ITEM 10 - Information
October 17, 2007

Review of Texas Transportation Institute's (TTI)
2007 Urban Mobility Report

Staff Recommendation: Receive briefing on the TTI 2007 Urban Mobility Report

Issues: None

Background: At the September 17 TPB meeting, staff was requested to brief the Board on the TTI 2007 Urban Mobility report which received recent media attention. This report used 2005 data to estimate congestion and average peak period travel time delay for 437 of the nation's urban areas.

THE 2007 URBAN MOBILITY REPORT

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2007 Urban Mobility Report

Congestion is a problem in America's 437 urban areas and it is getting worse in regions of all sizes. Congestion caused urban Americans to travel 4.2 billion hours more and to purchase an extra 2.9 billion gallons of fuel for a congestion cost of $78 billion (Exhibit 1). This was an increase of 220 million hours, 140 million gallons and $5 billion from 2004. **THE** solution to this problem is really to consider implementing **ALL** the solutions. One lesson from more than 20 years of mobility studies is that congestion relief is not just a matter of highway and transit agencies building big projects. Those are important. But so are actions by businesses, shippers, manufacturers and employers, as well as commuters, shoppers, and travelers for all reasons. Agencies, Businesses, Commuters—as simple as A-B-C.

For the complete report and congestion data on your city, see: http://mobility.tamu.edu/ums

Many Problems, Many Solutions

There is no "wonder" technology or policy to solve the congestion problem because there is not A congestion problem. There are several problems and therefore several solutions. The *2007 Urban Mobility Report* points out that the supply of solutions is not being implemented at a rate anywhere near the rate of travel demand growth. This report and the website data describe the scope of the problem and some of the improvement strategies.

Exhibit 1. Major Findings for 2007 –
The Important Numbers for The 437 U.S. Urban Areas
(Note: Improved methodology and more urban areas than 2005 Report)

Measures of…	1982	1995	2004	2005
… Individual Traveler Congestion				
Annual delay per peak traveler (hours)	14	31	37	38
Travel Time Index	1.09	1.19	1.25	1.26
"Wasted" fuel per peak traveler (gallons)	9	21	25	26
Congestion Cost (constant 2005 dollars)	$260	$570	$680	$710
Urban areas with 40+ hours of delay per peak traveler	1	11	28	28
… The Nation's Congestion Problem				
Travel delay (billion hours)	0.8	2.5	4.0	4.2
"Wasted" fuel (billion gallons)	0.5	1.7	2.7	2.9
Congestion cost (billions of 2005 dollars)	$14.9	$45.4	$73.1	$78.2
… Travel Needs Served				
Daily travel on major roads (billion vehicle-miles)	1.67	2.79	3.62	3.73
Annual public transportation travel (billion person-miles)	35.0	36.4	44.7	45.1
… Expansion Needed to Keep Today's Congestion Level				
Lane-miles of freeways and major streets added every year	19,233	17,254	15,677	16,203
Daily public transportation riders added every year (million)	14.5	14.9	16.0	16.5
… The Effect of Some Solutions				
Travel delay saved by				
Operational treatments (million hours)	N/A	N/A	270	292
Public transportation (million hours)	255	396	543	541
Congestion costs saved by				
Operational treatments (billions of 2005 dollars)	N/A	N/A	$5.0	$5.4
Public transportation (billions of 2005 dollars)	$4.9	$7.4	$10.1	$10.2

N/A – No Estimate Available Pre-2000 data do not include effect of operational strategies.
Travel Time Index (TTI) – The ratio of travel time in the peak period to travel time at free-flow conditions. A Travel Time Index of 1.35 indicates a 20-minute free-flow trip takes 27 minutes in the peak.
Delay per Peak Traveler – The extra time spent traveling at congested speeds rather than free-flow speeds divided by the number of persons making a trip during the peak period.
Wasted Fuel – Extra fuel consumed during congested travel.
Vehicle-miles – Total of all vehicle travel (10 vehicles traveling 9 miles is 90 vehicle-miles).
Expansion Needed – Either lane-miles or daily riders to keep pace with travel growth (and maintain congestion).

Since You Asked,
Here's Why the Numbers Are Different

Each year the *Urban Mobility Report* revises procedures and improves the processes and data used in the estimates. With sponsorship from the National Cooperative Highway Research Program of the Transportation Research Board (*1*), the methodology was significantly revised in 2006 and 2007 to take advantage of new studies and detailed data sources that have not been available in previous studies. Some key changes for this year and their general effects are summarized in Exhibit 2. All of the congestion statistics in the *2007 Urban Mobility Report* have been revised for all years from 1982 so that true trends can be identified (Exhibit 3).

- For almost all urban areas that were intensively studied, and for urban America as a whole, there was more delay, more wasted fuel and higher congestion cost in 2005 than in 2004. That is the conclusion of this report—congestion is worse in urban areas of all sizes.
- The revised methodology described below, however, shows that the estimated speeds on the most congested freeways are better in the 2007 Report than in the 2005 Report. But the year-to-year congestion trends are still "up."
- The 2007 report also estimates congestion problems in all urban areas, instead of only 85 regions. The 352 added regions were mostly small areas with relatively low congestion levels. Their addition reduces the average congestion values for each person traveling in the peak period (i.e., a little more delay and a lot more people), but it also increases the total congestion estimates (i.e., a lot more people that each have a small amount of delay).
- The benefits from operational treatments and public transportation likewise appear to decline compared to the 2005 report; the actual numbers increase if the same methods are used.

More information on the methodology is included on the website at:
http://mobility.tamu.edu/ums/report/methodology.stm

Exhibit 2. Summary – Changes to the *2007 Urban Mobility Report*

Change for 2007 Report	General Effect Compared to Previous Reports
Estimate of congestion in all 437 U.S. urban areas (individual urban area estimates were only developed for 85 urban areas)	Increase the total delay, fuel and cost of congestion values. Decrease the average "per traveler" congestion values.
Minor arterial street congestion estimate	Increase delay, fuel and cost values.
High-occupancy vehicle lane statistics	Better estimate of regional congestion
Improve freeway speed estimate	Reduce delay, fuel and cost values. Also caused lower benefits for operations treatments & public transportation service (lower initial delay results in lower delay benefits).
Improve population estimate in some regions	Better estimate of congestion effects on individuals
Use truck percentages for each road	Better estimate than previous 5 percent value for all regions
Use average of daily fuel prices for each state	Better estimate than previous sample of fuel prices
Seattle region moved to Very Large population group	All historical population group statistics revised to include Seattle in the Very Large group

Exhibit 3. National Congestion Measures, 1982 to 2005

						Hours Saved (million hours)		Gallons Saved (million gallons)		Dollars Saved (billions of 2005$)	
Year	TTI	Delay per Traveler (hours)	Total Delay (billion hours)	Total Fuel Wasted (billion gallons)	Total Cost ($2005 billion)	Operational Treatments & High-Occupancy Vehicle Lanes	Public Transp	Operational Treatments & High-Occupancy Vehicle Lanes	Public Transp	Operational Treatments & High-Occupancy Vehicle Lanes	Public Transp
1982	1.09	14	0.8	0.5	16.2		255		151		4.9
1983	1.09	15	0.9	0.5	16.2		259		154		5.0
1984	1.10	16	1.0	0.6	17.7		266		160		5.0
1985	1.11	18	1.1	0.7	20.5		280		169		5.3
1986	1.13	21	1.3	0.8	23.1		268		167		5.0
1987	1.14	22	1.4	0.9	25.8		277		173		5.1
1988	1.16	25	1.7	1.1	29.7		342		212		6.3
1989	1.17	27	1.8	1.2	32.9		363		227		6.7
1990	1.18	27	1.9	1.3	35.5		367		232		6.9
1991	1.18	28	2.0	1.3	35.8		366		233		6.8
1992	1.18	29	2.1	1.4	38.0		367		233		6.8
1993	1.18	30	2.2	1.5	40.1		367		232		6.8
1994	1.18	30	2.3	1.5	41.9		381		240		7.0
1995	1.19	31	2.5	1.7	45.4		396		251		7.4
1996	1.20	33	2.7	1.8	48.5		403		258		7.5
1997	1.21	34	2.8	1.9	51.3		421		269		7.8
1998	1.22	34	3.0	2.0	53.2		447		285		8.2
1999	1.23	35	3.2	2.1	57.2		471		304		8.7
2000	1.22	34	3.2	2.2	57.6	175	497	92	311	3.2	9.1
2001	1.23	35	3.3	2.3	60.4	197	517	104	325	3.6	9.5
2002	1.24	35	3.5	2.4	63.9	220	520	116	326	4.0	9.5
2003	1.24	36	3.7	2.5	67.2	247	508	130	319	4.5	9.3
2004	1.25	37	4.0	2.7	73.1	270	543	140	340	5.0	10.1
2005	1.26	38	4.2	2.9	78.2	292	541	147	340	5.4	10.2

Note: For more congestion information see Table 1 to 8 and http://mobility.tamu.edu/ums

Change Highlights—Additions to Congestion Estimates

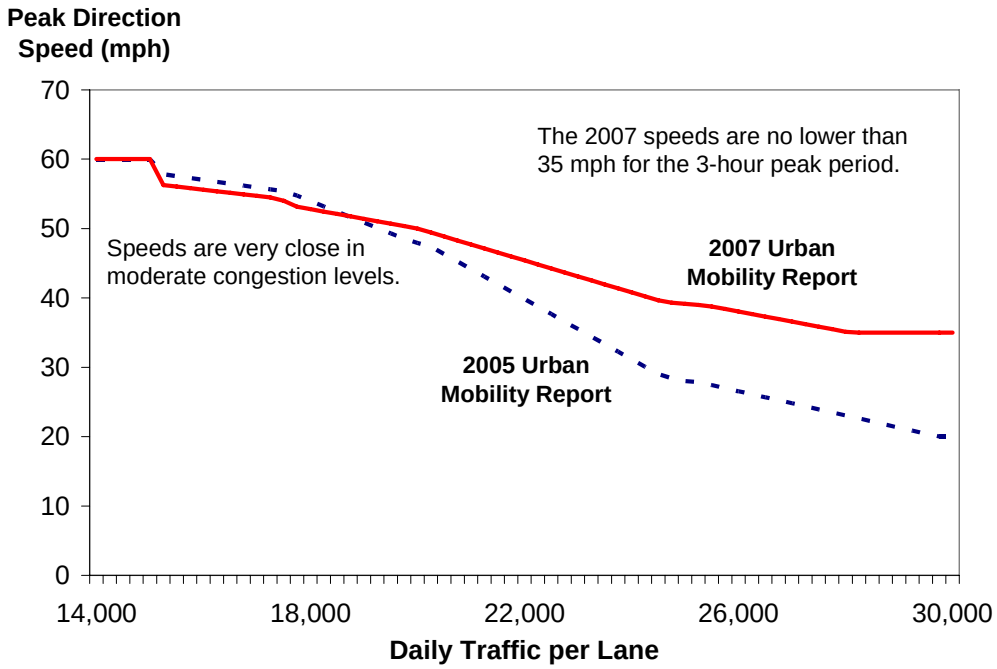
- National estimate of congestion and costs – The 352 areas that are not intensively studied were grouped together and congestion estimates were developed to describe the congestion problem in the nation's 437 urban areas (*2*). Adding these urban areas increased the total number of peak-period travelers included in the analysis from 82.1 million in the 85 urban areas to 110.5 million in the 437 urban areas. This change increases the total delay but, because the smaller areas are much less congested than the large regions, it reduces the average hours of delay per traveler.
- Minor arterial congestion – As major roads became congested, minor road traffic volumes have increased. The estimates of congestion are more complete with these streets included in the arterial category for the *2007 Urban Mobility Report*.
- HOV travel – Buses and carpools traveling in reserved lanes provide one solution that is successful in many urban corridors. In some cases these lanes can also be used by single travelers who pay a fee. The person volume and travel speed statistics from operational evaluations in 70 corridors have been included in the urban area congestion estimates.

Change Highlights—Changes to Congestion Methodology

- Freeway speed estimate – Data from freeway operation centers have become available in many travel corridors over the last few years. While the data are not complete enough to use as a direct measure of congestion in all 85 areas, it was used to update the estimation procedures. In general, the very low speeds used in previous studies are not sustained for an entire peak period in most freeway corridors (Exhibit 4). The detailed data show that freeways carry more vehicles at higher speeds than models previously estimated. In addition, traffic growth in the faster flowing off-peak direction has been greater than growth in the slower speed peak direction. The average traffic speed for all lanes, therefore, has not declined as much as previous models predicted. The congestion estimates for all urban areas are lower because of this change, but in most cases the trends have not changed from previous studies.
- Population estimate – Urban area populations are not updated by all state departments of transportation (DOTs) every year in every region. As better estimates are prepared by local planners, they are incorporated into the Urban Mobility Report database, even if data from previous years must be changed.
- Truck percentages for each road – Freight congestion has become a separate issue in some communities with its own set of solutions. Truck travel estimates included in the state and local datasets have improved over the years and have replaced the previous estimate of 5 percent trucks on all urban roads.
- Average of daily fuel price – The recent fluctuations in gas prices suggested a need to include more than a small sample of fuel prices. An average of daily prices in each study state has been developed.

- Seattle region – Regions are grouped according to population. Seattle's population is now above 3 million and its statistics are now included in the Very Large group. As with similar past changes, the Large and Very Large averages for each statistic and every year have been recalculated with the new urban area groupings.

Exhibit 4. Freeway Speed – Volume Relationship



Source: Reference (*1*)

Congestion Solution Portfolio – An Overview

The problem has grown too rapidly and is too complex for only one technology or service to be "the solution" in most regions. The increasing trends also indicate the urgency of the improvement need. Major improvements can take 10 to 15 years and smaller efforts may not satisfy all the needs.

So we recommend a ***balanced and diversified approach*** to reduce congestion. The solutions will be different depending on the state or city where they are implemented. There will also be a different mix of solutions in various parts of town depending on the type of development, the level of activity and policy or geographic constraints in particular sub-regions, neighborhoods and activity centers. Portions of a city might be more amenable to construction solutions, other areas might use more demand management, productivity improvements, diversified land use patterns or redevelopment solutions.

- **Get as much service as possible from what we have** – The billions of dollars invested in roads and public transportation systems provide a good starting place, but only a start. If those systems are not managed to serve person trips and freight shipments with safe, fast and reliable service, the return on the investment is not maximized. Many of these are low-cost improvements that typically have broad public support, like programs that rapidly remove crashed or stalled vehicles. Timing the traffic signals so that more vehicles see green lights is another relatively simple action, but one that requires periodic attention.

- **Add capacity in critical corridors** – This may be to handle freight or person travel; it could be a freeway or street, rail line, more buses or travel options; an intermodal transfer facility for freight or people; or other types of public transportation facility. More regions are also considering tolling one or more lanes as a way to pay for construction and provide high-speed and reliable trips to the public and freight shippers. The capacity expansions for people and freight might also include internet or computer systems, additional rail service, containers or other modes.

- **Relieve chokepoints in road and transit systems** – There are congested areas that may be quickly fixed by relatively small changes to designs or operating practices. Short sections of freeway, streets or public transportation systems may cause long back-ups. The solutions may be costly—such as rebuilding a freeway interchange—or they may be relatively inexpensive—adding a short section of freeway lane between an entrance and exit ramp or retiming a traffic signal to provide more time for a high-volume street.

- **Change the usage patterns** – There are many 8 to 5 or 9 to 5 jobs. School classes meet from 8:00 to 3:00 or 3:30. Combine those trips with trips to the doctor, shops and other locations and there is an easy way to understand the congestion problem—many trips trying to use the system at the same time. There are solutions that involve employers and travelers changing the time they travel. Flexible work hours allow employees to choose work schedules that meet family needs and the needs of their jobs. Using the phone, computer and internet to work from home for a few hours, or a few days each month also moves trips to off-peak hours while providing productivity benefits and lower turnover to employers and travel time benefits, stress reduction and job satisfaction improvements to employees.

- **Provide choices** – This might involve different routes, travel modes or lanes that involve a toll for high-speed and reliable service. As congestion has grown, the effect of collisions and vehicle breakdowns has become more severe because there are fewer alternative travel paths. Allowing travelers and shippers to satisfy their travel needs in ways that allow them to say, "this trip is very important and I need to get there on time" also provides an element of choice that is often lacking in current travel plans.

- **Diversify the development patterns** – Suburbs, downtowns, urban and rural areas are characterized by different arrangements of shops, offices and residential developments. The vehicle transportation requirements to serve these areas can be lessened using a variety of techniques. These typically involve denser developments with a mix of jobs, shops and homes, so that more people can walk to more destinations. They also frequently involve design elements like sidewalks, shade trees, medians, porches and parking garages or parking lots behind buildings. Shorter trips and denser developments are also conducive to using public transportation services. Sustaining the "quality of life" and gaining economic development without the typical increment of mobility decline in each of these sub-regions appear to be part, but not all, of the solution.

- **Realistic expectations** are also part of the solution. Large urban areas will be congested. Some locations near key activity centers in smaller urban areas will also be congested. But congestion does not have to be an all-day event. Identifying solutions and funding sources that meet a variety of community goals is challenging enough without attempting to eliminate congestion in all locations.

All types of programs, projects and policies should be considered. Without a detailed analysis it is impossible to say which action or set of actions will best meet the corridor or community needs. But, it is important to recognize that actions can make a difference. It is possible to at least slow the growth and in the right circumstances, such as slow or no growth in population and jobs and appropriate investment levels, reduce congestion.

Concluding Thoughts

Congestion is getting worse in many ways.

- Trips take longer.
- Congestion affects more of the day.
- Congestion affects weekend travel and rural areas.
- It affects more personal trips and freight shipments.
- Trip travel times are unreliable.

The *2007 Urban Mobility Report* points to a $78 billion congestion cost—and that is only the value of wasted time and fuel. Congestion causes the average peak-period traveler to spend an extra 38 hours of travel time, 26 gallons of fuel consumption and amounts to a cost of $710 per traveler. The report includes a more comprehensive picture of congestion in all 437 U.S. urban areas and uses an improved methodology to identify congestion effects. The report also describes the problems presented by irregular events—crashes, stalled vehicles, work zones, weather problems, special events and other causes—that result in an unreliable transportation network that causes late arrivals, shipments that miss the delivery time and inefficient manufacturing processes.

There is a cost to reducing congestion, but the benefits are enormous. According to one study, eliminating serious congestion returns eight dollars for every one spent. The benefits range from less travel time and fuel consumed, to faster and more reliable delivery times, expanded service regions and market areas; the benefit estimates do not include others such as safety and air quality that have also been shown to result.

The good news is that there are solutions that work. There are significant benefits from solving congestion problems—whether they are large or small, in big metropolitan regions or smaller urban areas and no matter the cause. There are performance measures that provide accountability to the public and decision makers and improve operational effectiveness. Detailed travel time data from freeways, streets and public transportation systems illustrate many of the traveler frustrations. Mobility reports in coming years will use more comprehensive datasets and improved analysis tools to capture traveler experience.

All of the potential congestion-reducing strategies are needed. Getting more productivity out of the existing road and public transportation systems is vital to reducing congestion and improving travel time reliability. Businesses and employees can use a variety of strategies to modify their times and modes of travel to avoid the peak periods. In many corridors, however, there is a need for additional capacity to move people and freight more rapidly and reliably. Future program decisions should focus on how to use each project, program or strategy to attack the problems, and how much transportation improvement to pursue.

National Congestion Tables

Table 1. Key Mobility Measures, 2005

Urban Area	Annual Delay per Traveler		Travel Time Index		Wasted Fuel per Traveler	
	Hours	Rank	Value	Rank	Gallons	Rank
Very Large Average (14 areas)	54		1.38		38	
Los Angeles-LBch-Santa Ana, CA	72	1	1.50	1	57	1
San Francisco-Oakland, CA	60	2	1.41	3	47	2
Washington, DC-VA-MD	60	2	1.37	7	43	5
Atlanta, GA	60	2	1.34	11	44	3
Dallas-Fort Worth-Arlington, TX	58	5	1.35	9	40	7
Houston, TX	56	7	1.36	8	42	6
Detroit, MI	54	8	1.29	21	35	10
Miami, FL	50	11	1.38	6	35	10
Phoenix, AZ	48	15	1.31	15	34	13
Chicago, IL-IN	46	16	1.47	2	32	17
New York-Newark, NY-NJ-CT	46	16	1.39	5	29	23
Boston, MA-NH-RI	46	16	1.27	25	31	19
Seattle, WA	45	19	1.30	17	34	13
Philadelphia, PA-NJ-DE-MD	38	33	1.28	23	24	34
Large Average (25 areas)	37		1.24		25	
San Diego, CA	57	6	1.40	4	44	3
San Jose, CA	54	8	1.34	11	38	9
Orlando, FL	54	8	1.30	17	35	10
Denver-Aurora, CO	50	11	1.33	13	33	15
Riverside-San Bernardino, CA	49	13	1.35	9	40	7
Tampa-St. Petersburg, FL	45	20	1.28	23	28	25
Baltimore, MD	44	22	1.30	17	32	17
Minneapolis-St. Paul, MN	43	23	1.26	26	30	21
Indianapolis, IN	43	23	1.22	32	28	25
Sacramento, CA	41	27	1.32	14	30	21
Las Vegas, NV	39	29	1.30	18	27	27
San Antonio, TX	39	29	1.23	28	27	27
Portland, OR-WA	38	33	1.29	21	27	27
Columbus, OH	33	36	1.19	36	24	34
St. Louis, MO-IL	33	36	1.16	46	20	40
Virginia Beach, VA	30	42	1.18	39	20	40
Memphis, TN-MS-AR	30	42	1.13	53	16	46
Providence, RI-MA	29	44	1.16	46	17	45
Cincinnati, OH-KY-IN	27	45	1.18	39	19	42
Milwaukee, WI	19	59	1.13	53	14	52
New Orleans, LA	18	63	1.15	49	11	62
Kansas City, MO-KS	17	64	1.08	73	10	66
Pittsburgh, PA	16	67	1.09	64	9	69
Cleveland, OH	13	75	1.09	64	9	69
Buffalo, NY	11	77	1.08	73	7	76
85 Area Average	**44**		**1.30**		**31**	
Remaining Areas						
51 Urban Areas Over 250,000 Popn	22		1.15		15	
301 Urban Areas Under 250,000 Popn	20		1.12		11	
All 437 Urban Areas	**38**		**1.26**		**26**	

Very Large Urban Areas—over 3 million population. Large Urban Areas—over 1 million and less than 3 million population.

Annual Delay per Traveler – Extra travel time for peak-period travel during the year divided by the number of travelers who begin a trip during the peak period (6 to 9 a.m. and 4 to 7 p.m.). Free-flow speeds (60 mph on freeways and 35 mph on principal arterials) are used as the comparison threshold.

Travel Time Index – The ratio of travel time in the peak period to the travel time at free-flow conditions. A value of 1.35 indicates a 20-minute free-flow trip takes 27 minutes in the peak

2005 values include the effects of operational treatments.

Note: Please do not place too much emphasis on small differences in the rankings. There may be little difference in congestion between areas ranked (for example) 6th and 12th. The actual measure values should also be examined.

Also note: The best congestion comparisons use multi-year trends and are made between similar urban areas.

Table 1. Key Mobility Measures, 2005, Continued

Urban Area	Annual Delay per Traveler		Travel Time Index		Wasted Fuel per Traveler	
	Hours	Rank	Value	Rank	Gallons	Rank
Medium Average (30 areas)	28		1.16		18	
Austin, TX	49	13	1.31	15	33	15
Charlotte, NC-SC	45	20	1.23	28	31	19
Louisville, KY-IN	42	25	1.23	28	29	23
Tucson, AZ	42	25	1.23	28	26	31
Nashville-Davidson, TN	40	28	1.17	42	25	33
Oxnard-Ventura, CA	39	29	1.24	27	27	27
Jacksonville, FL	39	29	1.21	35	26	31
Raleigh-Durham, NC	35	35	1.18	39	23	37
Albuquerque, NM	33	36	1.17	42	21	39
Birmingham, AL	33	36	1.15	49	22	38
Bridgeport-Stamford, CT-NY	31	40	1.22	32	24	34
Salt Lake City, UT	27	45	1.19	36	18	44
Sarasota-Bradenton, FL	25	48	1.19	36	15	50
Omaha, NE-IA	25	48	1.16	46	15	50
Honolulu, HI	24	51	1.22	32	16	46
El Paso, TX-NM	24	51	1.17	42	16	46
Grand Rapids, MI	24	51	1.10	60	14	52
Allentown-Bethlehem, PA-NJ	22	55	1.14	51	14	52
Oklahoma City, OK	21	56	1.09	64	13	59
Fresno, CA	20	57	1.12	55	12	61
Richmond, VA	20	57	1.09	64	13	59
Hartford, CT	19	59	1.11	57	14	52
New Haven, CT	19	59	1.11	57	14	52
Tulsa, OK	19	59	1.09	64	11	62
Dayton, OH	17	64	1.10	60	11	62
Albany-Schenectady, NY	16	67	1.08	73	10	66
Toledo, OH-MI	15	71	1.09	64	9	69
Springfield, MA-CT	11	77	1.06	81	7	76
Akron, OH	10	80	1.07	76	7	76
Rochester, NY	10	80	1.07	76	7	76
Small Average (16 areas)	17		1.09		10	
Charleston-North Charleston, SC	31	40	1.17	42	19	42
Colorado Springs, CO	27	45	1.14	51	16	46
Pensacola, FL-AL	25	48	1.11	57	14	52
Cape Coral, FL	24	51	1.12	55	14	52
Little Rock, AR	17	64	1.07	76	11	62
Boulder, CO	16	67	1.10	60	9	69
Columbia, SC	16	67	1.07	76	10	66
Eugene, OR	14	72	1.10	60	8	73
Bakersfield, CA	14	72	1.09	64	8	73
Salem, OR	14	72	1.09	64	8	73
Laredo, TX	12	76	1.09	64	6	81
Beaumont, TX	11	77	1.05	84	7	76
Anchorage, AK	10	80	1.07	76	5	83
Corpus Christi, TX	10	80	1.06	81	6	81
Brownsville, TX	8	84	1.06	81	4	85
Spokane, WA	8	84	1.04	85	5	83
85 Area Average	**44**		**1.30**		**31**	
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All 437 Urban Areas	**38**		**1.26**		**26**	

Medium Urban Areas—over 500,000 and less than 1 million population. Small Urban Areas—less than 500,000 population.
Annual Delay per Traveler – Extra travel time for peak-period travel during the year divided by the number of travelers who begin a trip during the peak period (6 to 9 a.m. and 4 to 7 p.m.). Free-flow speeds (60 mph on freeways and 35 mph on principal arterials) are used as the comparison threshold.
Travel Time Index – The ratio of travel time in the peak period to the travel time at free-flow conditions. A value of 1.35 indicates a 20-minute free-flow trip takes 27 minutes in the peak.
2005 values include the effects of operational treatments.
Note: Please do not place too much emphasis on small differences in the rankings. There may be little difference in congestion between areas ranked (for example) 6th and 12th. The actual measure values should also be examined.
Also note: The best congestion comparisons use multi-year trends and are made between similar urban areas.

Performance Measure Summary

There are several inventory and performance measures listed in the pages of this Urban Area Report for the years from 1982 to 2005. There is no single performance measure that experts agree "says it all." The best comparison of congestion levels and trends is done between regions of similar size, over several years, and with a few measures of congestion aspects. Examining a few measures over many years reduces the chance that data variations or the estimating procedures may have caused a "spike" in any single year. A few key points should be recognized by users of the Urban Mobility Report data.

Use the Trends – The multi-year performance measures are better indicators, in most cases, than any single year. (*5 years is 5 times better than 1 year*).

Use several measures – Each performance measure illustrates a different element of congestion. (*The view is more interesting from the top of a few measures*).

Compare to similar regions – Congestion analyses that compare areas with similar characteristics (for example population, growth rate, road and public transportation system design) are usually more insightful than comparisons of different regions. (*Los Angeles is not Peoria*).

Compare ranking changes and performance measure values – In some performance measures a small change in the value may cause a significant change in rank from one year to the next. This is the case when there are several regions with nearly the same value. (*15 hours is only 1 hour more than 14 hours*).

Consider the scope of improvement options – Any improvement project in a corridor within most of the regions will only have a modest effect on the regional congestion level. (*To have an effect on areawide congestion, there must be significant change in the system or service*).

Comparison of Several Key Mobility Performance Measures
Very Large Group – over 3 million population urban areas

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	1982 to 2005	
				Delay per Traveler	Total Delay
New York-Newark, NY-NJ-CT	L	0	H+	0	F+
Los Angeles-Long Beach-Santa Ana, CA	H+	H+	H+	S	F+
Chicago, IL-IN	L	H+	H	0	F+
Miami, FL	L	0	L	0	0
Philadelphia, PA-NJ-DE-MD	L-	L-	L-	S-	S-
Dallas-Fort Worth-Arlington, TX	H	L	L	F+	F
Washington, DC-VA-MD	**H**	**0**	**L**	**F+**	**S-**
Atlanta, GA	H	L	L	0	S-
San Francisco-Oakland, CA	H	H	L	F	S-
Boston, MA-NH-RI	L	L-	L-	0	S-
Detroit, MI	0	L-	L-	S	S-
Houston, TX	H	0	L-	S	S-
Phoenix, AZ	L	L	L-	S-	S-
Seattle, WA	L-	L-	L-	0	S-

0 – Average congestion levels or average congestion growth
H Higher congestion; H+ Much higher congestion; F Faster congestion growth; F+ Much faster growth
L Lower congestion; L- Much lower congestion; S Slower congestion growth; S- Much slower growth

Performance Measures and Definition of Terms

Travel Time Index – A measure of congestion that focuses on each trip and each mile of travel. The ratio of travel time in the peak period to travel time in free-flow. A value of 1.30 indicates a 20-minute free-flow trip takes 26 minutes in the peak.

Peak Travelers – Number of travelers (using any travel mode) who begin a trip during the morning or evening peak travel periods (6 to 9 a.m. and 4 to 7 p.m.).

Annual Delay per Traveler – A yearly sum of all the per-trip delays. This measure illustrates the effect of the per-mile congestion as well as the length of each trip. The extra time required to travel in the peak period is divided by the number of travelers who begin a trip during the peak period (6 to 9 a.m. and 4 to 7 p.m.).

Total Delay – The overall size of the congestion problem. Measured by the total travel time above that needed to complete a trip at free-flow speeds. The ranking of total delay usually follows the population ranking (larger regions usually have more delay).

Free-Flow Speeds (60 mph on freeways and 35 mph on arterials) – These values are used as the national comparison thresholds. Other speed values may be appropriate for urban areas or sub-regions.

Excess Fuel Consumed – Increased fuel consumption due to travel in congested conditions rather than free-flow conditions.

Public Transportation – Regular route service from all public transportation providers in an urban area.

Operations Treatments – Freeway incident management, freeway ramp metering, arterial street signal coordination and arterial street access management.

Congestion Cost – Value of travel delay for 2005 (estimated at $14.60 per hour of person travel and $77.10 per hour of truck time) and excess fuel consumption (estimated using state average cost per gallon).

Annual Increase Needed to Maintain Constant Congestion Level – Number of lane-miles that must be added to the road system each year – or – the number of new transit riders or carpoolers that must be added to keep congestion levels the same as the previous year.

Urban Area – The developed area (population density more than 1,000 persons per square mile) within a metropolitan region. The urban area boundaries change frequently (every year for most growing areas). The annual change in miles traveled, therefore, includes both new travel due to growth and travel that previously occurred in areas designated as rural.

Number of Rush Hours – Time when system might have congestion

Key Mobility Performance Measure Labels

Note: Designation of an urban area congestion problem as “Much higher”, “Much faster growth”, etc. is determined using a general indicator of the accuracy of the congestion estimates. For regions with the same indicator label, there may be no difference in congestion levels. Different values are used for the indicators in regions over 1 million population and below 1 million population.

Measures	Differences Within These Values May Not Indicate a Difference in Congestion Level	
2005 Values	**Above 1M Population**	**Below 1M Population**
Delay per Traveler -	5 Hours	3 Hours
Travel Time Index -	5 Index Points	3 Index Points
Total Delay -	5 Hours x Average Population	3 Hours x Average Population
1982 to 2005 Trends		
Delay per Traveler -	5 Hours	3 Hours
Total Delay -	5 Hours x Average Population	3 Hours x Average Population

The Mobility Data for Washington, DC-VA-MD

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	4,280	4,275	4,250	4,185	4,030	3,900
Rank	7	7	7	7	8	9
Urban Area (square miles)	1,310	1,310	1,305	1,270	1,230	1,200
Popn Density (persons/sq mile)	3,267	3,263	3,257	3,295	3,276	3,250
Peak Travelers (1000s)	2,131	2,120	2,100	2,072	1,999	1,938
Freeway						
Daily Vehicle-Miles of Travel (1000s)	38,580	38,200	37,815	36,200	35,770	34,535
Lane Miles	2,050	2,050	2,040	1,970	1,970	1,960
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	41,195	40,960	40,395	38,385	36,000	35,395
Lane Miles	6,100	5,945	5,915	5,850	5,800	5,740
Public Transportation						
Annual Psgr-Miles of Travel (millions)	2,195	2,267	2,193	2,156	2,055	1,854
Annual Unlinked Psgr Trips (millions)	462	443	434	430	415	381
Cost Components						
Value of Time ($/hour)	14.60	14.10	13.75	13.45	13.25	12.85
Commercial Cost ($/hour)	77.10	74.60	72.65	71.05	69.95	68.00
Fuel Cost ($/gallon)	2.40	2.04	1.62	1.53	1.75	1.61
System Performance						
Congested Travel (% of peak VMT)	81	81	81	80	79	74
Congested System (% of lane-miles)	63	63	63	63	63	59
Congested Time (number of "Rush Hours")	8.0	8.0	7.8	7.8	7.8	7.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	218	219	204	152	94	82
Transit Riders or Carpoolers (millions)	74	75	70	51	30	26
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	90,861	90,260	88,867	83,650	77,626	70,687
Rank	9	8	7	7	7	7
Fuel per Peak Traveler (gallons)	43	43	42	40	39	36
Rank	5	5	3	4	5	6
Annual Delay						
Total Delay (1000s of person-hours)	127,394	126,341	124,738	117,397	109,143	101,155
Rank	8	7	5	6	6	8
Delay per Peak Traveler (person-hrs)	60	60	59	57	55	52
Rank	2	3	3	4	5	6
Delay due to Incidents (percent)	51	50	50	50	50	50
Travel Time Index	1.37	1.37	1.37	1.36	1.35	1.33
Rank	7	5	4	4	3	4
Congestion Cost						
Total Cost ($ millions)	2,331	2,210	2,099	1,927	1,783	1,596
Rank	8	7	6	7	7	8
Cost per Peak Traveler ($)	1,094	1,042	1,000	930	892	823
Rank	4	4	3	5	5	7

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Washington, DC-VA-MD, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	3,885	3,800	3,660	3,570	3,510	3,480
Rank	9	10	10	10	9	9
Urban Area (square miles)	1,160	1,125	1,085	1,040	1,000	995
Popn Density (persons/sq mile)	3,349	3,378	3,373	3,433	3,510	3,497
Peak Travelers (1000s)	1,935	1,892	1,826	1,785	1,759	1,743
Freeway						
Daily Vehicle-Miles of Travel (1000s)	33,975	33,930	33,340	33,045	32,460	31,565
Lane Miles	1,950	1,935	1,930	1,925	1,920	1,915
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	35,165	34,965	34,370	34,575	33,880	34,080
Lane Miles	5,665	5,600	5,550	5,440	5,385	5,270
Public Transportation						
Annual Psgr-Miles of Travel (millions)	1,703	1,679	1,499	1,435	1,701	1,595
Annual Unlinked Psgr Trips (millions)	387	369	323	318	370	343
Cost Components						
Value of Time ($/hour)	12.40	12.15	12.00	11.70	11.40	11.05
Commercial Cost ($/hour)	65.80	64.35	63.40	61.95	60.20	58.50
Fuel Cost ($/gallon)	1.10	1.11	1.21	1.32	1.24	1.10
System Performance						
Congested Travel (% of peak VMT)	73	71	73	73	71	70
Congested System (% of lane-miles)	59	59	59	59	58	61
Congested Time (number of "Rush Hours")	7.6	7.6	7.6	7.6	7.6	7.4
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	79	152	225	352	414	429
Transit Riders or Carpoolers (millions)	25	48	71	112	130	136
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	72,603	67,625	68,790	68,992	63,690	61,371
Rank	6	6	5	5	5	5
Fuel per Peak Traveler (gallons)	38	36	38	39	36	35
Rank	6	6	6	4	4	5
Annual Delay						
Total Delay (1000s of person-hours)	106,382	97,902	100,519	100,555	93,939	91,314
Rank	6	7	4	5	5	5
Delay per Peak Traveler (person-hrs)	55	52	55	56	53	52
Rank	5	7	5	5	5	4
Delay due to Incidents (percent)	50	50	50	50	51	52
Travel Time Index	1.35	1.33	1.34	1.34	1.32	1.31
Rank	3	4	2	3	3	3
Congestion Cost						
Total Cost ($ millions)	1,585	1,440	1,467	1,441	1,306	1,223
Rank	7	7	5	5	6	5
Cost per Peak Traveler ($)	819	761	803	807	743	702
Rank	7	8	6	6	7	7

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Washington, DC-VA-MD, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	3,420	3,300	3,250	3,100	3,080	3,040
Rank	9	10	10	10	10	10
Urban Area (square miles)	975	925	920	840	835	830
Popn Density (persons/sq mile)	3,508	3,568	3,533	3,690	3,689	3,663
Peak Travelers (1000s)	1,717	1,660	1,638	1,566	1,540	1,505
Freeway						
Daily Vehicle-Miles of Travel (1000s)	29,320	27,985	26,000	25,080	24,590	23,455
Lane Miles	1,900	1,825	1,750	1,675	1,600	1,500
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	33,035	30,420	27,525	25,305	24,530	24,045
Lane Miles	5,250	5,210	5,180	5,145	5,125	5,105
Public Transportation						
Annual Psgr-Miles of Travel (millions)	1,447	1,559	1,642	1,713	1,640	1,607
Annual Unlinked Psgr Trips (millions)	353	354	383	376	370	354
Cost Components						
Value of Time ($/hour)	10.75	10.50	10.25	10.00	9.25	8.80
Commercial Cost ($/hour)	57.05	55.40	53.80	51.60	48.95	46.70
Fuel Cost ($/gallon)	1.12	1.18	1.12	1.08	1.10	1.02
System Performance						
Congested Travel (% of peak VMT)	69	70	67	66	69	67
Congested System (% of lane-miles)	61	61	61	61	62	61
Congested Time (number of "Rush Hours")	7.2	7.2	6.8	6.6	6.8	6.8
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	400	335	269	300	383	442
Transit Riders or Carpoolers (millions)	121	96	72	77	97	110
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	58,458	55,584	46,952	41,965	41,857	38,163
Rank	6	6	6	6	6	6
Fuel per Peak Traveler (gallons)	34	33	29	27	27	25
Rank	6	7	8	9	9	7
Annual Delay						
Total Delay (1000s of person-hours)	87,187	82,211	69,538	62,309	61,325	56,253
Rank	6	6	6	6	6	6
Delay per Peak Traveler (person-hrs)	51	50	42	40	40	37
Rank	7	6	8	9	9	8
Delay due to Incidents (percent)	52	52	52	52	53	53
Travel Time Index	1.31	1.31	1.29	1.27	1.28	1.26
Rank	3	3	4	5	4	5
Congestion Cost						
Total Cost ($ millions)	1,138	1,048	866	750	691	600
Rank	6	6	6	6	6	6
Cost per Peak Traveler ($)	663	631	529	479	449	399
Rank	6	7	8	11	9	9

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Washington, DC-VA-MD, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	2,980	2,920	2,860	2,810	2,780	2,700
Rank	10	9	9	9	9	9
Urban Area (square miles)	820	815	810	805	800	795
Popn Density (persons/sq mile)	3,634	3,583	3,531	3,491	3,475	3,396
Peak Travelers (1000s)	1,463	1,422	1,379	1,343	1,318	1,266
Freeway						
Daily Vehicle-Miles of Travel (1000s)	22,365	21,345	19,460	18,015	16,255	15,200
Lane Miles	1,425	1,345	1,290	1,285	1,260	1,230
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	23,930	22,885	21,165	19,230	18,105	17,375
Lane Miles	5,065	5,015	4,960	4,940	4,900	4,850
Public Transportation						
Annual Psgr-Miles of Travel (millions)	1,456	1,360	1,258	1,163	1,163	1,163
Annual Unlinked Psgr Trips (millions)	354	328	311	309	309	309
Cost Components						
Value of Time ($/hour)	8.50	8.20	8.00	7.75	7.45	7.20
Commercial Cost ($/hour)	44.85	43.30	42.50	41.05	39.35	38.10
Fuel Cost ($/gallon)	1.02	0.99	1.30	1.31	1.34	1.41
System Performance						
Congested Travel (% of peak VMT)	63	63	55	48	40	36
Congested System (% of lane-miles)	56	56	55	50	45	44
Congested Time (number of "Rush Hours")	6.8	6.8	6.2	5.4	4.6	4.2
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	473	- -	- -	- -	- -	- -
Transit Riders or Carpoolers (millions)	117	- -	- -	- -	- -	- -
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	34,104	30,957	24,811	19,479	14,294	12,373
Rank	5	7	7	7	8	9
Fuel per Peak Traveler (gallons)	23	22	18	15	11	10
Rank	5	6	7	11	16	15
Annual Delay						
Total Delay (1000s of person-hours)	51,164	46,325	38,635	30,651	23,043	20,011
Rank	6	7	7	7	8	9
Delay per Peak Traveler (person-hrs)	35	33	28	23	17	16
Rank	6	8	9	12	16	18
Delay due to Incidents (percent)	53	53	53	53	54	54
Travel Time Index	1.24	1.22	1.19	1.16	1.13	1.12
Rank	5	5	6	6	10	9
Congestion Cost						
Total Cost ($ millions)	530	464	385	297	215	182
Rank	6	7	7	7	8	10
Cost per Peak Traveler ($)	362	326	279	221	163	143
Rank	7	8	9	12	16	18

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.