

(DRAFT)

Washington Transportation Plan Update *Interim Briefing to the Transportation Commission* **Bottlenecks and Chokepoints**

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**Washington State
Department of Transportation**

Presentation Organization

- Topic Overview
- Demand and capacity in Washington
- Approaches to address the demand and capacity crisis
- Opportunities for strategic investments in Bottlenecks and Chokepoints

The Crisis of Demand and Capacity in Our Transportation Systems

Four paper topics in Washington Transportation Plan are closely connected to the issues of capacity, demand, congestion and delay. They are:

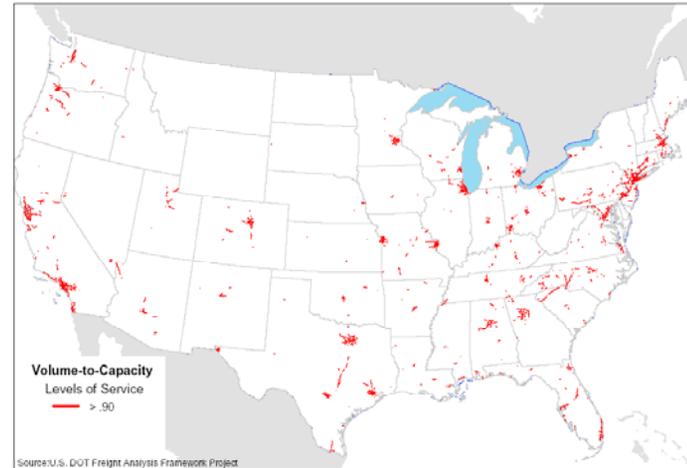
1. *System Efficiencies:* How can we best work toward optimizing how efficiently we derive the benefits of our current transportation system facilities and those we are able to create in the future?
2. *Moving Freight:* How are the special needs of freight movement to be incorporated into the state's transportation plan?
3. ***Bottlenecks and Chokepoints:* What opportunities for investment in new facility and system assets can help address system chokepoints and bottlenecks? What are the most effective near-term solutions through expanding capacity to move people and goods in shorter and more reliable times?**
4. *Building Future Visions:* What are the visions of transportation system futures - shared and unshared - that should shape today's transportation planning to help create pathways to the future?

What are Bottlenecks and Chokepoints?

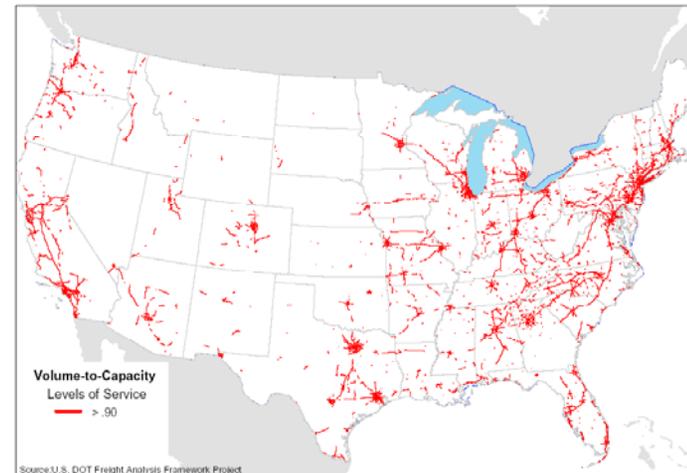
- Smaller scale (less than full corridor) capital investments which target specific traffic flow problems
 - Bottlenecks: places where roadways physically narrow, causing congestion (examples: lane drops on freeways; narrowing shoulders)
 - Chokepoints: places where delay occurs because of traffic interference and/or the roadway configuration (examples: freeway interchanges; left turns; seasonal road closures)

The Crisis of Demand and Capacity in Our Transportation Systems

- At our airports
 - Between 1995 and 2000, delay at the nation's 31 largest airports grew by 90%.
- On our rail lines
 - Projected volumes of imports, containers and other freight will severely over tax the current mainline capacity within 10 to 15 years if operational and capital improvements aren't made.
- On our highways
 - For highways across the country and in Washington State during the past two decades, population, employment, and travel have grown faster than the transportation supply.
 - In Washington, travel is up 91%, but lane miles have only increased by 8% from 1980 to 2002.

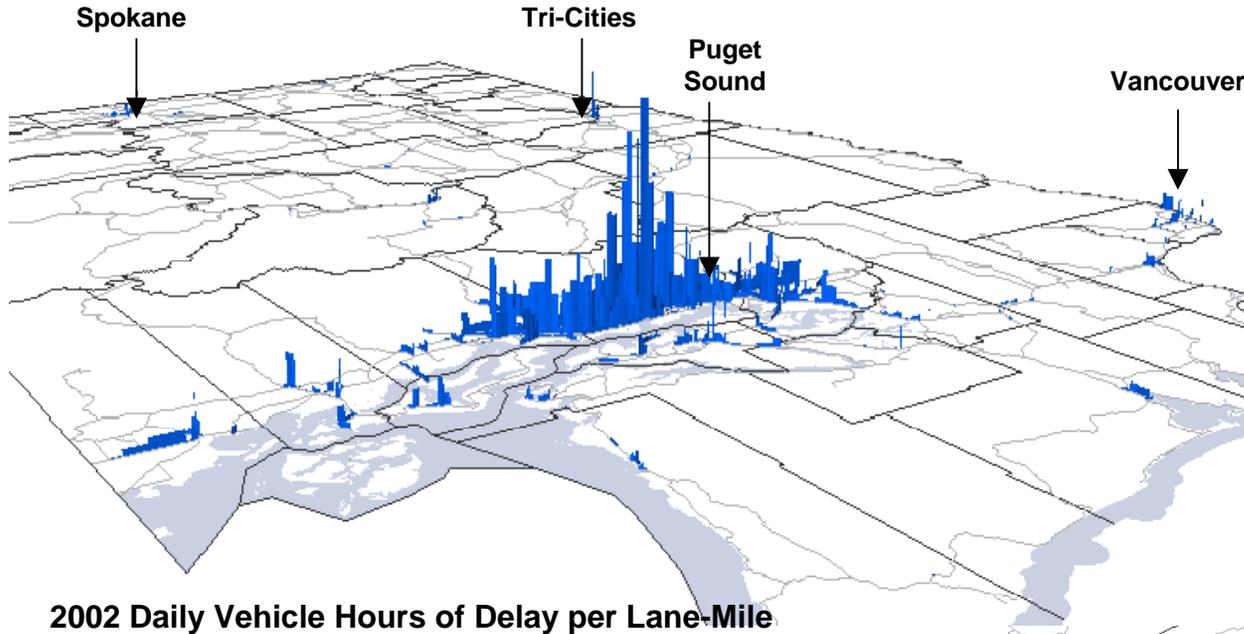


1998 Congested Highways



2020 Congested Highways

With Demand Growing and Supply Stagnant, Congestion as Measured by Traveler Delay has Increased



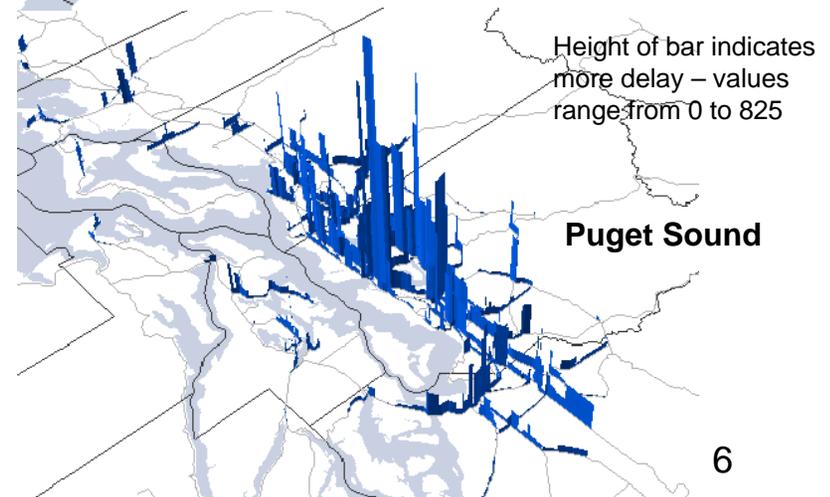
2002 Daily Vehicle Hours of Delay per Lane-Mile

Congestion is primarily concentrated in the urban areas, especially Puget Sound, Vancouver and Spokane.

The highest spike depicted on the map is located at the interchange for I-5 and I-90 in Seattle, where the average tally is about 825 vehicle hours of delay per lane mile per day.

A Simple Measure for Congestion

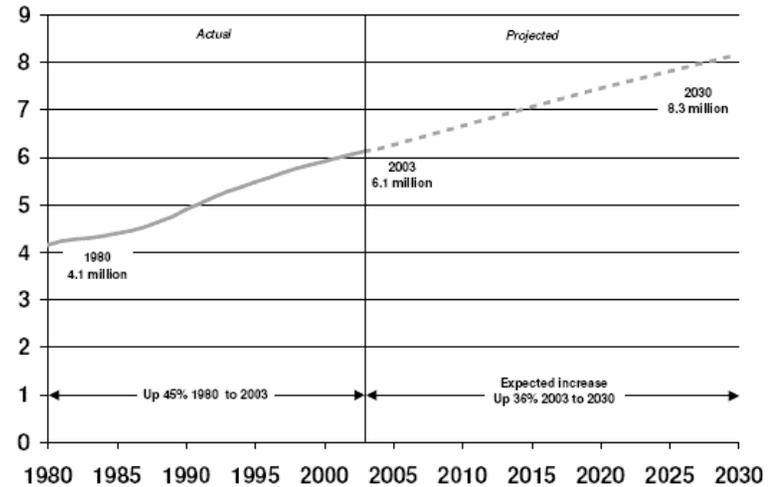
The number of hours of delay in a day on a given mile of highway is the most basic and accessible measure for describing congestion. It indicates which roadways are congested, and gives an indication of the severity of congestion and how long it lasts.



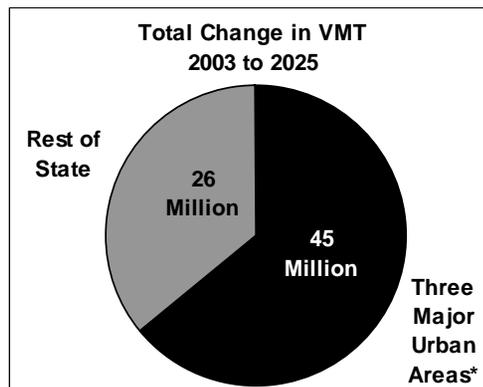
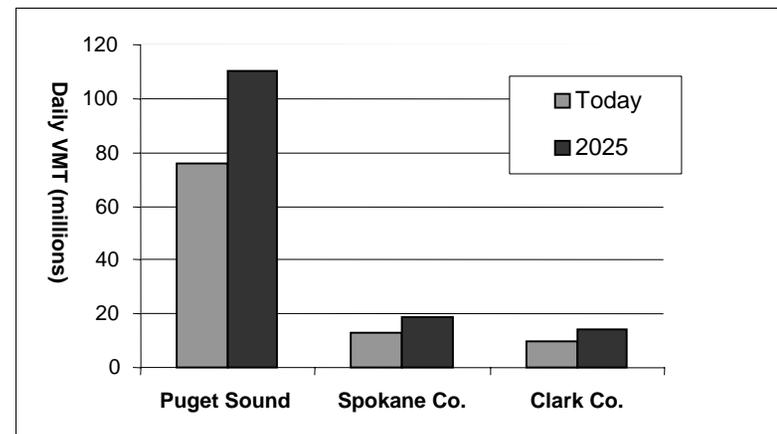
The Demand/Capacity Imbalance Will Grow in the Future

- The statewide population is expected to increase by approximately 2 million (from 6.1 million today to about 8 million in 2025).
- This population growth is expected to translate into substantial increases in travel demand.
 - 70 million more miles per day*
 - 54% increase from 2003 to 2025

Population



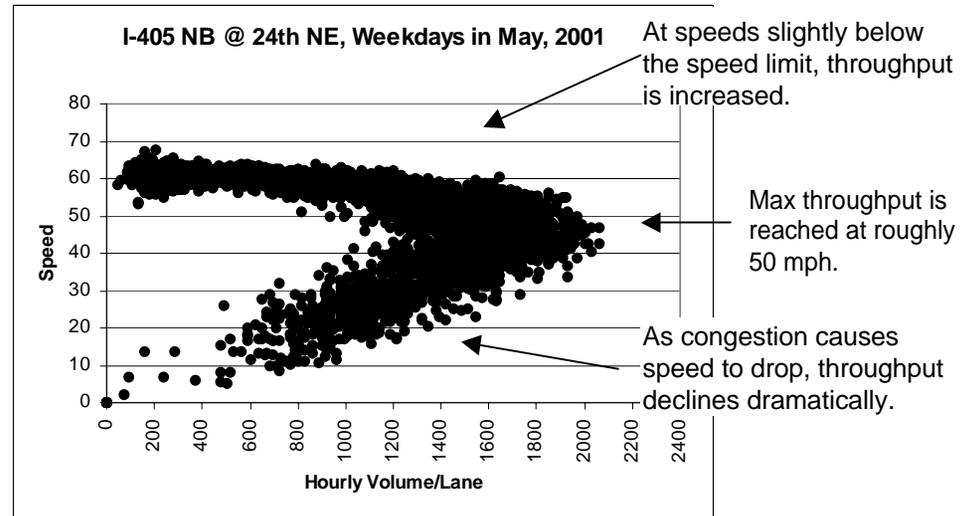
Daily Vehicle Miles Traveled



*In the Puget Sound region there are currently 76 million miles driven per day.

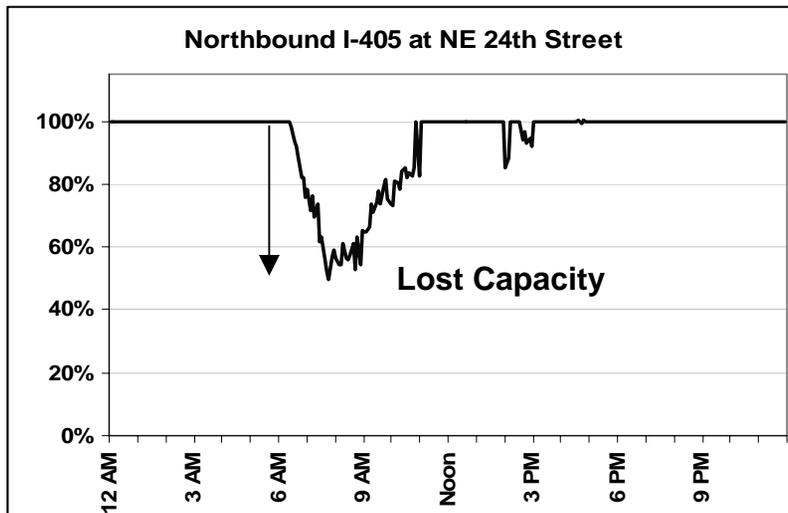
The Relationship Between Delay and Efficiency

- Maximum freeway throughput is typically at speeds of 45-50 mph. This accommodates about 2000 vehicles per hour per lane. System throughput drops dramatically when traffic volume forces speeds to drop below 50 mph.



Volume and Speed Relationship

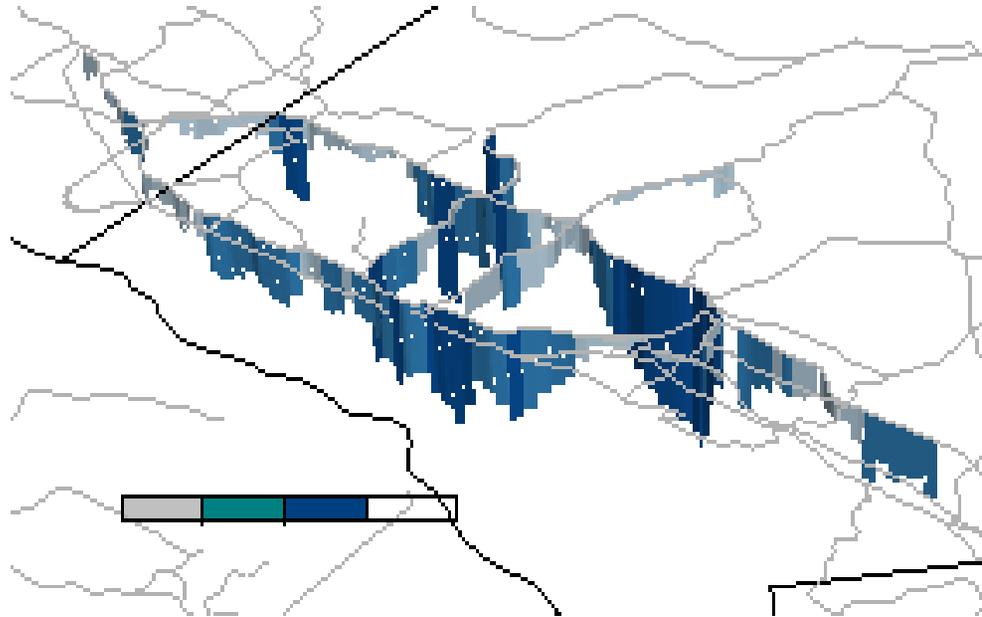
- During the peak period on I-405, congestion reduces the throughput of the 2 general purpose lanes in Renton to the capacity of one free-flowing lane.



Percent of Productivity Lost Due to Delay

The Lost Productivity on Puget Sound Freeways is Staggering

In the peak travel period on an average weekday, delay causes significant loss in productivity throughout Puget Sound freeways by as much as 60% when they are needed the most!



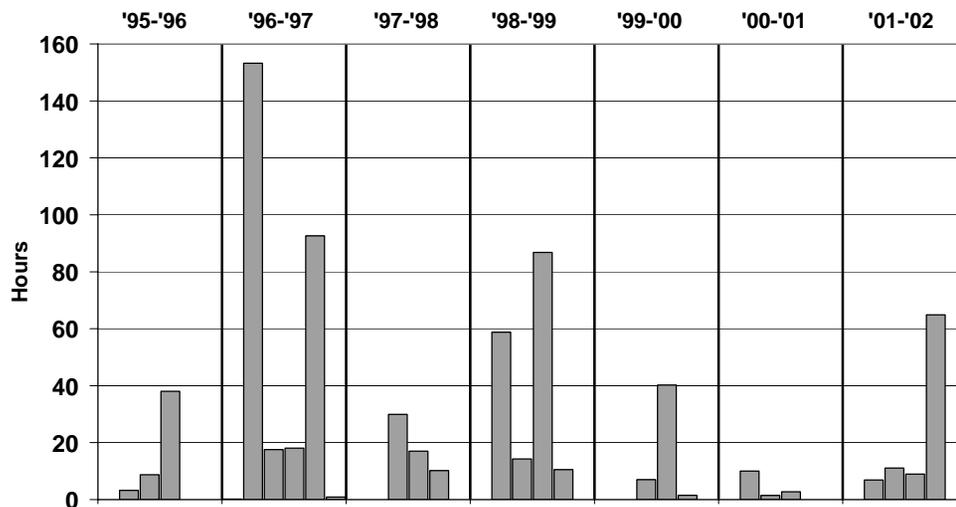
Percent of Productivity Lost Due to Delay

Two Main Take-Away Points About Measuring Congestion

- Not all delay indicates system inefficiency – even though speeds drop, throughput increases until freeway speeds drop below 45 to 50 mph.
- To maximize efficiency, our goal should be to “keep traffic flow above the curve.” This can be done in several ways:
 - Operational measures, which control the number of vehicles using a lane (such as HOV lanes, ramp metering or pricing)
 - Capital investments, which expand capacity

Bottlenecks and Chokepoints are Not Always About Locations with Measured Congestion—Related Delays

- Many rural roads have conditions where small scale investments (passing lanes or truck climbing lanes) would improve traffic flow – usually with accompanying safety benefits.



Winter Road Closures on I-90 from 1995 to 2002
(November thru April)

- Roads that have seasonal closures for spring thaw are bottlenecks for freight movement
- I-90 Snoqualmie Pass is a significant source of delay due to avalanche closures – this affects cross state business and personal travel and freight movement.

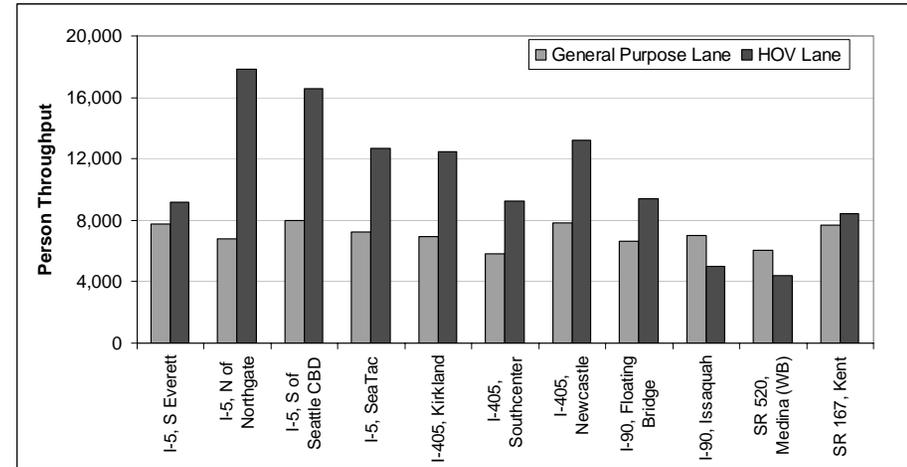
How Have We Addressed the Demand Capacity Imbalance in Our Roadway Systems in the Past?

- For decades, the State has planned for, and with limited funding, made investments in our transportation system. For the most part, these capital investments have been targeted on improvements to maintain the maximum throughput of a facility:
 - High occupancy vehicle lanes
 - Ramp metering and
 - Signal synchronization
 - Strategic general capacity improvements (bottlenecks and chokepoints)

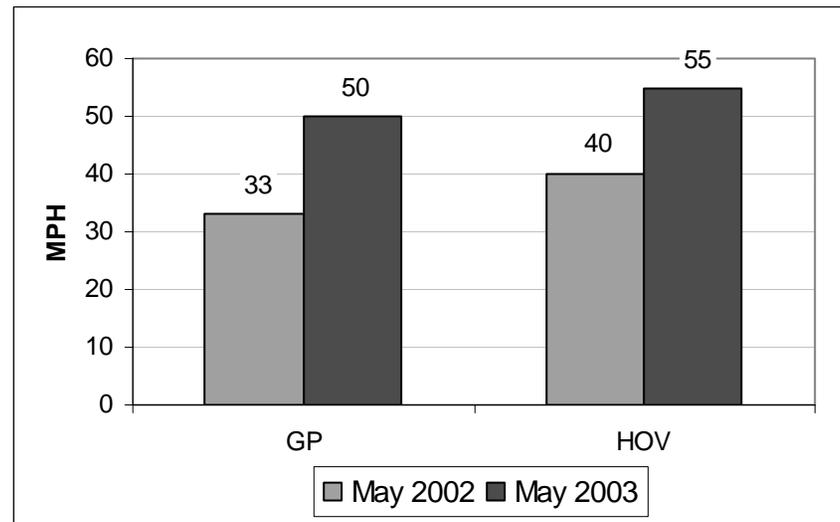
Approaches: HOV Lanes

■ The High Occupancy Vehicle (HOV) Lane System

- HOV lanes constituted the majority of WSDOT's new construction program in the 1990's.
- HOV lanes increase efficiency during the peak periods in two ways:
 - Occupancy requirements limit the number of vehicles using the lane – keeping flow “above the curve” (a target of 1500-1600 vehicles per lane per hour).
 - HOV lanes carry more people per vehicle, which increases the person throughput of the freeway system
- Adding an HOV lane can also improve general purpose lane performance by shifting some of the demand off the general purpose lanes.



**People Moved in General Purpose and HOV lanes (2002)
PM Peak Period Peak Direction**



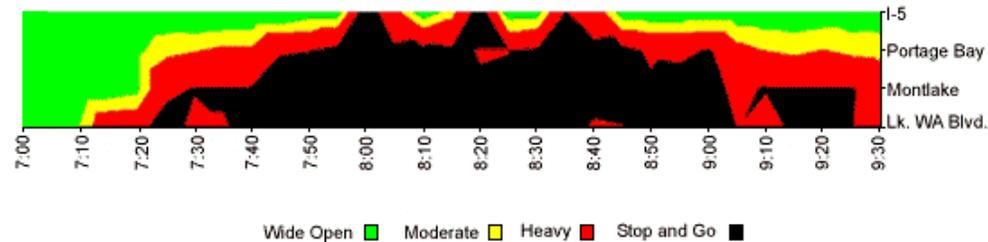
**Improvements in Speed on I-5 South of Southcenter
With the Opening of the HOV Lane 13**

Approaches: Ramp Metering

- A ramp metering system is a set of physical investments at freeway on-ramp locations, tied to a total freeway monitoring network, designed to make the system work more efficiently.
- Ramp meters regulate/reduce the inflow of vehicles at on ramps to keep the traffic flowing at or near its peak levels on mainline freeway lanes.
- Ramp metering, in effect, contributes to system efficiency by maintaining the freeway as close to maximum throughput as possible.

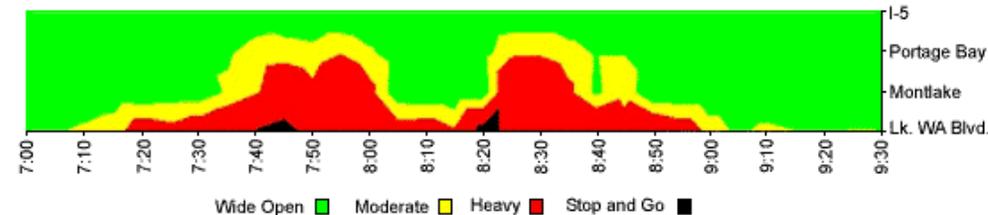
SR-520 Before Ramp Metering

SR 520 Eastbound Morning Congestion I-5 to Lake Washington Blvd
Wednesday July 25, 2001



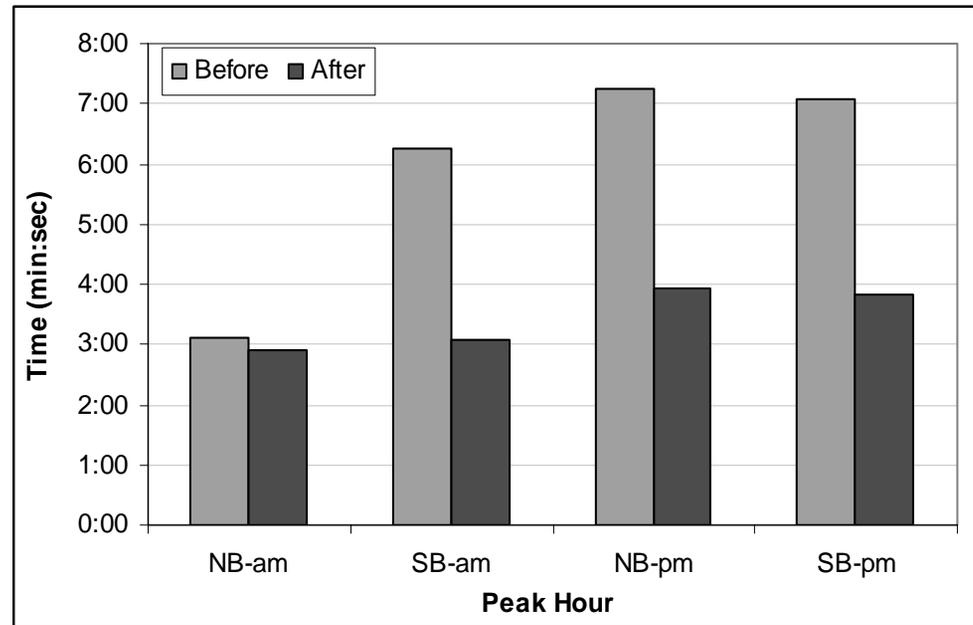
SR-520 After Ramp Metering

SR 520 Eastbound Morning Congestion, I-5 to Lake Washington Blvd
Thursday September 6, 2001



Approaches: Traffic Signal Synchronization on Arterials

- Signal synchronization's main objective is to coordinate green time to optimize through movements thereby reducing stop-and-go conditions from intersection to intersection
- Like ramp metering for freeways, signal synchronization contributes to arterial operation efficiency.



Delay Reduction due to Signal Optimization on SR 527 from 228th Street to SR 524

Where Do Bottlenecks and Chokepoints Fit in this Discussion?

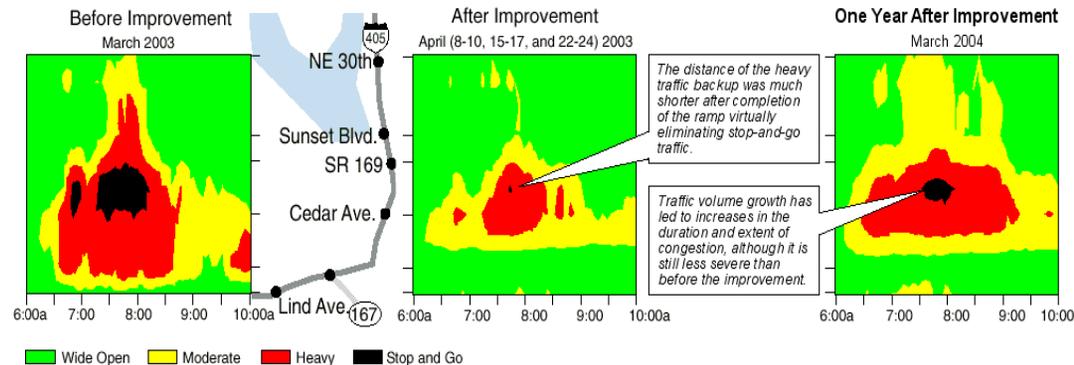
- The current highway system plan has identified billions of dollars in capacity expansion projects, including many large scale corridor projects.
- Because of the high cost of these corridor improvements and, in the short term not enough funding, an incremental approach will be necessary that includes both operational improvements and smaller scale capital investments.
- Targeted capital investments at bottlenecks and chokepoints cost less than full corridor projects, and can result in a recognizable reduction in delay and improved flow for the traveler – they represent the biggest bang for the “short” buck to be invested in capacity expansion solutions.
- Bottleneck and chokepoint investments can be designed to be the first phase or increment of a total corridor improvement.

Approaches: Capital Investment to Address Bottlenecks and Chokepoints

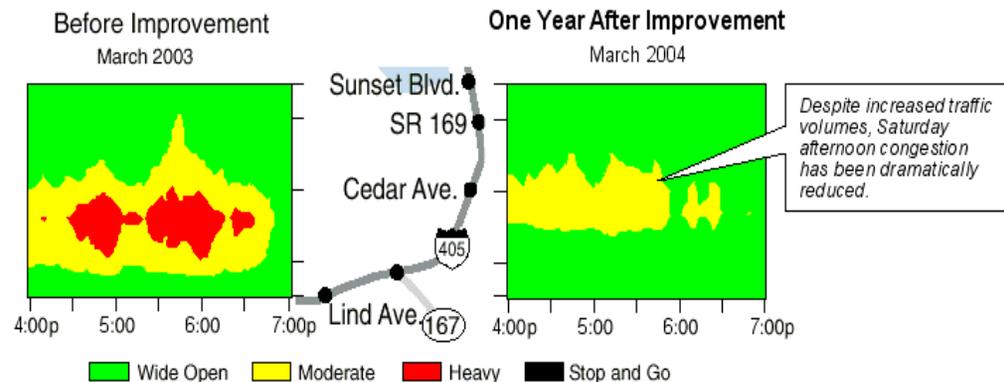
Bottlenecks and chokepoints

- The recently completed I-405 / SR 167 Flyover ramp is a good example of one such targeted investment.
- The ramp cost \$10 million, was completed in two years, and has reduced delay on weekdays, and virtually eliminated delay on weekends.
- Accounting for delay savings and safety benefits, this project will recoup the building cost for the users of the system within less than 3 years.

Average Weekday Congestion
I-405 Southbound



Average Weekend Congestion
I-405 Southbound



Bottleneck and Chokepoint Investment Opportunities:

- There are a wide range of investment opportunities and trade offs that can be made to select projects to address bottlenecks and chokepoints.
- Bottleneck and Chokepoint Investment options could be developed to improve travel for:
 - Commuters
 - Freight
 - Interregional Movement
 - Recreation and Event Access

The following policy options and example projects were developed to:

- Initiate the needed debate on this topic.
- Provide the Transportation Commission, Legislature and the citizens of the State a starting point for discussion.

Bottleneck and Chokepoint Investment Opportunities: Commuters

▪ For Commuters

- Much of the congestion on the system is related to the peaking of travel during commute times, and many of our improvement projects have been focused on peak period travel.
- Projects on this list would include:
 - Spot improvements on major commute corridors
 - Transit direct access ramps
 - Arterial investments needed for local concurrency requirements
 - Additional HOV lane development
 - Intersection or Interchange improvements

Example Projects

- **Spokane Vicinity - I-90 – Argonne Road to the east** – improve by adding lane capacity in stages. This is a heavily used commuting corridor from the residential areas east of Spokane into the Spokane urban center.
- **SR 28/SR 285 – Approaches to George Sellars Bridge** – improve connections at the approaches to this bridge which is located at the south end of the city. This is one of the major problem locations in the Wenatchee urban area. Many commuters use this bridge to travel from Wenatchee to East Wenatchee resulting in congestion each day during peak periods.
- **SR 167 – Puyallup to Auburn – complete HOV lanes** – SR 167 has become one of the most congested corridors in the Central Puget Sound region due to residential growth in south King and north Pierce Counties. This congested highway would greatly benefit from completing the HOV lanes south to Puyallup.

Bottleneck and Chokepoint Investment Opportunities: Freight

■ For Freight

- The ability of freight to move efficiently throughout the state and with minimal delay affects our cost of goods and retention and growth of jobs.
- Projects on this list would include:
 - Improved access to ports
 - Improved access to regional distribution centers
 - Improving roads to all weather standards to insure all year travel reliability, including avalanche protection in our passes.
 - Truck climbing lanes

Example Projects

- **I-5 in the Chehalis Vicinity – add lanes to I-5 – phased approach** – I-5 carries more freight traffic than any other highway in the state. In the Chehalis vicinity I-5 is reduced to two lanes in each direction. This results in delay for freight movement.
- **SR 509 at Port of Tacoma – improve connection into the Port** – Phase 1 of the SR 509 development plan was implemented several years ago by constructing a new bridge and highway connection from I-705 to the vicinity to Port of Tacoma Road. Phase 2 adds two more interchanges connecting SR 509 to roadways leading directly into the Port facilities.
- **I-90 at Snoqualmie Pass – Provide avalanche protection** – I-90 carries the second highest tonnage of freight in the state. Several times each winter it must be closed due to severe avalanche danger.

Bottleneck and Chokepoint Investment Opportunities: Interregional Movement

■ For Interregional Movement

- If the focus was to remove bottlenecks and chokepoints in interregional travel, projects would include:
 - Passing and truck climbing lanes on major rural principal arterials
 - Improvements to freeways in major urban areas to allow smoother through movement, such as creating lane continuity on I-5 through Seattle
 - Adding collector and distributor roadways to minimize interference with entering and exiting traffic

Example Projects

- **SR 97 – Blewett Pass – additional passing lanes** – The Blewett Pass portion of SR 97 is one of the major routes connecting south central Washington with north central Washington. While there are some passing lanes currently in-place, additional passing lanes would be beneficial.
- **SR 97 – Satus Pass – additional passing/truck climbing lanes** – SR 97 traverses the state from the Canadian Border to the Oregon Border. The section of SR 97 is connects south central Washington with Oregon. Passing lanes are needed to allow fast moving passenger cars to safely pass trucks and recreational vehicles.
- **US 2 at Monroe – Construct 2-lane bypass of Monroe** – US 2 and I-90 are the two mountain passes open year round that allow access to central and eastern Washington State. The town of Monroe has become a chokepoint for interregional travel due to access related problems from development and the proliferation of traffic signals on the section of US 2.

Bottleneck and Chokepoint Investment Opportunities: Events and Recreation

- **For Events and Recreation**

- Tourist-oriented areas tend to have seasonal or weekend traffic peaks that don't show up on annual average traffic data. Investments that would focus on these seasonal delay locations include:
 - Access to major entertainment facilities
 - Widening or adding passing lanes on major tourist routes

Example Projects

- **US 101 – add passing lanes in strategic locations** - US 101 is a much used recreational route. It is a two lane highway with limited passing opportunities. Installing passing lanes in strategic locations along with associated informational signing could help to reduce serious accidents in this corridor.
- **I-90/SR 18 Interchange – Improve interchange connections** – This interchange fits in all four categories. In the winter it is used as a connection to ski areas and in the summer to hiking trails and other recreational opportunities.
- **SR 20 at SR 20 Spur – Replace intersection with interchange** – This interchange is the gateway to Whidbey Island and Deception Pass State Park. The current at-grade connection is a chokepoint.

Bottleneck and Chokepoint Multiple Benefits

One way to look at the issue of competing Bottleneck and Chokepoint investment opportunities is to look for projects that perform multiple objectives.

Location	Commute GP/Transit	Freight	Inter regional	Events & Rec.
Olympic Peninsula				
US 101 – add passing lanes in strategic locations		X		X
I-5/US 101 Interchange – Improve interchange connections	X	X		X
US 101/SR 8 Interchange – Improve interchange connections		X		X
Northwest Washington				
SR 20/I-5 Interchange – Reconstruct interchange	X	X	X	X
I-5 through Mount Vernon – Add capacity to I-5	X	X	X	X
SR 20 at SR 20 Spur – Replace intersection with interchange	X	X		X
Central Puget Sound				
I-405 – Spot I/C improvements & lane additions throughout corridor	X	X	X	
SR 167 – Puyallup to Auburn – complete HOV lanes	X	X		

Example of projects that perform multiple functions