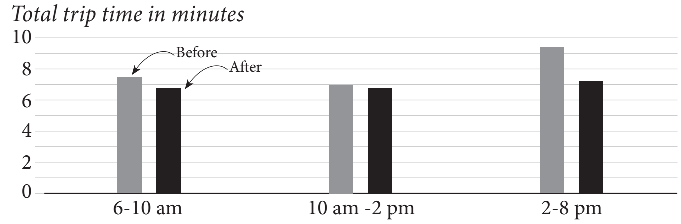
After retiming, peak period travel times generally decreased in both directions, with the exception of westbound morning traffic, when travel times increased 2.5 minutes between 7:00 am and 8:00 am. This increase, plus the fact that westbound morning travel times remained fairly constant at about 6.5 and 7 minutes, raised the average westbound trip time slightly, as shown in the graph.

During the morning peak in the eastbound direction, overall trip time decreased by an average of 30 seconds with the largest savings (up to 1.5 minutes) between 6:00 am and 7:00 am. The eastbound midday peak saw a 15 second decrease in trip time during the 10:00 am-2:00 pm period, and the westbound traffic saw an average decrease of 30 seconds. The eastbound afternoon peak saw the largest decrease in travel time overall with an average of over 2 minutes. From 4:00 pm-5:00 pm, trip time decreased by as much as 3.5 minutes. Westbound traffic during

SR 522 signal re-timing Before and After results

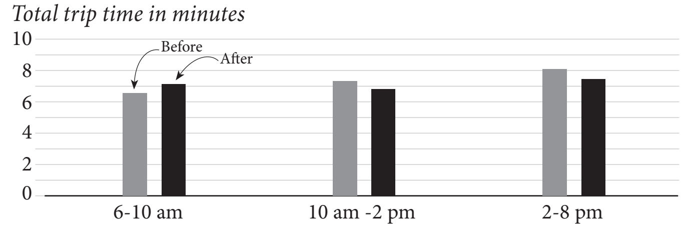
Eastbound SR 522 Before and After coordination trip time through nine intersections

Total trip time in minutes



Westbound SR 522 Before and After coordination trip time through nine intersections

Total trip time in minutes



Data Source: WSDOT Northwest Region Traffic Office.

What WSDOT is doing to fight congestion: Operate Efficiently

this time also saw a decrease in trip time on average of 1 minute, with up to 3 minutes of savings between 3:00 pm and 4:00 pm. Overall, updated signalization along SR 522 between NE 153rd St and 83rd Pl NE has decreased trip times through the corridor.

Direct access ramp performance update

HOV lane users save up to 8 minutes using direct access ramps

WSDOT has been building high occupancy vehicle (HOV) lane direct access ramps throughout the Puget Sound area for Sound Transit, with the first opening in the fall of 2004. The following analysis provides an update on how direct access ramps are performing, which was last reported in the September 30, 2006, *Gray Notebook*. Direct access ramps allow buses, carpools, and vanpools to directly access the HOV lanes from park and ride lots and local streets. Direct access ramps eliminate weaving across the general purpose lanes by carpools, vanpools, and buses. Direct access ramps improve safety, reduce congestion, save time, and increase reliability for both HOVs and general-purpose traffic.

Ten major HOV lane direct access ramps in the Puget Sound area have opened in the past few years. Ten more direct access ramps are planned. The map on the next page shows the locations of direct access ramp projects, completed and planned.

Preliminary performance evaluations have been completed for each of the complete direct access ramps. Substantial savings have been achieved allowing Sound Transit and Community Transit to adjust their transit schedules. Travel time savings at the Federal Way direct access ramps are not available because the opening of the new park and ride has rerouted buses, so current routes cannot be compared to routes before the construction of the direct access ramps. The table below shows the weekday volume of buses and total vehicles along with the travel time savings at each direct access ramp.

Direct access ramp volumes and travel time savings

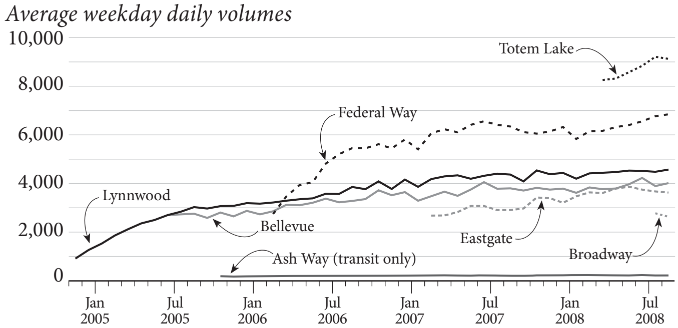
Location	Transit Daily Volume	Total Daily Volume	Time Savings
Lynnwood	212	4,570	4-8 minutes
Bellevue	334	4,020	1-2 minutes
Ash Way*	129	220	2-6 minutes
Federal Way	257	6,850	N/A
Eastgate	293	3,630	5-6 minutes
Totem Lake	303	9,130	2-6 minutes
Broadway	126	2,630	3-7 minutes

Source: WSDOT Northwest Region Traffic Office
*Transit only traffic.

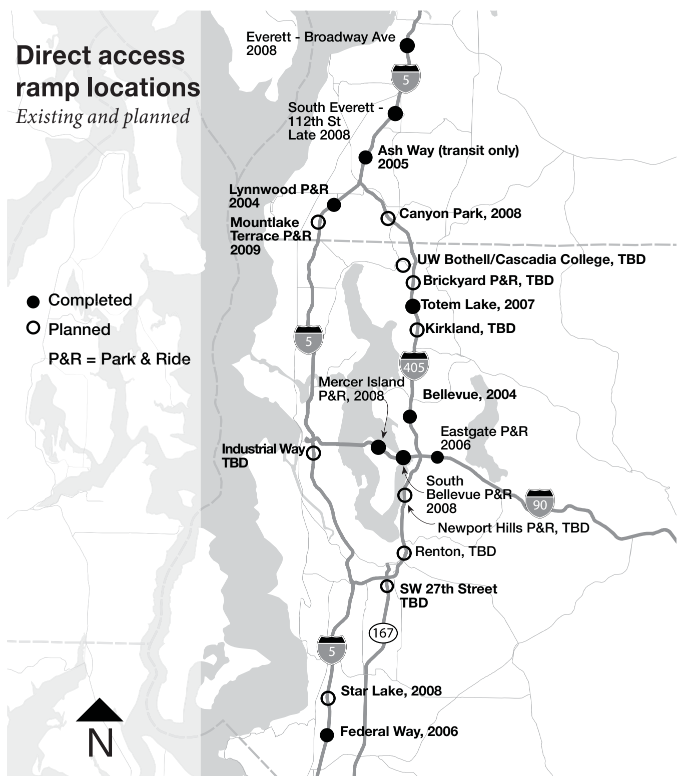
The graph below shows the steady and in some cases rapid growth of the direct access ramps upon their opening. Currently, the Lynnwood direct access ramps carry approximately 4,600 vehicles per day, Bellevue carries 4,000 vehicles, Federal Way carries 6,800 vehicles, Eastgate carries 3,800 vehicles and the Broadway ramps in Everett opened to about 2,600 vehicles per day. The Totem Lake ramps lead with carrying up to 9,000 vehicles per day, but there has been speculation of high numbers of HOV violation. The Ash Way ramps, which are restricted to transit vehicles, carry approximately 200 vehicles per day.

Direct access ramp volumes

Average weekday daily volumes



Data Source: Northwest Region Traffic Office.



What WSDOT is doing to fight congestion: Intelligent Transportation Systems

Intelligent Transportation Systems are a key component of Moving Washington

Operating our highways efficiently is one of the three *Moving Washington* strategies WSDOT uses to fight congestion. One element of operating efficiently is using Intelligent Transportation Systems (ITS)—a set of technology-based tools for smoothing traffic flows, managing situations such as collisions that constrict traffic, and providing information to the traveling public. ITS relies on a technology infrastructure that runs parallel to the state highway network. Key ITS elements include:

- ***Communications Backbone***–The backbone of ITS is a communication system composed of radio, microwave and fiber optics elements that touches most sections of the highway network. The backbone provides radio communications for those maintaining the roads and data transmission for those managing the roads. The data that is transmitted over the system comes from many ITS elements that are part of our overall traffic management efforts.
- ***Traffic cameras***–Closed-circuit television cameras across the state help WSDOT detect congestion and accidents and be constantly aware of traffic and road conditions. The camera images are shared with other agencies such as the Washington State Patrol, and sent to our traffic management centers and emergency responders for operations monitoring, to the web for travelers, and to the media.
- ***Variable message signs***–A variable message sign is an electronic traffic sign used on roadways to provide motorists with important information about traffic congestion, incidents, roadwork zones, travel times, special events, or speed limits on a specific highway segment. They may also recommend alternative routes, limit travel speed, warn of duration and location of problems, broadcast AMBER Alerts, or simply provide alerts or warnings.
- ***Highway advisory radios***–Highway advisory radios are licensed low-power AM radio stations installed along the roadway to provide alerts and general information regarding traffic and travel.
- ***Road and weather information systems***–These systems use specialized instruments installed along highways to detect weather and road surface condition observations. This information is used to guide decisions on maintenance strategies and to provide information to drivers.
- ***Ramp Meters***–Ramp meters are traffic signals on freeway on-ramps that control the flow of vehicles entering the freeway mainline. Metering rates are automatically adjusted based on prevailing freeway traffic conditions.
- ***Traffic Data Detectors***–These instruments track traffic flow on highways. The most common detector is the induction loop, a low-voltage wire coil buried in the roadway that creates an electrical pulse when a vehicle passes over it. Other, less common instruments use infrared, radar, sound, or video imaging to detect vehicles.
- ***Traffic Management Centers***–WSDOT operates seven regional traffic management centers—the nerve centers for WSDOT's operations activities. Real-time information is gathered 24 hours a day, 7 days a week from the ITS components above as well as the Washington State Patrol, road crews, incident response teams, and media traffic reporters. WSDOT uses this information to operate the highway system, coordinate responses to clear incidents, and notify the public and the media of these events.

Number of CCTVs, variable message signs, and traffic data stations increase

The overall number of closed-circuit television cameras (CCTVs) increased because many new cameras were added in the Seattle area, and, in some cases, existing devices that had not previously been recorded were added to the database.

WSDOT added 24 traffic detection devices, mostly on I-5 from the King County line to Tumwater. This information is now in the flow maps available on WSDOT's traffic website: http://www.wsdot.wa.gov/traffic. The number of variable message signs (VMS) increased from 165 to 181 because WSDOT added several VMSs in Olympia and I-90 in Seattle.

ITS elements inventory

As of October 2008, WSDOT owned elements and WSDOT maintained elements

Device Type	Number of Devices or Sites 2007[1]	2008	Approximate Cost per Device or Site
Closed Circuit Television Cameras	521	542	$15,000-$30,000
Variable Message Signs (VMSs)	179	181[3]	$100,000
Highway Advisory Radio Transmitters	70	72	$50,000
Road/Weather Information Systems	94	97	$25,000-$50,000
Metered Ramps	137	137	$10,000-$100,000
Traffic Data Stations	530	554	$10,000-$20,000
Traffic Management Centers (TMCs)[2]	8	8	N/A

Data Source: WSDOT Traffic Operations Office.

[1] Some local cities and counties pay WSDOT to maintain their CCTVs and VMSs. The 2007 numbers in last year's report included both WSDOT-owned and WSDOT-maintained elements. 2008 numbers reflect only WSDOT-owned elements.

[2] This includes one winter operations site at Snoqualmie Pass.

[3] Last year's number included 14 inactive signs. This year's number does not include inactive signs. These signs are not scheduled to be repaired and used again.

Measuring Delay and Congestion Annual Update

What WSDOT is doing to fight congestion: Intelligent Transportation Systems

Planning for the future of ITS in Washington

WSDOT's current and future initiatives to expand and improve ITS are described in its 2009-15 Strategic Plan: Business Directions, available on WSDOT's website at http://www.wsdot.wa.gov/Accountability/PerformanceReporting/StrategicPlan.htm.

WSDOT prepares new ITS plan

WSDOT's statewide ITS plan identifies the near- and long-term ITS improvements necessary to meet the objectives and strategies identified in WSDOT's 2009-2015 Strategic Plan and in the congestion-fighting program Moving Washington.

Several key improvements have been identified. The plan calls for expanding ITS communication capabilities for delivering real-time information to the traveling public. It also recommends installing new ITS field devices and adding incident response vehicles in areas without current coverage, and the replacement of aging devices that are becoming obsolete. Meanwhile, upgrading the two Traffic Management Centers in the Seattle and Tacoma areas will help in managing traffic demands. Finally, the plan recommends implementing Active Traffic Management techniques such as those discussed in the September 30, 2007 *Gray Notebook* (p. 82), including the variable speed limits described on this page. The plan is currently in draft form and will be published soon.

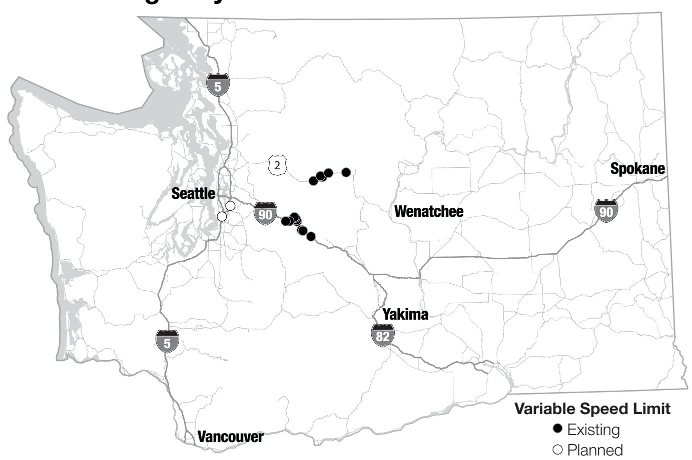
ITS supports Active Traffic Management

Active Traffic Management (ATM) expands the use of ITS technology to dynamically manage traffic based on the prevailing conditions. WSDOT is studying ways to use ATM to improve traffic flow and is testing new techniques to manage traffic on the region's busiest routes.

WSDOT is currently using several ATM tools on Washington highways including Variable Speed Limits, Lane Control, and Queue Warning. These signs are intended to slow quickly-moving vehicles when the system has registered the presence of traffic back-ups ahead. This helps prevent collisions that result from drivers running into the back of a queue of vehicles. By reducing collisions, they also improve traffic flow and travel time reliability.

Variable Speed Limit signs are already in use on Stevens and Snoqualmie Pass, and soon Variable Speed Limit, Lane Control, and Queue Warning signs will be in place on SR520 and I-90 as part of the Urban Partnership Agreement, and on I-5 to help mitigate traffic congestion during the replacement of the aging Alaskan Way Viaduct. Based on similar ATM practices already in use in Europe, WSDOT believes that by implementing the variable speed limits and lane control, there will be a drop in collisions by up to 30% which in turn will improve travel flow by 10%.

Locations of variable speed limit signs on WSDOT highways



Data source: WSDOT Traffic Operations

Lake Washington Urban Partnership Agreement

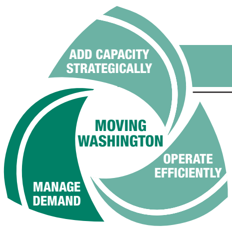
The Lake Washington Urban Partnership is a cooperative agreement among the federal government, WSDOT, King County and the Puget Sound Regional Council to employ innovative traffic management tools for improving traffic flow along State Route 520 and Interstate 90 between Seattle and the Eastside. The four strategies are:

- Transit: Additional transit service and improved peak period frequency including new bus rapid transit facilities and park-and-ride improvements.
- Telecommuting: Emphasized telecommute and travel demand reduction programs with major employers already committed to these strategies.
- Tolling: Electronic tolling on SR520, if approved by the Legislature, will help finance the new bridge and improve throughput, reliability and speed for cars and transit.
- Technology: Technologies, such as Active Traffic Management tools, will improve system efficiency and optimize traffic performance on the SR520 and I-90 corridors by reducing collisions.

U.S./Canada border crossing

In preparation for the 2010 Winter Olympics in Vancouver, B.C., Canada, WSDOT and British Columbia's Ministry of Transportation are now providing real-time border crossing wait times on the web. The website opened earlier this year and can be viewed here: www.wsdot.wa.gov/traffic/border/

What WSDOT is doing to fight congestion: Manage Demand



Moving Washington

Manage Demand

We can make the best use of our highway capacity if we better distribute the demand we place on our most congested bridges and highways. That means offering commuters more choices, such as convenient bus service, incentives to carpool or vanpool, and promoting workplace environments more conducive to telecommuting. Managing demand strategies encourage drivers to use less congested routes and times to travel by displaying real-time traffic information on the Internet and electronic road signs.

Growth and transportation efficiency centers

Expanding trip reduction in urban centers

WSDOT is collaborating with local governments, transit agencies, and businesses to help reduce drive-alone trips and vehicles miles traveled (VMT) in growing urban centers. The new Growth and Transportation Efficiency Center (GTEC) program, which is part of the CTR law, works with businesses to encourage employees to ride the bus, vanpool, carpool, walk, bike, work from home, and use other commute options besides driving alone.

While the existing statewide CTR program focuses on commuters traveling to major employers, GTECs promote the same types of comprehensive commute options programs with an emphasis on smaller employers, residents and students. By working with small businesses, neighborhoods and schools, the program is providing services and incentives to more than 235,000 commuters around the state who are not currently part of a regional CTR program. The goal of the program is to reduce more than 14,000 trips by 2011 that would otherwise be traveling on some of the state's most congested highways. Achieving this goal will mean a reduction of nearly 95 million annual VMT.

The GTEC program is one of WSDOT's *Moving Washington* strategies for reducing traffic congestion by managing demand. Offering more choices to commuters will make the best use of highway capacity by better distributing the demands placed on our roadways. The program will also help communities meet their local goals for growth and economic development, reduce their carbon footprint, improve air quality and public health.

Statewide implementation

Fourteen cities from around the state developed GTEC plans and applied for funding from the Governor's Commute Trip Reduction Board in 2007. The board selected seven GTECs for funding, using the $2.4 million one-time allocation provided in the 2007-2009 Legislative transportation budget. The seven funded GTECs are located in downtown areas throughout the state. These programs are reaching out to small businesses, and providing them with the services and information to help support their employees as they shift to alternative commute modes.

GTEC locations statewide

Source: WSDOT Public Transportation Division

Program strategies

The GTECs provide benefits for the state highway system while supporting local goals and policies to direct growth and economic development into their urban centers. These GTECs are implementing a number of strategies that: provide trip reduction incentives for commuters; ensure investment for increased transit services to meet employer needs; and align local jurisdiction policies to address transportation and land use goals.

Measurement

Like the CTR program, WSDOT will rely on commuter surveys to track progress toward trip reduction and VMT reduction goals in each GTEC. In summer and fall 2008, each of the seven funded GTECs and the three voluntary GTECs distributed surveys and collected baseline data about travelers within the area GTEC. WSDOT will analyze the baseline data from the surveys and will use it as a benchmark to determine future performance of the program in reducing drive-alone trips and VMT.

Next steps

WSDOT will deliver a report on the initial program deployment and recommendations on future funding levels to the legislature by January 2009. The report will include progress reports from the seven programs as well as pertinent baseline data. The initial experience of the program indicates a need for greater levels of technical support and data collection, as well as implementing regional parking management, multimodal concurrency, and the inclusion of GTECs in state, regional, and local funding priorities.

Measuring Delay and Congestion: Moving Washington

WSDOT's balanced strategies to fight congestion

Washington depends on mobility

Effective transportation is critical to maintaining our economy, environment and quality of life. *Moving Washington* is the WSDOT's vision of investments and priorities for the next 10 years. It integrates new capacity, efficiencies, and commute options to address congestion head-on and improve the performance of our state's transportation system. The program's primary objective is mobility, one of the state Legislature's five transportation priorities along with preserving our transportation infrastructure, making the system safe for all, protecting the environment, and practicing sound stewardship.

The transportation improvements outlined here are necessary for us to continue to enjoy all that our state has to offer. From the coastal rain forests of the Olympic Peninsula to the river gorges in the south and east, Washington State is rich with landscapes and a diverse economy. We depend on a reliable trip to work, and we want to spend time with our families when our work is done. Businesses from agriculture and manufacturing to retail and tourism rely on our transportation system. More information on *Moving Washington* can be found at: http://www.wsdot.wa.gov/movingwashington/

Washington drivers are already seeing benefits

The *Moving Washington* 10-year transportation program will improve current traffic conditions and prepare our system for heightened demands in the future. The program includes specific actions that can achieve tangible early results. WSDOT has already started to realize results from the program's strategies with the completion of numerous highway construction projects. Examples of the benefits that these projects are having can be found on pages 42-51. Many more projects are under construction, and drivers will soon see their benefits as well.

What WSDOT is already doing to fight congestion

Building additional highway capacity:

- The 392 construction projects of the 2003 and 2005 transportation funding packages include 116 mobility projects to fight congestion, of which 35 have now been completed.

Using intelligent transportation systems to operate the system more efficiently:

- Traffic cameras
- Traffic management centers
- Variable message signs
- Integrated traffic signals
- Ramp meters
- Traffic data collectors

Providing commute choices to manage demand:

- Vanpools
- Park & rides
- Transit partnerships
- Telecommuting programs
- Commute trip reduction
- HOV/carpooling

The Program

There is no single solution for traffic congestion, that is why WSDOT reduces congestion by focusing on three key balanced strategies, which are the basis for the *Moving Washington* program:

Add Capacity Strategically

As our state continues to grow, it is necessary to develop additional traffic capacity. However, budgetary constraints and other factors mean we cannot simply build our way out of congestion. WSDOT plans projects wisely by targeting the worst traffic-flow bottlenecks and chokepoints in the transportation system. The 2003 and 2005 transportation funding packages include 116 mobility projects that add capacity where it makes the most sense statewide. Washington continues to invest in improvements to I-5, I-405, and SR 520 in the central Puget Sound and US 395 through Spokane, among others around the state.

Operate Efficiently

Efficiency means taking steps to smooth traffic flow and avoid or reduce situations that constrict road capacity. Collisions account for roughly 25% of traffic backups, so making our roads safer will go a long way toward easing congestion. Technology, such as driver information signs, enables WSDOT and the traveling public to react quickly to unforeseen traffic fluctuations. Among the tools WSDOT employs to provide this efficiency are metered freeway on-ramps, incident response teams, variable speed-limit systems, variable tolling, and integrated traffic signals.

Manage Demand

WSDOT seeks to make the best use of highway capacity by better distributing the demand placed on our most congested bridges and highways. That means offering commuters more choices, such as convenient bus service, incentives to carpool or vanpool, and promoting workplace environments more conducive to telecommuting. WSDOT continues to expand its programs to encourage drivers to use less congested routes and times to travel by displaying real-time traffic information through various means including via the Internet and variable message signs.

WSDOT's balanced strategies to fight congestion

Moving Washington: Corridor Performance

The *Moving Washington* program targets congestion on Washington State's busiest corridors. For each corridor, WSDOT utilizes the three strategies to fight congestion: add capacity strategically, operate efficiently, and manage demand. Projects listed are not comprehensive, but are only selected projects for the corridors. For more information on the *Moving Washington* program and the strategic corridors, please see: http://www.wsdot.wa.gov/movingwashington.

Westside Corridor: I-5 between Arlington and Tumwater, SR 99, US 2

Corridor performance highlights

		2005	2007	%∆
Average Travel Times (minutes)				
I-5 Everett-Seattle (AM)		46	47	+2%
I-5 Seattle-Everett (PM)		44	43	-2%
I-5 Federal Way-Seattle (AM)		43	47	+9%
I-5 Seattle-Federal Way (PM)		36	37	+3%
*Delay**	I-5	18,752	19,802	+5%

Before and After Case Study: I-5 Everett HOV project improves travel times by 5-9 minutes during the evening commute (p. 44).

*Daily hours of delay (in thousands) relative to posted speeds.

Selected congestion relief projects programmed to improve corridor performance:

Add Capacity Strategically

- SR 99 Alaskan Way Viaduct Replacement.
- SR 512 westbound to southbound flyover ramp.
- I-5 HOV lanes Lakewood to Fife.
- I-5/SR 18 westbound to southbound flyover ramp.
- SR 509 connection to Sea-Tac Airport.
- Complete Business, Access and Transit Lanes on SR 99 in Shoreline.
- SR 518 third lane from I-5 to Sea-Tac Airport.
- New HOV lanes on SR 99.
- Interchange reconstruction at SR 531.

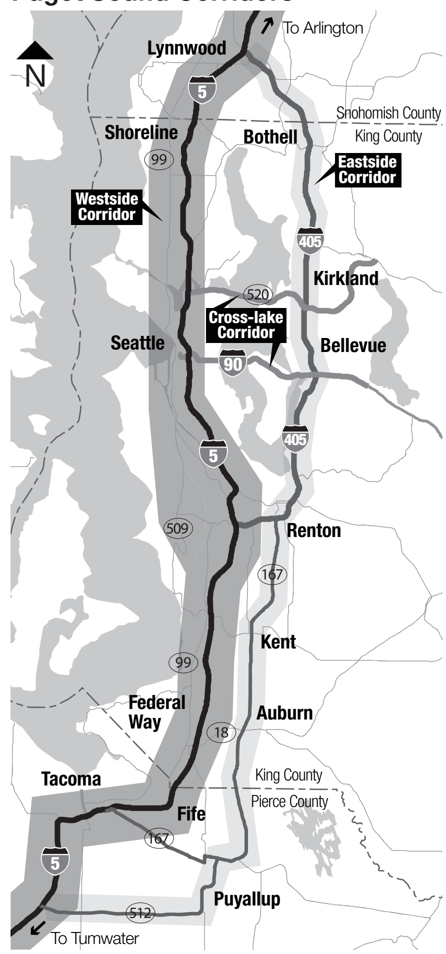
Operate Efficiently

- I-5 Active Traffic Management.
- I-5 Express Lane Tolling.
- Install additional ramp meters.
- Automate operation of reversible lanes.
- Integrate ramp arterial signals.

Manage Demand

- WSDOT provides rights of way and works with transit agencies to improve access and performance.
- Transit uses shoulder during peak periods from Olive Way to SR 520.
- Construct an Industrial Way HOV direct access ramp.
- Further expand the vanpool program in the Central Puget Sound region.
- Expand Park & Ride lot capacity.
- Support established growth and transportation efficiency centers (GTECs).

Moving Washington: Puget Sound Corridors



Cross-Lake Corridor: I-90 and SR 520 between Seattle and Bellevue

Corridor performance highlights

		2005	2007	%∆
Average Travel Times (minutes)				
I-90 Bellevue-Seattle (AM)		16	17	+6%
I-90 Seattle-Bellevue (PM)		18	17	-6%
SR-520 Bellevue-Seattle (AM)		18	18	0%
SR-520 Seattle-Bellevue (PM)		20	19	-6%
*Delay**	I-90	2,156	2,427	+12%
	SR 520	3,020	3,340	+10%

Before and After Case Study: SR 202 to SR 520 project saves drivers up to 20 minutes during peak periods (pp. 44-45).

*Daily hours of delay (in thousands) relative to posted speeds.

Selected congestion relief projects programmed to improve corridor performance:

Add Capacity Strategically

- SR 520 HOV and Bridge Reconstruction.
- Complete the I-90 HOV and Two Way Transit project.
- Extend the I-90 HOV Lane in Issaquah
- Widen SR 900 in Issaquah by one lane in each direction with HOV lanes.
- Phase 2 of the SR 519 South Seattle Intermodal Access to Port of Seattle.
- New interchange between SR 520 and SR 202.

Operate Efficiently

- I-90 and SR 520 Active Traffic Management.
- Automate operation of the I-90 reversible lanes.
- Direct ramp connection between the new SR 520 HOV Lane and the I-5 reversible lanes.
- Move HOV lanes to the inside on SR 520 east of I-405.

Manage Demand

- Begin variable time-of-day tolling on I-90 at I-5 to I-405.
- Support the implementation of Bus Rapid Transit service on SR 520.
- Increase capacity of Park & Ride lots

Measuring Delay and Congestion: Moving Washington

WSDOT's balanced strategies to fight congestion

Puget Sound Eastside Corridor: I-405, SR 167, and SR 512

Corridor performance highlights

		2005	2007	%∆
Average Travel Times (minutes)				
I-405 Tukwilla-Bellevue (AM)		38	42	+11%
I-405 Bellevue-Tukwilla (PM)		31	34	+10%
SR-167 Auburn-Renton (AM)		17	18	+6%
SR-167 Renton-Auburn (PM)		18	19	+6%
*Delay**	I-405	13,108	14,421	+10%
	SR 167	2,660	2,916	+10%

Before and After Case Study: SR-167 HOT lanes users save 10 minutes in travel times on average compared to commuters using GP lanes during the peak period (pp. 45-47).

*Daily hours of delay (in thousands) relative to posted speeds.

Selected congestion relief projects programmed to improve corridor performance:

Add Capacity Strategically
- Improve ramp connections on SR 512 at SR 7 and at Canyon Road.
- Extend the SR 167 HOV/HOT Lanes.
- I-405 Corridor Express Lanes.
- Additional Lanes on I-405 in Renton and Bellevue vicinities.
- Build a new freeway connection from the Port of Tacoma to Puyallup.
- New bridge over NE 10th Street in downtown Bellevue.

Operate Efficiently
- I-405/SR 167 Active Traffic Management.
- Use SR 512 shoulders during peak commuting periods as additional lanes.
- Construct an HOV Bypass and signal improvements on SR 169 at I-405.

Manage Demand
- Support the implementation of bus rapid transit service on the I-405 corridor.
- Help identify new GTECs along the SR 167 and I-405 corridors.
- Expand Park and Ride lot capacity.
- Better manage existing Park and Ride lot space.

For more information on the I-405 congestion relief project please see p. 112.

Spokane: I-90 and North Spokane Corridors

Corridor performance highlights

	2005	2007	%∆
Average Travel Times (min : sec)			
I-90 Argonne-Division (AM)	7:44	8:20	+8%
I-90 Division-Argonne (PM)	8:24	8:10	-3%

Before and After Case Study: Adding lanes on I-90/ Argonne Rd to Sullivan Rd improved travelers' speeds by 22% and travel times by 11% (pp. 42-43).

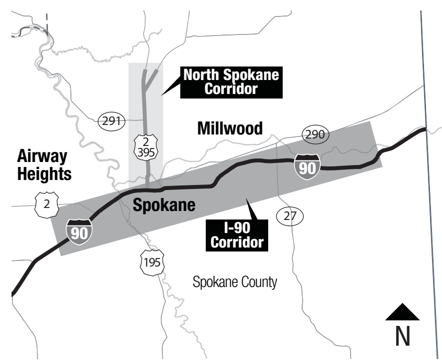
Selected congestion relief projects programmed to improve corridor performance:

Add Capacity Strategically
- US 395 North-South Freeway
- I-90/US 2 interchange eastbound off-ramp and terminal improvements

Operate Efficiently
- Intelligent transportation systems upgrades.
- TMC expansion and security enhancements
- I-90 Sullivan interchange to Idaho state line- enhanced incident response.
- I-90 / Spokane port of entry weigh station relocation.

Manage Demand
- US 195 Hatch Road to I-90 – park and ride facilities.
- North Spokane Corridor–new Park & Ride and pedestrian/bike paths.

Moving Washington: Spokane Corridors



Other Moving Washington corridors: selected congestion relief projects to improve performance

Vancouver Corridors: I-5/I-205 North-South, SR 500, and SR 14

Add Capacity Strategically
- Columbia River Crossing.
- SR 500/St. Johns Blvd.–Interchange.

Operate Efficiently
- Clark Co. and Vancouver signal optimization.

Manage Demand
- Advanced Traffic Information System infill.

Cross-State Corridors: I-90, US 2, and SR 97

Add Capacity Strategically
- I-90 Snoqualmie Pass East Project.
- US 2/US 97 Peshastin East Interchange.
- US 97 Blewett Pass add passing lanes.

Operate Efficiently
- TMC improvements for Yakima and Wenatchee.
- I-90 IRT from North Bend to Spokane.
- US 2 Variable Speed Limit System.

Manage Demand
- Traveler information including flow maps, VMS and web messaging on I-90 and US 2.
- I-90/SR 17 Park & Ride.

Connecting Communities Program

Add Capacity Strategically
- I-82/Valley Mall Blvd - interchange.
- SR 240 Columbia Ctr Blvd to US 395-construct interchange.
- Additional lanes on SR 28 at Sunset Highway.

Operate Efficiently
- SR 17 signal retiming.
- I-5 Lewis County ITS Infill.
- Add Tri-Cities Incident Response Teams.
- SR 21 Ferry Boat replacement.

Manage Demand
- Chuckanut Park & Ride.
- Tri-Cities traveller information enhancements.
- New Park & Ride lots for US 97/SR 970, Alger and Conway.

Summary of WSDOT's congestion performance measures

WSDOT collects real-time data for 52 commute routes in the Puget Sound region and two in Spokane. In the central Puget Sound, data are collected from over 5,000 loop detectors embedded in the pavement of the 709 centerline miles. Using this quality controlled data, WSDOT analyzes system performance by using a variety of performance measures. In tracking and communicating performance results, WSDOT adheres to the congestion measurement principles the agency established. These principles call for the use of accurate, real-time data rather than modeled data in order to better communicate with the public, and using language and terminology that is meaningful to the public ("Plain English").

Measuring speed, travel times, and reliability

Travel times and reliable travel times are important measures to commuters and businesses in Washington State. In addition to reporting on the 38 key Puget Sound commute routes and the two Spokane commutes, this year's congestion annual update looks at travel times for the "other 14" commutes (of the 52 tracked Puget Sound commutes) and for HOV lanes. The metrics used in travel time analysis include the average travel time, 95% reliable travel time, the duration of peak period congestion, and the percent of weekdays when average travel speeds fell below 35 mph. The performance of an individual route is compared to data from previous years.

Real-time travel times for key commutes around Puget Sound, Spokane, and Vancouver are available to the public and updated every five minutes on the WSDOT web site at http://www.wsdot.wa.gov/traffic/seattle/traveltimes/.

Measuring traffic volumes and vehicle miles traveled

WSDOT examines two volume metrics for each commute route: volume during peak hours and the total daily volume. WSDOT continues to analyze factors such as the use of public transportation, population change, job growth, and fuel prices as they relate to volume and travel time changes.

Traffic volume is a vehicle count at a given roadway location. It is measured by a detector in each lane at the location. WSDOT has loop detectors spaced at approximately half-mile intervals throughout the Puget Sound freeway network.

Vehicle miles traveled (VMT) is a metric WSDOT uses to quantify travel along a route. It is simply the vehicle count multiplied by a length of roadway. Because traffic volumes vary along a route, each location's traffic volume is multiplied by the representative length of the route, and these values are added up to obtain a route's VMT. WSDOT uses this measure to better understand the number of trips taken for certain commute routes, as well as total miles traveled on state highways to predict future demands and establish needs.

In 2008, the Legislature established per capita VMT as the primary measure connecting congestion and greenhouse gas emissions.

WSDOT's congestion measurement principles

- Use real-time measurements (rather than computer models) whenever and wherever possible.
- Use maximum throughput as the basis for congestion measures.
- Measure congestion due to incidents (non-recurrent) as distinct from congestion due to inadequate capacity (recurrent).
- Show how reducing non-recurrent congestion from incidents will improve the travel time reliability.
- Demonstrate both long-term trends and short-to-intermediate-term results.
- Communicate about possible congestion fixes using an "apples-to-apples" comparison with the current situation (for example, if the trip takes 20 minutes today, how many minutes less will it be if WSDOT improves the interchange?
- Use "Plain-English" to describe measurements and results.

Key congestion performance measures

Measure	Definition
Average Peak Travel Time	The average travel time on a route during the peak travel period.
95% Reliable Travel Time	Travel time with 95% certainty (i.e. on-time 19 out of 20 work days).
Maximum Throughput Travel Time Index (MT^3I)	The ratio of peak commute period travel time compared to maximum throughput speed travel time
Percent of Days When Speeds Fall Below 35 mph	Percentage of days annually that observed speeds fall below 35 mph (severe congestion) on key highway segments.
Vehicle Throughput	Measures how many vehicles move through a highway segment in an hour.
Lost Throughput Productivity	Percentage of a highway's lost vehicle throughput due to congestion.
Delay	The average total daily hours of delay per mile based on the maximum throughput speed of 51 mph measured annually as cumulative (total) delay.
Duration of Congestion	The period when speeds fall below 70% of the posted limits (41 mph and less).
HOV Lane Reliability	An HOV lane is deemed "reliable" so long as it maintains an average speed of 45 mph for 90% of the peak period.
Person Throughput	Measures how many people, on average, move through a highway segment during peak periods.
Before and After Analysis	Before and after performance analysis of selected highway congestion relief projects and strategies.

Measuring Delay and Congestion: Annual Update

Summary of WSDOT’s congestion performance measures, continued

Maximum throughput and evaluating vehicle throughput productivity

WSDOT’s goal is to achieve maximum throughput whenever possible. Highways are engineered to move specific volumes of vehicles based on the number of lanes and other design aspects. Many people are surprised to learn that highways do not operate at their maximum efficiency when vehicles are moving at 60 mph (the typical urban highway posted speed limit in Washington State). Maximum throughput, where the greatest number of cars pass through an individual lane every hour, actually occurs at roughly between 42-51 mph (70% and 85% of posted speeds). As congestion increases, speeds decrease and fewer vehicles pass through a corridor. Throughput productivity may decline from a maximum of roughly 2,000 vehicles per lane per hour traveling at speeds between 42-51 mph (100% efficiency) to as low as 700 vehicles/lane/hr (35% efficiency) when traveling at speeds less than 30 mph. For a more detailed discussion of why WSDOT uses maximum throughput as a basis for measuring congestion see the September 30, 2007, *Gray Notebook*, p. 60.

In the 2008 Congestion Report, WSDOT uses maximum throughput as a basis of measurement for the following measures:

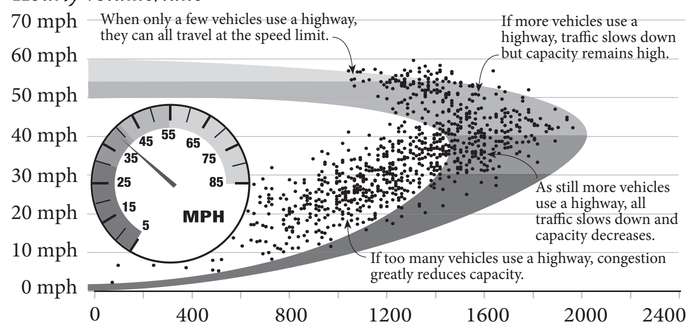
- Lost throughput productivity;
- Maximum Throughput Travel Time Index—MT³I (For a more detailed discussion of this measure, please see p. 38);
- Duration of Congestion;
- Delay (both statewide and for individual corridors).

Measuring delay

Typically, delay has been calculated based on the difference between actual travel times and posted speed travel times. WSDOT uses maximum throughput standards as the measurement basis, rather than posted speeds, to assess relative delay against the highway’s most efficient condition. WSDOT measures delay on the 38 key Puget Sound commute routes, and produces regional calculations of average delay.

An Adaptation of the Speed/Volume Curve: Relating Speed and Volume
I-405 Northbound at 24th NE, 6-11 AM Weekdays in May 2001
Hourly Volume/Lane

An adaptation of the speed/volume curve: relating speed and volume
I-405 northbound at 24th NE, 6-11 AM weekdays in May 2001
Hourly volume/lane



Measuring HOV lane performance

WSDOT utilizes two measures to evaluate HOV lane performance. WSDOT and the Puget Sound Regional Council adopted a reliability standard for HOV lanes which states that for 90% of the time, HOV lanes should maintain an average speed of 45 mph. This is the basis for WSDOT’s HOV reliability measure. WSDOT also measures person throughput to gauge the effectiveness of HOV lanes in carrying more people compared to general purpose lanes. New to this year’s congestion annual update, HOV lane travel times are being reported.

Before and after analysis of congestion relief projects

The 2003 Nickel and the 2005 Transportation Partnership Account funding packages provide over $10 billion in funding for 116 congestion relief projects statewide. To measure the extent to which these investments are mitigating congestion, WSDOT is implementing before and after project studies to analyze impacts on travel times and delay. On highway segments without in-pavement loop detectors, data will be collected through the use of automated license plate recognition cameras. Where real-time data are unavailable, modelled data are used. Before and after analysis will be expanded to all congestion relief capacity projects in the coming years.

WSDOT congestion measurement speed thresholds*

Posted speed	Approx. 60 mph	Vehicles are moving through a highway segment at approximately the posted speed. However since there are fewer vehicles on the highway, the highway segment is not reaching its maximum productivity under these conditions.
Maximum throughput speeds	42-51 mph (70%-85% of posted speed)	Vehicles are moving slower than the posted speed and the number of vehicles moving through the highway segment is higher. These speed conditions enable the segment to reach its maximum productivity in terms of vehicle volume and throughput.
Duration of congestion speeds	Under 42 mph (less than 70% of posted speed)	Average vehicle speeds are below 42 mph (70% of the posted speed). Drivers have less-than-optimal spacing between cars, and the number of vehicles that can move through a highway segment is reduced. The highway begins to operate less efficiently because fewer vehicles are moving through a highway segment under these conditions than they would at maximum throughput.
Severe congestion speeds	35 mph or below (Less than 60% of posted speeds)	Speeds and spacing between vehicles continue to decline in a highway segment and highway efficiency operates well below maximum productivity.

*Based on a posted speed limit of 60 MPH.

Incident Response Quarterly Update

Statewide Incident Response

The mission of WSDOT's Incident Response (IR) program is to safely and quickly clear traffic incidents on state highways. Quick clearance minimizes congestion and dangerous traffic blockages that can lead to secondary collisions. IR roving units, which operate during peak traffic periods, also offer a variety of free assistance that reduces motorists' exposure to risk, such as providing fuel and jump starts, changing flat tires, and moving blocking vehicles safely off the roadway. Additionally, IR units are trained and equipped to assist Washington State Patrol (WSP) troopers at collisions and other traffic emergencies. Available for call out 24 hours a day, seven days a week, IR units assist WSP with traffic control, mobile communications, clean-up, and other incident clearance functions as needed during major incidents.

More information on the IR program can be found at www.wsdot.wa.gov/Operations/IncidentResponse/.

Statewide average clearance times: 12.6 minutes for Quarter 3, 2008, up 6.8% from last quarter

In Quarter 3 of 2008, the average clearance time for all incidents statewide was 12.6 minutes, up 6.8% from last quarter's historic low of 11.8 minutes, but this is lower than the range of clearance times for the past three years: 12.9-14.4 minutes. This is especially significant for Quarter 3, which typically has longer clearance times due to the higher traffic demand of the summer months.

Once again, quicker clearance by IR drivers and lower collision rates contributed to this lower clearance time. WSDOT believes that concerted efforts to quickly clear incidents are beginning to be reflected in the clearance time numbers. Meanwhile, the rate of collisions in the state, including fatal and severe collisions, is dropping, as can be seen in the table on p. 58.

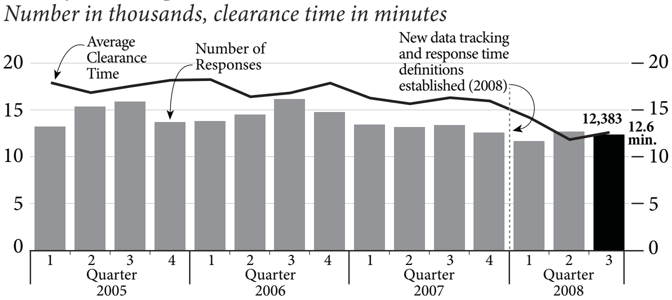
Again this quarter, the proportion of statewide over-90-minute incidents that WSDOT responded to in Quarter 3 of 2008 is relatively low. Fewer long-duration incidents in the data results in a lower average clearance time, because those incidents are not pulling the average up. Over the past two years, over-90-minute incidents represented 1.3% to 1.8% of all quarterly responses. In Quarter 3 of 2008, over-90-minute incidents represented only 1.2% of all incidents that WSDOT responded to. This was up slightly from the 1.0% proportion reported last quarter but again lower than the range for the past two years.

WSDOT responds to 23% fewer fatality collisions statewide compared to the same quarter last year

During Quarter 3 of 2008, WSDOT's Incident Responders attended 27 fatality collisions statewide. This is a 58% increase from last quarter's historic low of 17 responses to fatality collisions, but a 23% drop from the 35 fatality collision responded to in Quarter 3 of last year. This may be attributable to the lower number of fatality incidents that appears to be a recent statewide trend, or it may indicate that IR assistance was not necessary at all fatality incidents.

Number of responses & overall average clearance time

January 2005 - September 2008
Number in thousands, clearance time in minutes



Data Source: Washington Incident Response Tracking System, WSDOT Traffic Office.

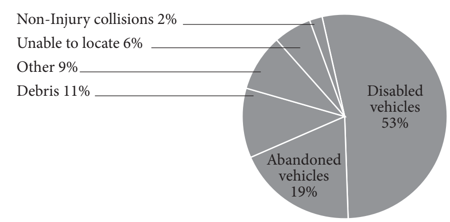
Note: Program-wide data is available since January 2002. Prior to Q3 of 2003, the number of responses by IRT are shown. From Q3 2003 to Q2 2007, responses by Registered Tow Truck Operators and WSP Cadets have been reported in the total. From Q1 2002 to Q4 2007, Average Clearance Time do not include "Unable-to-Locate" (UTL) responses into calculation. Average number of responses does include UTLs, because this represents work performed on behalf of the Incident Response Program. In Q1 2008, WSDOT's Incident Response Program moved to a new database system and began calculating average clearance time in a different way. This accounts for the apparent decrease in the average clearance time value.

IR responses to incidents statewide broken out by duration and type of incident

Quarter 3, 2008

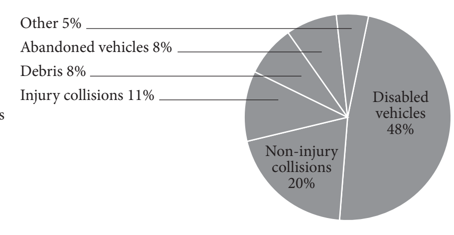
Incidents Lasting Less Than 15 Minutes (9,490)

Fatality, Injury and Police Activity were less than 1% (not shown). There were 16 Fires, 2 Hazardous Materials events involved incidents in addition to or as a result of above incidents. 4 incidents involved WSDOT property damage, and 302 were located in work zones.



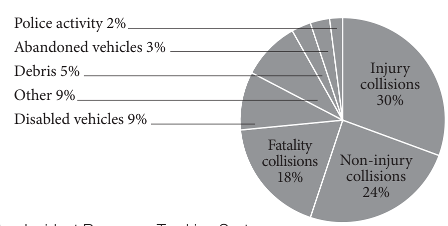
Incidents Lasting 15 to 90 Minutes, (2,746)

Fatality and Police Activity were less than 1% (not shown). There were 8 Hazardous Materials and 72 Fire involved incidents in addition to or as a result of above incidents. 48 incidents involved WSDOT property damage, and 98 were located in work zones.



Incidents Lasting 90 Minutes and Longer (148)

There were 10 Hazardous Materials and 14 Fire involved incidents in addition to or as a result of above incidents. 20 incidents involved WSDOT property damage, and 14 were located in work zones.



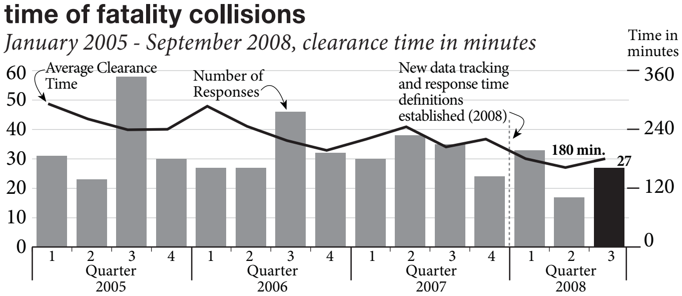
Data Source: WSDOT Washington Incident Response Tracking System

Incident Response
Quarterly Update

The Nine Key Congested Corridors

Number of responses and average clearance time of fatality collisions

January 2005 - September 2008, clearance time in minutes



Data Source: Washington Incident Tracking System, WSDOT Traffic Office.

Note: In Q1 2008, WSDOT's Incident Response Program moved to a new database system and began calculating average clearance time in a different way. This accounts for the apparent decrease in the average clearance time value.

Annualized average duration of over-90-minute incidents on 9 key routes drops below new target during Quarter 3, 2008

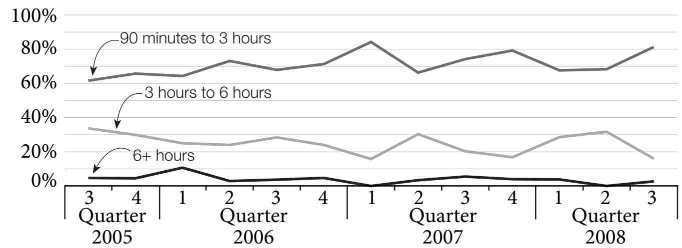
In Quarter 3 of 2008, the average duration of the 74 over-90-minute lane-blocking incidents was 147 minutes. This is a drop of 4% from last quarter, and a drop of 11.8% from the same quarter last year. The annualized average for the three quarters of 2008 to date is 154 minutes, just below the Governor's target of 155 minutes.

Two extraordinary incidents during Quarter 3, 2008

This quarter saw two extraordinary (6+ hour) incidents. These incidents exert a strong influence on the quarterly average so WSDOT and WSP generally highlight them to explain why they were so time-consuming. Both involved semi diesel leaks that resulted in investigations by the Department of Ecology. Without these incidents in the data set, the average duration for Quarter 3 of 2008 would have fall from 147 minutes to 139 minutes.

Duration of blocking incident by type and percentage

Quarter 3, 2005 -.Quarter 3, 2008



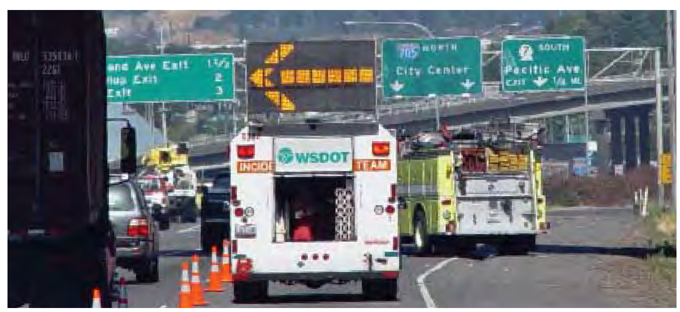
Data Source: WSDOT Traffic Office and WSP.

Extraordinary (6+ Hour) incidents on the GMAP routes

Quarter 3, 2008; Duration in minute

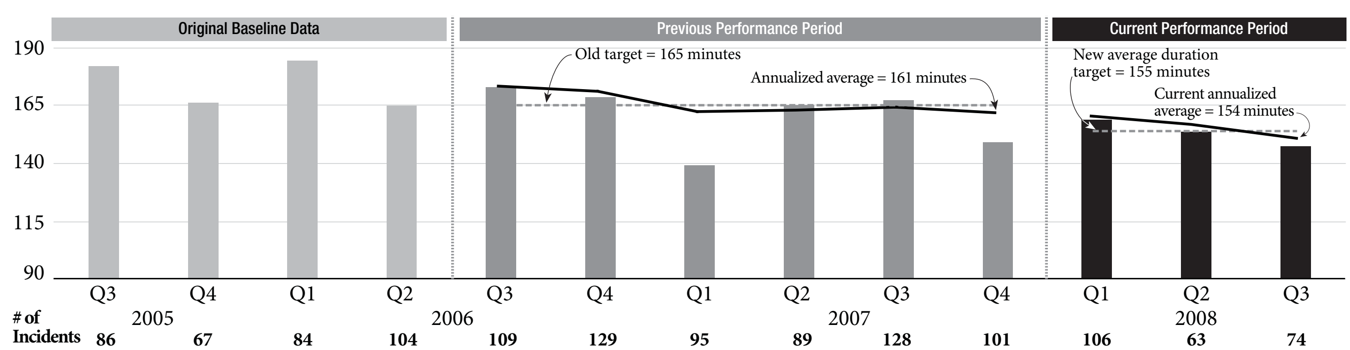
Date	Location	Duration	Brief Description
Aug 1	NB I-5, Tumwater	462 min.	Three-car injury collision. Fully loaded semi involved, spilled drywall across two lanes. DOE came to scene for 40 gallon diesel spill. Semi required two class C and one class S tow for removal.
Aug 20	NB I-5, 41st St.	403 min.	Semi went over embankment. DOE came to scene for 40-gallon diesel spill. Vehicle required class C tow.

Source: WSP and WSDOT Traffic Office



Progress towards GMAP goal or reducing average clearance time for over-90-minute incidents on the nine key highway segments

July 2005 - June 2008; Average duration in minutes



Data Source: Washington State Patrol and WSDOT Traffic Office.

The Nine Key Congested Corridors

Property damage collisions make up 26% of over-90-minute blocking incidents on the 9 key corridors

Since WSDOT and WSP began tracking over-90-minute blocking collisions on the 9 key routes, 325 (26.3%) of the 1235 total incidents have been incidents which involved non-injury, property-damage-only collisions.

In order to determine the contributing factors causing these incidents to last 90+ minutes, the agencies reviewed the 85 property damage collision incidents that occurred between September 2007 and August 2008; these make up 23.8% of the 357 incidents that occurred during that time period.

Commercial Motor Vehicle (CMV) Involvement – 55%

These collisions had a Commercial Motor Vehicle involved in the incidents. Often these incidents involved rollovers, damage to the trailer or cab, spilled loads, or diesel spills (see below). Often these vehicles required specialized tow trucks that were capable of up righting overturned trailers and hauling away these heavy vehicles. WSDOT and WSP began the Major Incident Tow program in July 2007 in order to expedite the clearance of these common blocking incidents.

Hazardous Material and Fuel Spills – 20%

In most instances, these events involved a CMV; either diesel fuel is leaking from the CMV's gas tanks, or liquids being hauled in the trailers were spilled in the course of a collision. When spills occur near waterways, responders take extra precautions in order to prevent or limit contamination. If the Department of Ecology is called to the scene, extra time is spent waiting for their arrival and review of the situation. Sometimes, contractors and special equipment are required to clean up the spill.

Pickup/SUV hauling trailers or other items – 13%

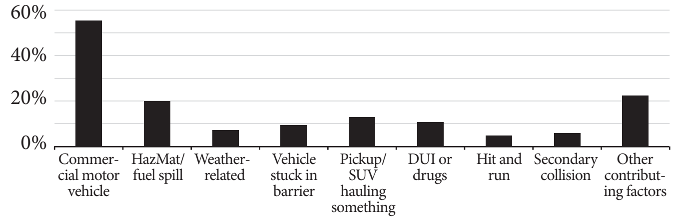
The events involved passenger vehicles that were hauling items lost them or became too damaged to continue hauling them. These items included U-Hauls, heavy equipment, trailers, campers, and boats. Removal of the often-damaged hauled item took special accommodations and therefore extra time. Almost all of these events took place between April and September.

Alcohol or Drugs – 11%

Property damage incidents involving alcohol or drug use required extra time for WSP to conduct investigations and make any necessary arrests.

Factors affecting over-90-minute property damage collisions on 9 key routes

September 2007 - August 2008



Out of 85 incidents from September 2007 - August 2008

Number will not add up to 100% because many incidents involve more than one variable

"Other" includes: DOT property damage; WSP trooper involved in collision; non-DUI/drug criminal activity; involved parties fleeing scene on foot; uninjured driver trapped in vehicle; leakage of non-hazardous cargo; and construction zone preventing timely arrival of responders.

Vehicle stuck in barrier – 9%

In these incidents, vehicles became wedged in guardrails, tangled in cable median barriers, or high-centered on jersey barriers, and required extra time for removal.

Weather-related – 7%

All of these events occurred between December and March. In some instances, snow and/or ice caused a property damage collision, and responders closed the roadway for de-icing as a safety precaution. Also, the weather sometimes hindered the response effort, making it difficult for responders to arrive at the scene or for damaged-but-drivable vehicles to leave it.

Secondary collision – 6%

Initial incident caused another (secondary) event or collision. This might be under-reported in the data because incidents are not coded for this. It is voluntary information offered by the WSP troopers.

Hit & Run – 5%

In these events, when a vehicle left the scene, the incident became a criminal investigation and this required extra time to secure the scene and investigate.

Other Contributing Factors – 22%

"Other" incidents included: DOT property damage, such as guardrail, cable median barrier, signs, and bridges, which must be fixed before reopening in order to protect public safety; a law-enforcement officer involved in the collision; criminal behavior by involved parties or outstanding warrants against them; involved parties fleeing the scene on foot; uninjured drivers trapped in vehicles and needing to be cut out; leaking cargo that is not hazardous; and barriers in the construction zone preventing responders from reaching the scene.