September 2007

Urban Mobility Report 2007

Texas Transportation Institute

UTCM
University Transportation Center for Mobility
Texas Transportation Institute

THE 2007 URBAN MOBILITY REPORT

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September 2007

Acknowledgements

Pam Rowe—Report Preparation
Tobey Lindsey—Web Page Creation and Maintenance
Richard Cole, Rick Davenport, Bernie Fette and Michele Hoelscher—Media Relations
John Henry and Kim Miller—Cover Artwork
Dolores Hott and Nancy Pippin—Printing and Distribution
Rhonda Brinkmann—Editing

Support for this research was provided in part by a grant from the U.S. Department of Transportation, University Transportation Centers Program to the University Transportation Center for Mobility (DTRT06-G-0044).

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APTA American Public Transportation Association

ARTBA American Road & Transportation Builders Association

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

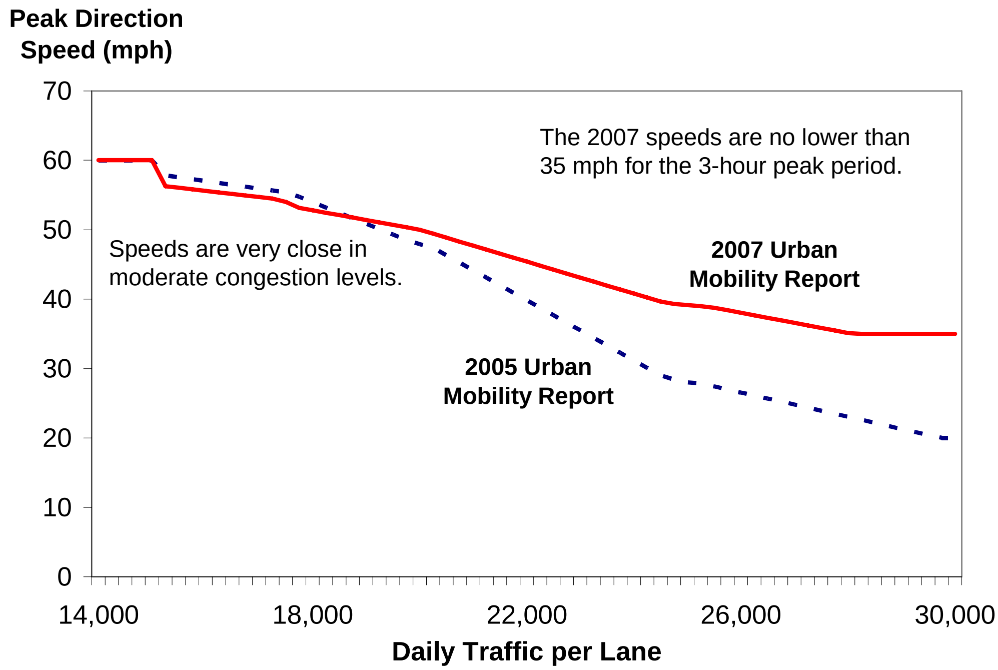
- National estimate of congestion and costs – The 352 areas that are not intensively studied were grouped together and congestion estimates were developed to describe the congestion problem in the nation's 437 urban areas (*2*). Adding these urban areas increased the total number of peak-period travelers 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*)

What Causes Congestion?

In a word, “you.” Most of the Mojave Desert is not congested. But the rural portions also support very few jobs, has hardly any schools and provides a very small contribution to the nation’s economic production. The 100 largest metropolitan regions, on the other hand, contribute 70 percent of the gross domestic product and have 69 percent of the jobs (*3*). It is not surprising that congestion exists in large areas given the number of people and the amount of freight moving in many directions over the course of two peak periods of two or three hours each. *So the first cause—many people and lots of freight moving at the same time*.

The second cause is the slow growth in supply—both roads and public transportation—in the last 20 years. Congestion has increased even though there are more roads and more transit service. Travel by public transportation riders has increased 30 percent in the 85 urban areas studied in this report. The contribution of the road growth effect to the congestion problem is difficult to estimate. The data files used for the Urban Mobility Report include the growth in urban roadway and travel that results from job and population growth, transportation investments **and** expanding urbanized area boundaries. Roads in areas that were rural are re-designated as urban, causing the “urban” lane-miles to grow even if there are no roads constructed. But even given this shortcoming, the differences are dramatic— travel has increased 105 percent in big metro regions while road capacity on freeways and major streets has grown by only 45 percent. *Too many people, too many trips over too short of a time period on a system that is too small—not really a new observation* (*2*,*4*).

A third factor causes many trips to be delayed by events that are irregular, but frequent. Crashes, vehicle breakdowns, improperly timed traffic signals, special events and weather are factors that cause a variety of traffic congestion problems. The effect of these events are made worse by the increasing travel volumes. *The solutions to each of these problems are different and are usually a combination of policies, practices, equipment and facilities*.

The commuting *uber reference*, *Commuting in America III* (*5*) confirmed the lengthening commute times, with average travel time to work growing 2 minutes (to 25.5 minutes) from 1990 to 2000, following a 1.7 minute increase in the decade before. This two-decade trend in commuting time growth raises concerns when compared to the growth in commuter volume—23 million more solo drivers in the 80s, but only 13 million more single drivers in the 90s. A greater growth in travel time with substantially fewer additional trips suggests that the transportation capacity built in earlier decades is being “used up.”

The proportion of commute trips going from one county to another and from one suburb to another has increased significantly. The long commutes—*Commuting in America III* labels a one-way trip over 1 hour as “extreme”—increased from 6 percent of commute trips to 8 percent. Over 12 percent of commuters in the largest metropolitan regions (over 5 million) had trips lengths beyond 60 minutes. With this as an alternative, it is not surprising that working at home and leaving for work before 6 a.m. also saw substantial increases.

The Congestion Problems

Travelers and shippers must plan around traffic jams for more of their trips, in more hours of the day and in more parts of town than in 1982. In some locations, this includes weekends and rural areas. Mobility problems have increased at a relatively consistent rate during the more than two decades studied.

Congestion wastes a lot of time, fuel and money. In 2005,

- 2.9 billion gallons of wasted fuel (enough to fill 58 supertankers)
- 4.2 billion hours of extra time (enough to fill 260 million iPod Shuffles™ with music)
- $78 billion of delay and fuel cost (enough to buy $78 billion of something)

The effect of uncertain or longer delivery times, missed meetings, business relocations and other congestion results are not included.

Congestion costs are increasing. The congestion "invoice" for the cost of extra time and fuel in 437 urban areas (all values in constant 2005 dollars),

- In 2005 – $78 billion
- In 2004 – $73 billion
- In 1982 – $15 billion

Congestion affects the people who typically make trips during the peak period.

- Yearly delay for the peak-period traveler was 38 hours in 2005—almost one week of vacation—an increase from 14 hours in 1982 (Exhibit 5).
- That traveler wasted 26 gallons of fuel in 2005—three weeks worth of gasoline for the average U.S. resident—up from 9 gallons in 1982 (Exhibit 6).
- Congestion effects were even larger in areas over one million persons—48 hours and 34 gallons in 2005.

The value for the delay and wasted fuel was $710 per traveler in 2005 compared to an inflation-adjusted $260 in 1982.

Exhibit 5. Hours of Travel Delay per Peak-Period Traveler

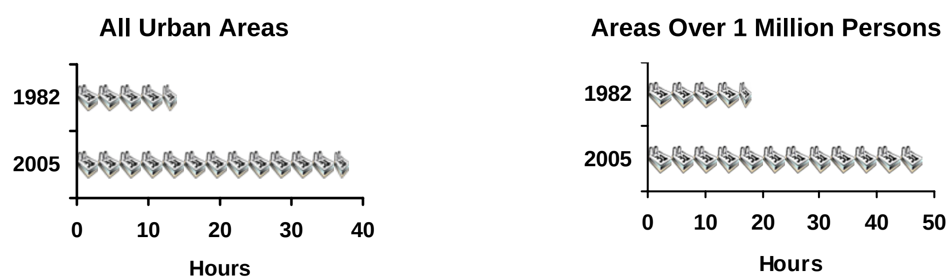
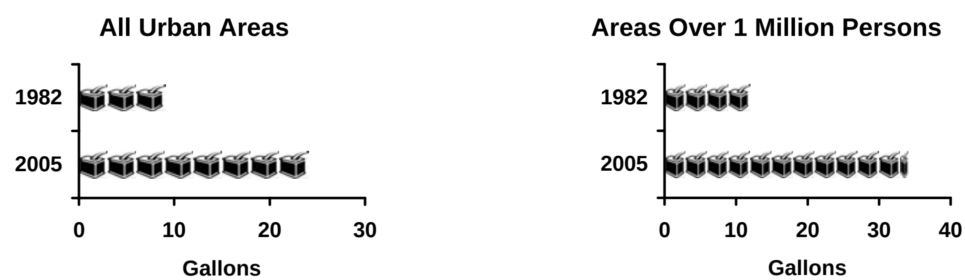


Exhibit 6. Gallons of Fuel Wasted per Peak-Period Traveler



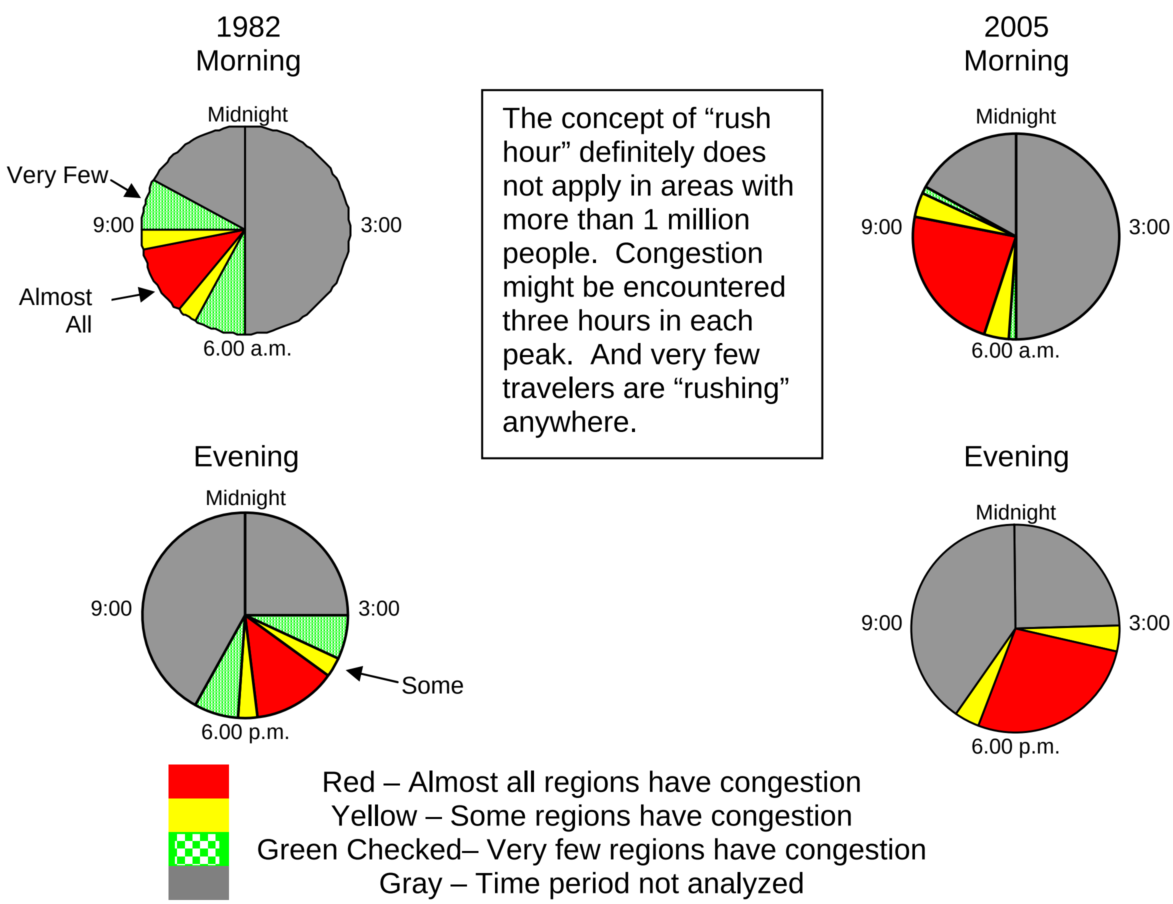
Think of what else could be done with the 38 hours of extra congestion suffered by the average urban traveler in 2005.

- Almost 5 vacation days
- Approximately 20 movies (but not including previews of other movies)
- More than 120 summer sunburns

The Jam Clock (Exhibit 7) depicts the growth of congested periods within the morning and evening "rush hours."

Exhibit 7. The Jam Clock

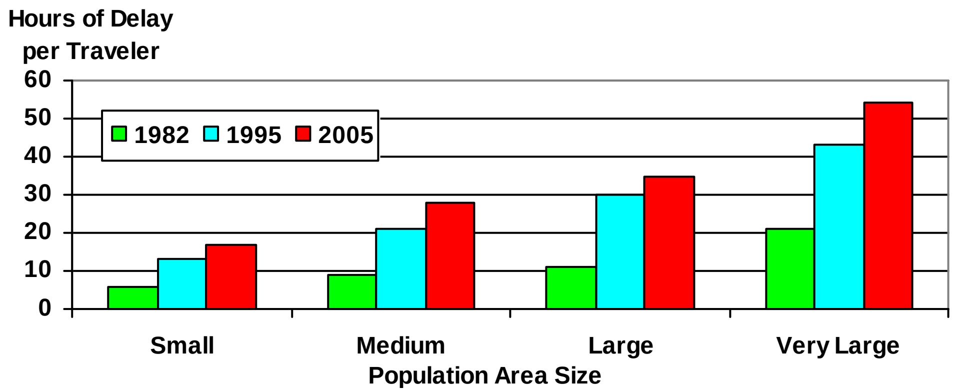
The Time of Day when Congestion Might Exist
(in urban areas with more than 1 million people)



Note: The *2007 Urban Mobility Report* examined 6 to 10 a.m. and 3 to 7 p.m.

Congestion is worse in areas of every size (Exhibit 8)

Exhibit 8. Congestion Growth Trend

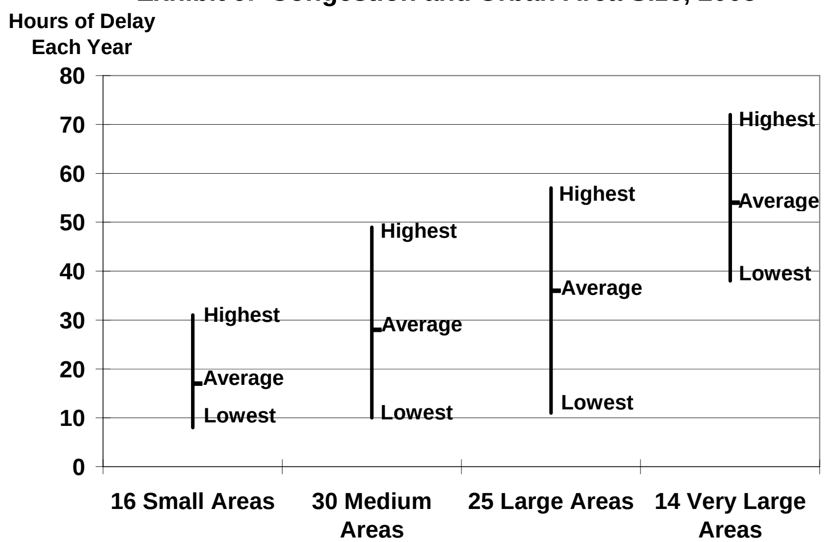


Small = less than 500,000   Large = 1 million to 3 million
Medium = 500,000 to 1 million   Very Large = more than 3 million

The delay statistics in Exhibit 8 point to the importance of action. Major projects, programs and funding efforts take 10 to 15 years to develop. In that time, congestion endured by travelers and businesses grow to those of the next largest population group. So in ten years, cities with 500,000 to 1 million people will have the traffic problems that areas over 1 million people have now, if actions are not taken to change the trends.

Congestion levels vary in cities of the same size. Exhibit 9 shows the wide range in congestion problems in each of the four urban size groups. In the three largest groups, there is a difference of at least 30 hours of delay per traveler between the most and least congested regions. Certainly there is some natural variation due to geographic, economic and weather conditions.

Exhibit 9. Congestion and Urban Area Size, 2005

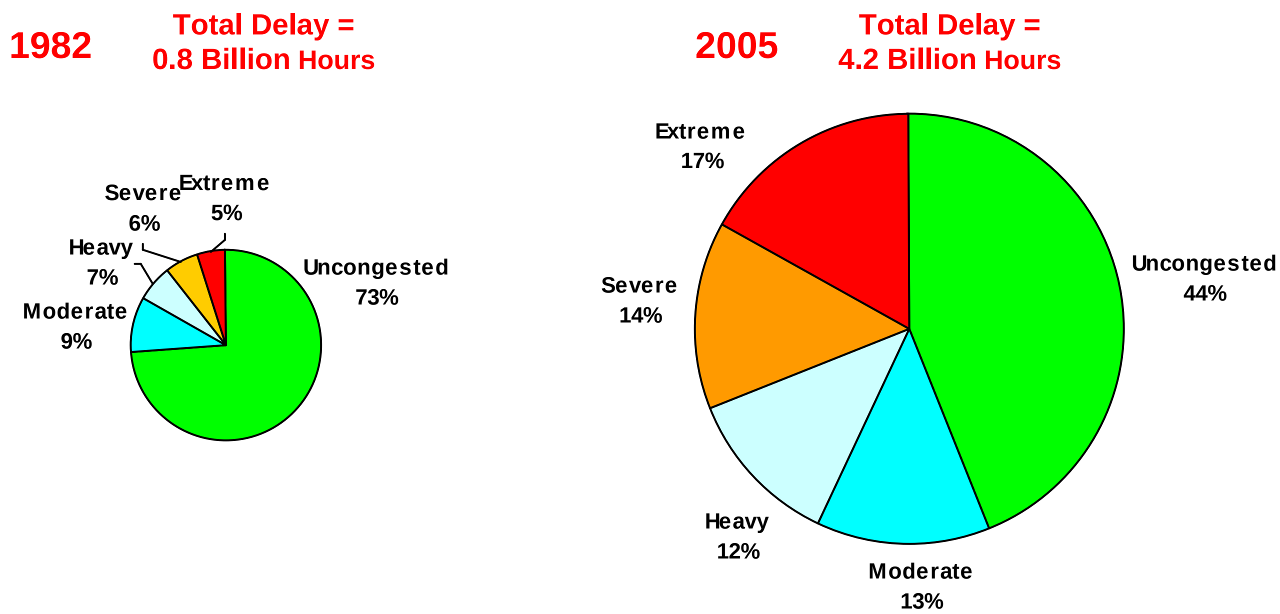


Some of the differences are also the result of decisions by the public about transportation funding levels, mobility goals and what type of projects, programs and policies they support to address congestion problems. The answer is not to grade every city, every project and every hour of delay on the same scale, but rather to identify the community goals, benefits and costs and decide how to reach the mobility targets.

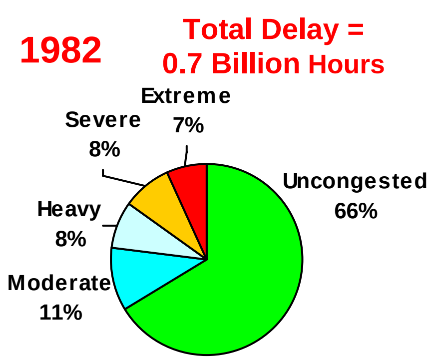
Travelers and shippers must plan around congestion more often.

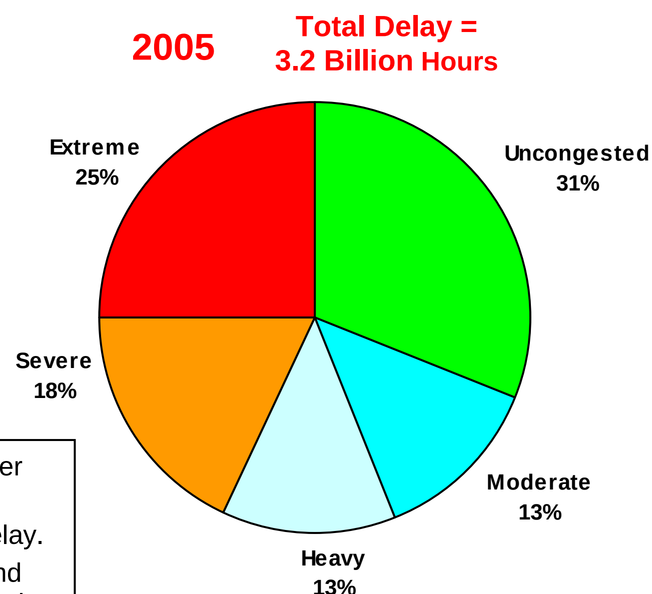
- In all 437 urban areas, the worst congestion levels affected (Exhibit 10) only 1 in 9 trips in 1982, but 1 in 3 trips in 2005.
- Free-flowing traffic is seen less than one-third of the time in urban areas over 1 million population.
- Delay is five times larger overall and is six times higher in regions with fewer than 1 million people.

Exhibit 10. Congestion Growth – 1982 to 2005



Urban Areas Over 1 Million Population





But the problem could be even worse in the regions over 1 million population.

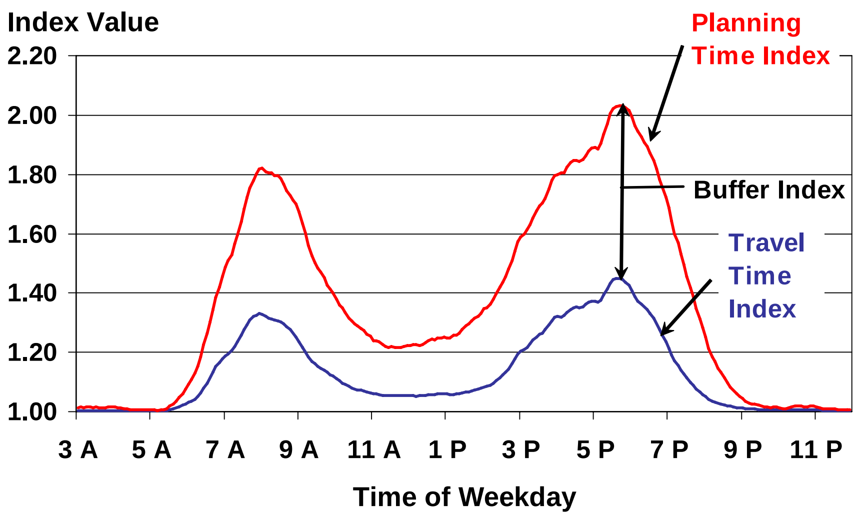
- Operational treatments save 259 million hours of delay.
- And if there were no public transportation service and travelers used their cars, there would be an additional 493 million hours of delay.

Unreliable Travel Times – One of the Congestion Problems

You have an important family event at home at 5:45 p.m. Your normal commute time is 30 to 35 minutes. But you also know that your travel time varies. The problem is that crashes, vehicle breakdowns, road work, weather and variations in daily traffic volume all change the commute from day to day. In order to arrive before the event starts, you must plan for extra travel time. This extra time, or "buffer time," is part of the congestion problem—unreliability.

The Planning Time Index is similar to the Travel Time Index except that the PTI indicates the travel time needed to make your destination on time 19 days out of 20—essentially the worst weekday of the month (*6*). An Index value of 2.0, for example, would mean that you should allow twice as much time for an important trip as your travel time in uncongested conditions. The difference between the average time and the planning time is a reliability measure termed the "Buffer Index." (Exhibit 11) In general, the Buffer Index goes up in the peak periods, indicating reliability problems and congestion occur at the same time and explaining why so much extra travel time has to be planned.

Exhibit 11. The Extra "Buffer" Time Needed When Planning Important Trips



Source: Reference (*7*)

According to data from some of the freeways in 19 metropolitan regions (Exhibit 12), travelers and freight shippers should plan on twice as much extra travel time if they have an important trip as they would allow in average conditions. For example, in Phoenix a 20-minute free-flow trip takes an average of almost 28 minutes. On one weekday out of 20 (essentially the worst travel day of the month) that trip will take 36 minutes. The frustrating and economically damaging part of this doubling of the extra travel time (16 minutes vs. 8 minutes more than the free-flow travel time of 20 minutes) is that we cannot know which day that is and how it might affect important trips or deliveries.

This distinction between "average" and "important" is crucial to understanding the role of the solutions described in the next few pages. Some strategies reduce congestion for all travelers and at all times on every day. Other strategies provide options that some travelers, manufacturers or freight shippers might choose for time-sensitive travel. Some solutions target congestion problems that occur every day and others address irregular events such as vehicle crashes that cause some of the longest delays and greatest frustrations.

Exhibit 12. You Should Plan for Much Longer Travel Times if You Wish to Arrive On-Schedule, 2007 Data

Region	Multiply the free-flow travel time by this factor to estimate the time to reach your destination:	
	In Average Conditions (Travel Time Index)	For an Important Trip (Planning Time Index)
Chicago, IL	1.48	2.07
Detroit, MI	1.24	1.65
Houston, TX	1.43	2.01
Los Angeles, CA	1.47	1.92
Minneapolis-St. Paul, MN	1.29	1.70
Orange County, CA	1.40	1.77
Philadelphia, PA	1.29	1.76
Phoenix, AZ	1.38	1.80
Pittsburgh, PA	1.28	1.70
Portland, OR	1.34	1.87
Providence, RI	1.14	1.43
Riverside-San Bernardino, CA	1.34	1.77
Sacramento, CA	1.26	1.61
Salt Lake City, UT	1.16	1.52
San Antonio, TX	1.22	1.61
San Diego, CA	1.31	1.66
San Francisco, CA	1.25	1.51
Seattle, WA	1.44	2.06
Tampa, FL	1.23	1.55

Source: Reference (*7*)

Note: Index values are a ratio of travel time in the peak to free-flow travel time. A Travel Time Index of 1.40 indicates a 20-minute off-peak trip takes 28 minutes on average. A Planning Time Index of 1.80 indicates the 20-minute off-peak trip might take 36 minutes one day each month.

Note: In most regions only a few freeways are included in this dataset. This difference in coverage and differences in the data collection devices make comparisons between the regional values in Exhibit 12 impossible. These 2007 data are only for freeways and, thus, not comparable with the areawide data included in other tables in the *2007 Urban Mobility Report.*

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.

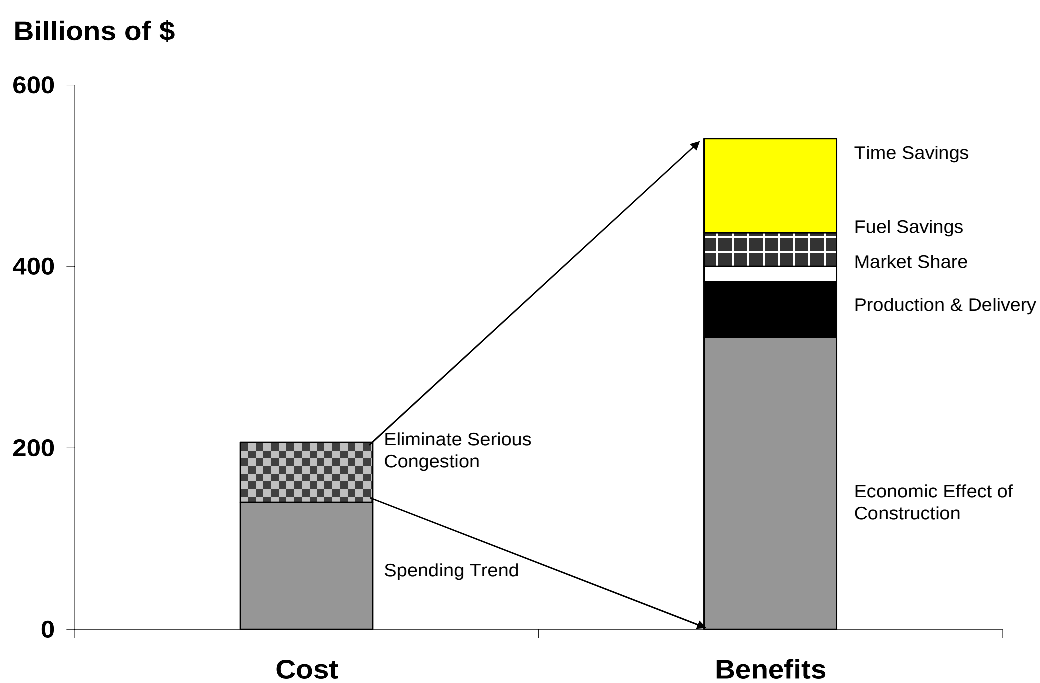
All types of programs, projects and policies should be considered. Without a detailed analysis it is impossible to say which action or set of actions will best meet the corridor or community needs. But, it is important to recognize that actions can make a difference. It is possible to at least slow the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

The Benefits of Action

Addressing the congestion problems can provide substantial benefits and provide improvements in many sectors of society and the economy. The costs involved in eliminating serious congestion problems are large and the projects, programs and policies that are implemented will require the cooperation of the public, agencies at all levels of government and, in many states, the private sector as well.

A study conducted for the Texas Governor's Business Council (*8*) estimated that solving the serious congestion problems in the state's eight largest metropolitan regions would generate $540 billion in economic benefits—including $37 billion in reduced fuel consumption and $104 billion in travel time savings (Exhibit 13). The analysis estimated almost $80 billion in business efficiencies and operating savings would result from lower congestion levels. More than $320 billion in construction effects, which include more than 110,000 jobs that would be created, were also identified.

Exhibit 13. 25-Year Costs and Benefits of Implementing Texas Metropolitan Mobility Plan



Source: Reference (*8*)

The results suggest that the congestion costs included in the *Urban Mobility Report* series are on the low side of those actually experienced. The cost of eliminating all the serious congestion in the eight regions was estimated at between $65 billion and $70 billion by a joint committee of Texas Department of Transportation and the Metropolitan Planning Organizations in each region (*9*). The combination of specific projects was left to each urban region to identify over the coming years, and the end result would not be "no congestion" but rather congestion that would only last for one hour in each commute period, rather than three or four hours.

Similar mobility planning efforts have been conducted in Atlanta, where the transportation agencies have adopted a long-term mobility goal and increased the importance of congestion relief in their project selection process (*10*). Projections of 2030 congestion levels twice the current levels are similar to many major metro regions. The selection and funding of projects will be the subject of much discussion and the type of mobility improvement strategies that will be pursued will depend on the size, character and location of the problem within the metro region.

When these types of improvement packages and mobility goals are offered by agencies that are perceived to be doing a good job with the funding and options they have, approval rates are generally high. The Washington State Legislature has approved two funding increases in the last four years for a variety of operational and infrastructure improvement programs proposed by the Washington State Department of Transportation (*11*). A transportation investment package consisting of $19.9 billion in new bond financing was approved by California voters in November 2006 (*12*). Included in both programs were a range of solutions and a commitment to transparent reporting of results and accountability to decision-makers and taxpayers for timely reporting and project completion. Both programs have mobility and other performance goals.

The purpose of a mobility planning effort is to establish a process where vision, needs and accountability drive the process of transportation improvement. Current procedures follow a process determined by the expected available funds that dictate the amount of transportation improvement projects and programs. The more aggressive mobility planning approaches address "how can we fulfill our mobility vision?" or "how can we reduce congestion?" or "how can we improve service reliability?" rather than simply "what does the funding allow?"

Improve Productivity

More efficient operation of roads and public transportation can provide more productivity from the existing system at relatively low cost. Some of these can be accelerated by information technology, some are the result of design changes and some are the result of more aggressive operating practices.

This report presents information on the effect of four prominent operational treatments which are estimated to relieve a total of 257 million hours of delay (6 percent of the total) in 2005 (Exhibit 14) with a value of $5.1 billion. If the treatments were deployed on all major freeways and streets, the benefit would expand to about 565 million hours of delay (13 percent of delay) and more than $10.5 billion would be saved. These are significant benefits, especially since these techniques can be enacted much quicker than significant roadway or public transportation system expansions can occur. But the operational treatments do not replace the need for those expansions (*13*,*14*,*15*).

Exhibit 14. Operational Improvement Summary for All 437 Urban Areas

Operations Treatment	Delay Reduction from Current Projects: Hours Saved (Million)	Delay Reduction from Current Projects: Dollars Saved ($ Million)	Possible Delay Reduction if Implemented on All Roads (Million Hours)
Ramp Metering (25)	38.6	733	106.2
Incident Management (272)	129.5	2,493	222.6
Signal Coordination (437)	21.0	451	55.5
Access Management (437)	68.2	1,376	180.2
TOTAL	257	5,053	565

Note: This analysis uses nationally consistent data and relatively simple estimation procedures. Local or more detailed evaluations should be used where available. These estimates should be considered preliminary pending more extensive review and revision of information obtained from source databases.

Note: This operational treatment benefit summary does not include high-occupancy vehicle lanes.

The Washington State DOT has implemented several of the productivity improvement programs and is acknowledged as a leader in the use of operations strategies—both at a technical and policy level. The incident management program is a combination of transportation, enforcement and emergency responder personnel who have common goals and shared responsibilities. The ramp metering system provides an ability to accommodate more vehicles, people and freight on the freeway system with fewer collisions and greater reliability. The transportation network has been examined to identify bottlenecks (chokepoints)—locations where congestion begins before the rest of the network is overloaded. Investments in solving these problem locations will allow more travelers to get through the bottlenecks before systemwide congestion becomes a problem. And as an agency, WSDOT has improved the ability to control the traffic flow to maximize safety and reliability by a variety of methods and with a variety of partnering agencies (*16*).

Freeway Entrance Ramp Metering

Entrance ramp meters regulate the flow of traffic on freeway ramps using traffic signals similar to those at street intersections. They are designed to create more space between entering vehicles so those vehicles do not collide or disrupt the mainlane traffic flow. The signals allow one vehicle to enter the freeway at some interval (for example, every two to five seconds). They also reduce the number of entering vehicles due to the short distance trips that are encouraged to use the parallel streets to avoid the ramp wait time (*17*).

The Minnesota DOT conducted an experiment that consisted of turning off the 430 ramp meters in the Minneapolis-St. Paul region for seven weeks in 2000. The results showed that there are travel time savings from operating the ramp meters, but the most dramatic change was the 26 percent increase in crashes when the meters were de-activated. There was also a 14 percent increase in the volume handled by the freeway with the meters on—the productivity improvement that operations programs seek to attain. Reducing collisions, increasing volume and improving the reliability of service on the freeway mainlanes maximizes the return from the freeway investment (*17*).

Freeway Incident Management Programs

Freeway Service Patrol, Highway Angel, Highway Helper, The Minutemen and Motorists Assistance Program are all names that have been applied to the operations that remove crashed and disabled vehicles from the freeway lanes and shoulders. They work in conjunction with surveillance cameras, cell phone incident call-in programs and other elements to remove these disruptions, decrease delay and fuel consumption and improve the reliability of the system.

The benefits of these programs can be significant. Benefit/cost ratios from the reduction in delay between 3:1 and 10:1 are common for freeway service patrols (*18*). These are achieved by a combination of additional personnel, technology and equipment deployment and interagency cooperation. The mix of agencies and jurisdictions that must work together are sometimes problematic and incident management programs cause a re-evaluation of the procedures used. Evaluations of the Maryland Coordinated Highways Action Response Team (CHART) show that the incident clearance times were reduced in patrolled areas (which is logical), but also reduced in areas without CHART patrols due to improvements in operating efficiency by all agencies (*19*).

An incident management program can also reduce “secondary” crashes—collisions within the stop-and-go traffic caused by the initial incident. Perhaps the most aggressive program in the U.S.—Houston’s SAFEclear—consists of tow trucks that respond within six minutes of notification. Quick removal of stalled vehicles and crashes, combined with the Motorist Assistance Program, has reduced collisions by more than 10 percent in the first two years of operation, saving $70 million in collision costs (*20*).

Traffic Signal Coordination Programs

Traffic signal timing can be a significant source of delay on the major street system. Much of this delay is the result of managing the flow of intersecting traffic, but some of the delay can be reduced if the traffic arrives at the intersection when the signal is green instead of red. This is difficult in a complex urban environment, and when traffic volumes are very high coordinating the signals does not work as well due to the long lines of cars already waiting to get through the intersection in both directions.

The 85 intensively studied urban areas reported some level of traffic signal coordination in 2005, with the coverage representing slightly over half of the street miles in the urban areas (*2*,*15*). Signal coordination projects have the highest percentage treatment within the urban areas studied because the technology has been proven, the cost is relatively low and the government institutions are familiar with the implementation methods.

The effect of the signal coordination projects was to reduce delay by 17 million person hours, approximately 1 percent of the street delay (*13*). While the total effect is relatively modest, the cost is relatively low and the benefits decline as the system becomes more congested. The modest effect does not indicate that the treatment should not be implemented—why should a driver encounter a red light if it is not necessary? As the National Traffic Signal Report Card (*21*) found in 2005, many cities should put more effort into maximizing the benefits from signal coordination.

Arterial Street Access Management Programs

Providing smooth traffic flow and reducing collisions are the goals of a variety of individual treatments that make up a statewide or municipal access management program. Typical treatments include:

- Combining driveways to minimize the disruptions to street traffic flow
- Increasing the spacing between intersections
- Median turn lanes or turn restrictions
- Acceleration and deceleration lanes
- Development regulations that help reduce the potential collision and conflict points

Such programs are a combination of design standards, public sector regulations and private sector development actions. Colorado and Florida have been particularly aggressive in adopting access management practices (*22*).

Access management treatments have been shown to reduce collisions, increase the number of vehicles that can use a street, reduce fuel consumption and decrease travel times by regulating the flow of traffic and reducing the number of challenging situations for drivers. The benefits estimated in the *2007 Urban Mobility Report* are for a moderate mix of these treatments and only include the reduction in travel delay and wasted fuel. In surveys of business owners affected by the medians and turn lanes, most report no reduction in customers and some see an increase in property values (*23*).

More Capacity

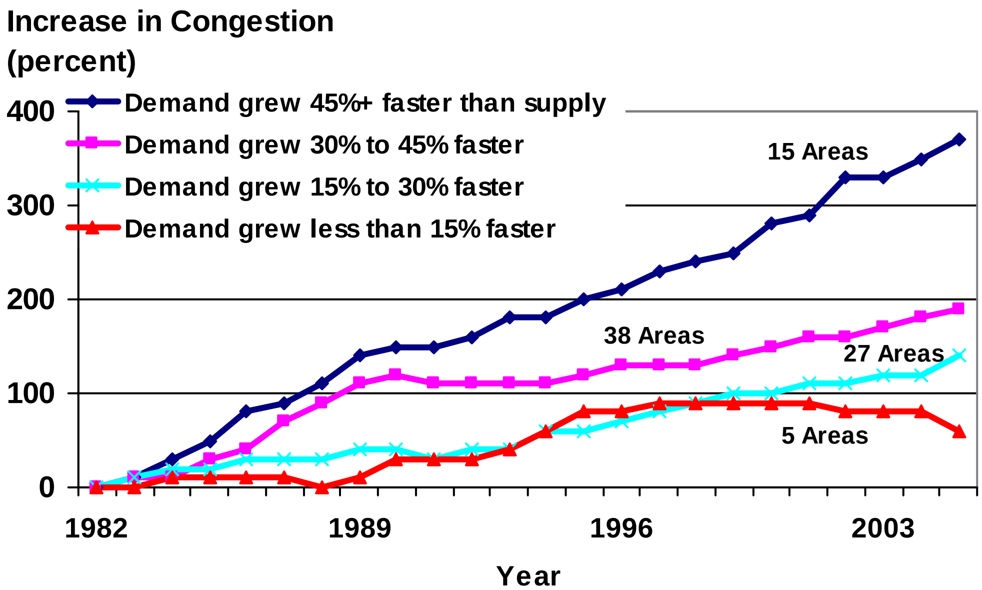
More road and public transportation improvement projects are part of the equation. New streets and urban freeways will be needed to serve new developments; public transportation improvements are particularly important in congested corridors and to serve major activity centers; and, toll highways and toll lanes are being used more frequently in urban corridors. Capacity expansions are also important additions for freeway-to-freeway interchanges and connections to ports, rail yards, intermodal terminals and other major activity centers for people and freight transportation.

Benefits of Roadway Capacity Increases

Urban areas can slow the growth of congestion by building roads. Regions where road capacity has grown at about the same rate as travel demand have seen less delay growth than areas where travel has increased much more rapidly than road supply. The change in miles traveled was compared to the change in lane-miles for each of the 85 urban areas between 1982 and 2005 (Exhibit 15 and Table 7). Four groups of urban regions were identified based on the ratio of growth in demand and roads. The increase in congestion from 1982 to 2005 was plotted for each group.

- **Significant mismatch** – Traffic growth was more than 45 percent faster than the growth in road capacity for the 15 urban areas in this group.
- **Moderate mismatch** – Traffic growth was between 30 and 45 percent greater than road growth. There were 38 urban areas in this group.
- **Closer match** – Traffic growth was between 15 percent and 30 percent more than road growth. There were 27 urban areas in this group.
- **Narrow gap** – Road growth was within 15 percent of traffic growth for the 5 urban areas in this group.

Exhibit 15. Road Growth and Mobility Level



Additional roadways reduce the rate of increase in congestion. It appears that the growth in facilities has to be at a rate slightly greater than travel growth in order to maintain constant travel times, if additional roads are the only solution used to address mobility concerns. It is also clear, however, that if only five of the 85 areas studied were able to accomplish that rate, ***there must be a broader set of solutions*** applied to the problem, as well as more of each solution.

Constructing transportation projects quickly and with as little extra delay as possible requires a mix of strategies, just as the regional approach to congestion relief. The Katy Freeway (I-10 West in Houston) expansion project includes additional mainlanes and high-occupancy toll lanes, in addition to reconstructed pavement, noise walls and landscaping. The regional toll authority purchased the right to operate the toll lanes using funds generated over almost two decades of successful toll operation in other corridors. The accelerated cash flow enabled the Texas DOT to decrease the construction time from 12 years to six years. The increased cost of the 24-hour construction schedule was partially offset by savings in construction cost inflation that would have occurred. The estimated $2.8 billion in benefits that resulted from six years of improvements in delay, lower fuel consumption and improved business environment more than offset the estimated $300 million in extra costs (*8*).

The recent reconstruction of the MacArthur Maze Interchange in Oakland, near the Bay Bridge, illustrates the kind of rapid response to the destruction of critical transportation links that the public and business leaders expect. A contracting process that emphasized cooperation between construction companies, suppliers and state and local agencies and which included incentives for rapid completion led to the interchange be fully re-opened in 26 days, 35 days ahead of the deadline. The $5 million completion bonus was accounted for in the contractor's bid. A project without the completion bonus would have resulted in a higher construction bid, and no incentive to rapidly finish repairing an interchange estimated to have a $6 million daily economic effect on the region (*24*,*25*).

Benefits of Public Transportation Service

Regular route public transportation service on buses and trains provides a significant amount of peak-period travel in the most congested corridors and urban areas in the U.S. If public transportation service was discontinued and the riders traveled in private vehicles, the 437 urban areas would have suffered an additional 541 million hours of delay and consumed 340 million more gallons of fuel in 2005 (Exhibit 16), one-third more than a decade ago (*4*). The value of the delay and fuel that would be consumed if there were no public transportation service would be an additional $10.2 billion congestion cost, a 13 percent increase over current levels in the 437 urban areas.

This total is less than previous estimates because there is lower freeway delay due to the methodology improvements. There is an estimated delay savings contribution of 31 million hours and $574 million from public transportation services in the 352 urban areas that were not individually studied. Delay is lower in the most congested regions with the new calculation procedure than with the old; these are also the regions that have the highest public transportation ridership. The new method comes to the same conclusion—substantial and increasing benefits.

Public transportation service provides many other benefits in the corridors and areas it serves. Access to jobs, shops, medical, school and other destinations for those who do not have private transportation may provide societal benefits and the reliable service provided by underground and overhead rail lines that are not affected by traffic congestion are not quantified. Typically, in contrast to roads, the ridership is concentrated in a relatively small portion of the urban area. That is often the most congested area and the locations where additional road capacity is difficult to construct. Downtowns and other large employment centers in major urban regions would look much different without public transportation service.

There were approximately 51 billion passenger-miles of travel on public transportation systems in the 437 urban areas in 2005 (*4*). The annual travel ranges from an average of 18 million miles per year in Small urban areas to about 2.7 billion miles in Very Large areas. More information on the effects for each urban area is included in Table 3.

- The Very Large areas would experience an increase in delay of about 430 million hours per year (17 percent of total delay) if there were no public transportation service. Most of the urban areas over 3 million population have significant public transportation ridership, extensive rail systems and very large bus systems.

- The Large urban areas would experience the second largest increase in delay with about 64 million additional hours of delay per year (7 percent of today delay) if public transportation service were not available. Public transportation plays an important role in providing travel options in these communities. As corridors become more congested, the role of public transportation in providing travel capacity to major activity centers in these regions will grow.

Exhibit 16. Delay Increase if Public Transportation Service Were Eliminated – 437 Areas

Population Group and Number of Areas	Average Annual Passenger-Miles of Travel (Million)	Delay Reduction Due to Public Transportation		
		Hours of Delay (Million)	Percent of Base Delay	Dollars Saved ($ Million)
Very Large (14)	37,691	430	17	8,091
Large (25)	5,459	64	7	1,193
Medium (30)	1,665	15	4	270
Small (16)	287	1	3	26
Other (352)	6,324	31	5	574
National Urban Total	51,426	541	13	10,154

Source: Reference (*4*) and TTI Review

A longer-term approach to estimating mobility benefits from public transportation will be to develop links with transit agency operations databases. These include travel time, speed and passenger volume data automatically collected by transit vehicle monitoring systems. Linking these data with the roadway performance data in public transportation corridors would be the logical extension of the archived roadway data inclusion efforts being funded by the Federal Highway Administration (*7*). An alternative to the real-time data would be to estimate public transportation vehicle travel time and speed information from route schedules, and combine them with the passenger loading information collected by the public transportation systems. While these data are not reported in nationally consistent formats, most public transportation systems have some of this information; the challenge is to develop comparable datasets**.**

The Metropolitan Transportation Authority (MTA) and the Long Island Rail Road (LIRR) are proposing to construct a new direct 3.5-mile commuter rail extension from Long Island and Queens to Grand Central Terminal (GCT) on Manhattan’s East Side. The current highway system and East River crossings are at capacity and subject to severe congestion and long delays. The LIRR operates at capacity in this area with peak service of 37 trains per hour into its only Manhattan terminal at Penn Station. Nearly half of LIRR’s 106,000 existing daily riders, however, have destinations on Manhattan’s East Side and currently spend approximately 20 minutes “doubling back” from Penn Station on the island’s West Side. The project will connect to the currently unused lower level of the 63rd Street Tunnel beneath the East River. At Grand Central Terminal, the project would provide new tracks, platforms, entrances, waiting areas, ticket windows and other services (*26*).

Relieve Chokepoints

Congestion does not come in one size or shape and neither do solutions. Some congestion problems start as just a few too many cars trying to get through an intersection or onto a freeway. The slowdowns that begin there penalize travelers and shippers in at least two ways. First, the trips take longer because traffic is moving slower. Secondly, a stop-and-go system is inefficient and fewer travelers can get through the constriction. This double penalty was depicted by Washington State DOT as rice flowing (or not) through a funnel—pour slowly and the rice tumbles through; pour quickly and the constriction point is overwhelmed and rice clogs the funnel (*27*).

Eliminating these problem locations could have huge benefits. A 2004 study of the largest highway bottlenecks by the American Highway Users Alliance (*28*) estimated that there were more than 210 congested locations in 33 states with more than one million hours of travel delay. The top 24 most congested freeway bottlenecks each accounted for more than 10 million hours of delay; these were located in 13 different metropolitan regions. The study noted that progress had been made in the five years since the previous study with seven of the top 20 locations dropping off the worst bottlenecks list through construction improvements.

Similar studies focusing on freight bottlenecks were conducted for the Ohio DOT and expanded to national examinations of freight travel and congestion problems (*29,30,31*). Several metropolitan regions have also conducted analyses of public transportation service bottlenecks. All the conclusions have been similar—there are significant returns on investment from addressing the locations of most severe congestion. The solutions range from the simple, quick and cheap to the complex, lengthy and expensive. For example, about 250 miles of freeway shoulder in Minneapolis are used to allow buses to bypass stop-and-go traffic, thereby saving time and providing a much more reliable time schedule for public transportation riders. The routes that use the shoulders had a 9.2 percent ridership increase over a two-year period when the overall system ridership decreased 6.5 percent, illustrating the favorable passenger reaction to improved speed and reliability attributes (*32*).

Change the Usage Pattern

The way that travelers use the transportation network can be modified to accommodate more demand and reduce congestion. Using the telephone or internet for certain trips, traveling in off-peak hours and using public transportation and carpools are examples. Projects that use tolls or pricing incentives can be tailored to meet transportation needs and also address social and economic equity concerns.

Any of these changes will affect the way that travelers, employers and shippers conduct their lives and business; these may not be inconsequential effects. The key will be to provide better conditions and more travel options primarily for work commutes, but there are also opportunities to change trips for shopping, school, health care and a variety of other activities.

Although comprising slightly less than 20 percent of all vehicular trips in the average urban area, commute trips generally cluster around the most congested peak periods and are from the same origin to the same destination at the same time of day. These factors make commute trips by carpooling, vanpooling, public transit, bicycling and walking more likely. Furthermore, alternative work arrangements—including flexible work hours, compressed work weeks and teleworking—provide another means of shifting trips out of the peak periods. This “triple divergence”—moving away from congested roads—is described in much more detail by Anthony Downs in his book, “Still Stuck in Traffic” (*33*).

The goal of all of these programs is to move trips to uncongested times, routes or modes so that there is less congestion during peak hours and so that more trips can be handled on the current system. Carrying more trips can be thought of in the same way as increasing production in a manufacturing plant. If the current buses, cars and trains can carry more people to the places they want to go, there are benefits to society and the economy.

The role of phones, computers and the internet cannot be overlooked as the future role of commute options are examined. New technologies are being used along with changes in business practices to encourage employers to allow jobs to be done from home or remote locations—and these might allow workers to avoid their commute a few days each month, or travel to their jobsites after a few hours of work at home in the morning.

Atlanta’s “Cash for Commuters” program is a one example of the newer, more aggressive commute option programs. Built around a Clean Air Campaign, the program involved payment of cash incentives to driver-only commuters who switched to another mode. Participants earned up to $60 per month (for three months) by choosing and using an eligible alternative mode of transportation. During the program, participants used alternative modes an average of more than four days each week compared to less than one day per week before. A year and one-half after the program, participants still used a commute alternative an average of 2.4 days per week. Overall, program participants decreased their single-occupant commute modes from 84 percent to 53 percent. This type of change has benefits in less vehicle travel and fewer parking spaces needed and participants have reported lower frustration levels and better on-time arrival. Decreasing each commuter’s peak-period personal vehicle trips by one per week could have substantial congestion benefits, if employers and employees choose these options (*34*).

Provide Travel Options

Lanes that provide high-speed reliable service for bus, carpool, vanpool, and toll-paying travelers are being operated in at least three dozen metropolitan regions (*35*). In addition, they are becoming an important element in regions that wish to add road capacity. The ability to move more people in fewer cars, and the possibility of providing a high-speed, reliable operation are increasingly viewed as a desired element in the congestion reduction checklist (even when a toll is charged). The lanes are most used during the peak travel periods when congestion is worst and the time savings compared to the general travel lanes are the most significant. In addition to saving time on an average trip, the buses, carpools, and other users experience more reliable service because they are less affected by collisions or vehicle breakdowns.

The 70 congested corridors with data on the person volume and travel time for high-occupancy vehicle lanes or high-occupancy toll lanes in 15 metropolitan regions showed an annual delay reduction of 33 million hours, with a value of $620 million per year. These HOV and high-occupancy toll (HOT) lanes carry about one-third of the peak-direction passenger load on the freeways, providing significant passenger movement at much higher speeds and with more reliable travel times than the congested mainlanes. (See Supporting Information section of the report at http://mobility.tamu.edu/ums/report).

High-occupancy toll lanes appear to be the way that the concept of value (or congestion) pricing will be initially implemented in many regions. Offering a high-speed and reliable trip in exchange for a price allows travelers and freight shippers to react to situations where a trip is more important than at other times. While there are only a few corridors with such lanes—SR 91 and I-15 in Southern California, I-394 in Minneapolis, I-10 and US 290 in Houston, I-25 in Denver and I-15 in Salt Lake City—there are several others being considered as part of corridor improvement projects. The focus on providing a different type of service is the attraction of the concept. The experience to date indicates that the typical high-occupancy toll lane user places a higher value on quickly completing the trip than most mainlane users. This may be repair workers attempting to make one more service call, parents picking up kids at day care or making a trip to see a performance or business travelers getting to a meeting or the airport. The many types of trip purposes and levels of tolerance for delay are a part of the diverse peak-period travel population, not unlike the many different congestion problems that have several solutions.

Pricing is also involved in an innovative freight improvement program that has been implemented at the ports of Los Angeles/Long Beach and Oakland. Container fees are reduced for overnight loading or unloading and raised during the peak daylight hours. The higher peak fees are used to fund the overtime pay rates and other overnight operating charges. Approximately one-third of containers have shifted to the off-peak hours in less than two years of program operation (*36*).

Congestion Solutions - Conclusions

Most large city transportation agencies are pursuing all of these strategies as well as others. The mix of programs, policies and projects may be different in each city and the pace of implementation varies according to overall funding, commitment, location of problems, public support and other factors. Addressing the range of different problems with an overall strategy that chooses solutions with the greatest benefit for the least cost recognizes the diversity of the problems and opportunities in each region.

Policy-makers and big city residents have learned to expect congestion for 1 or 2 hours in the morning and in the evening. However, agencies should be able to improve the performance and reliability of the service at other hours. But they have not been able to combine the leadership, technical and financial support to expand the system, improve operations and change travel patterns to keep congestion levels from growing.

The involvement of business leaders in crafting a set of locally supported solutions would seem to be a very important element in the future. At the strategic end, business leader actions take the form of information development and communication with the public and decision makers to emphasize the role of transportation in the state and regional economy. Leaders in Atlanta, Oregon and Texas have documented the costs of congestion to businesses and the benefits from pursuing vision-oriented efforts that offer concepts and funding solutions (*8*,*10*,*36,37*,*38*).

At the tactical end, a group of business leaders in Miami have formed a group named “Meeting Our Vehicular Needs” (MOV’N) to push for a mix of strategies from relatively small, focused operations or design changes to areawide education efforts aimed at improving congestion and safety. Actions requiring modest effort on the part of individuals—moving minor crashes off the road or staying out of intersections when the road ahead is filled—are relatively minor individually, but as regional actions, these can improve travel times and travel time reliability (*39*).

But, as we started the discussion of problems with “you” as the problem, so there are roles for “you” in the solution. Trying a carpool, vanpool or public transportation, flexible work hours, telecommuting and the simple act of checking the travel information websites before starting a trip are immediate actions that may improve your travel.

All of the options are appropriate for congested corridors. In some cases, one or two improvement types will satisfy the community mobility goals. The improvements can also build on the services and qualities provided by the others. The Ohio Department of Transportation, for example, found that the safety problems and congested locations were very similar and solutions to one problem usually improved the other condition as well (*40*).

It bears repeating that regions where the agencies are seen as aggressively operating the current system to get as much service as possible with existing resources have built an expectation and level of trust that allows them to engage the public in a discussion about the benefits of additional transportation investments. The public and decision makers do not always support increased funding or new strategies, but the debate is typically over whether the benefits are worth the cost, rather than if there is a need.

Methodology

The base data for the *2007 Urban Mobility Report* come from the states and the US Department of Transportation (*2*,*15*). The travel and road inventory statistics are analyzed with a set of procedures developed from computer models and empirical studies. The new travel time and speed estimation process is described in a technical memorandum (*1*) and a website: http://mobility.tamu.edu/ums/report/methodology.stm

The methodology creates a set of "base" statistics developed from traffic density values. The density data—daily traffic volume per lane of roadway—is converted to average peak-period speed using a set of estimation curves based on relatively ideal travel conditions—no crashes, breakdowns or weather problems for the years 1982 to 2005.

The "base" estimates, however, do not include the effect of many transportation improvements. The 2007 report addresses this estimation deficiency with methodologies designed to identify the effect of operational treatments and public transportation services. The delay, cost and index measures for 2000 through 2005 include these treatments and identify them as "with strategies." The effects of public transportation, however, are shown for every year since 1982.

The calculation details for estimating the effect of operational treatments and public transportation service are described in a separate report (*13*) available at http://mobility.tamu.edu/ums/report/methodology.stm

Future Changes

There will be changes in the methodology used in this report series over the next few years. There is more information every year from freeways, streets and public transportation systems that provide more descriptive travel time data. Travel time information is being collected from travelers and shippers on the road network by a variety of public and private data collection sources. Some advanced transit operating systems monitor passenger volume, travel time and schedule information and share data with traffic signal systems. Traffic signals can be retimed immediately by the computers to reduce person congestion (not just vehicle congestion). These data can also be used to more accurately describe congestion problems on public transportation and roadway systems.

Combining Performance Measures

Table 6 illustrates an approach to understanding several of the key measures. The value for each statistic is rated according to the relationship to the average value for the population group. The terms "higher" and "lower" than average congestion are used to characterize the 2005 values and trends from 1982 to 2005. These descriptions do not indicate any judgment about the extent of mobility problems. Urban areas that have better than average rankings may have congestion problems that residents consider significant. What Table 6 does, however, is provide the reader with some context for the mobility discussion.

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**	
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**	

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.

Table 2. Components of the Congestion Problem, 2005 Urban Area Totals

Urban Area	Travel Delay (1000 Hours)	Rank	Excess Fuel Consumed (1000 Gallons)	Rank	Congestion Cost ($ Million)	Rank
Very Large Average (14 areas)	169,278		120,127		3,205	
Los Angeles-LBch-Santa Ana, CA	490,552	1	383,674	1	9,325	1
New York-Newark, NY-NJ-CT	384,046	2	241,976	2	7,383	2
Chicago, IL-IN	202,835	3	141,612	3	3,968	3
Dallas-Fort Worth-Arlington, TX	152,129	4	106,207	4	2,747	4
Miami, FL	150,146	5	105,181	5	2,730	5
Atlanta, GA	132,296	6	96,066	7	2,581	6
San Francisco-Oakland, CA	129,919	7	100,525	6	2,414	7
Washington, DC-VA-MD	127,394	8	90,861	9	2,331	8
Houston, TX	124,131	9	92,559	8	2,225	9
Detroit, MI	115,547	10	76,062	10	2,174	10
Philadelphia, PA-NJ-DE-MD	111,704	11	70,902	12	2,076	11
Boston, MA-NH-RI	93,374	12	62,521	13	1,820	12
Phoenix, AZ	81,727	14	58,922	14	1,687	14
Seattle, WA	74,098	15	54,707	15	1,413	15
Large Average (25 areas)	33,809		23,366		628	
San Diego, CA	90,711	13	71,123	11	1,708	13
Denver-Aurora, CO	64,997	16	42,519	16	1,176	16
Minneapolis-St. Paul, MN	59,746	17	41,820	17	1,099	18
Baltimore, MD	56,769	18	40,814	18	1,126	17
Tampa-St. Petersburg, FL	56,203	19	35,281	20	1,005	19
San Jose, CA	50,038	20	34,710	21	899	21
Riverside-San Bernardino, CA	48,266	21	39,627	19	955	20
Orlando, FL	40,595	22	26,049	23	738	22
Sacramento, CA	39,577	23	29,244	22	729	23
St. Louis, MO-IL	37,772	24	23,342	25	711	24
Portland, OR-WA	33,660	25	24,007	24	625	25
Las Vegas, NV	29,493	26	20,023	27	543	26
San Antonio, TX	29,380	27	20,425	26	530	27
Virginia Beach, VA	25,602	28	17,102	29	467	29
Cincinnati, OH-KY-IN	24,378	29	17,447	28	459	30
Indianapolis, IN	24,318	30	16,098	30	478	28
Columbus, OH	21,958	32	15,513	31	409	32
Providence, RI-MA	19,482	37	11,660	38	343	38
Memphis TN-MS-AR	17,129	39	9,234	43	317	40
Pittsburgh, PA	16,159	41	9,215	44	285	41
Milwaukee, WI	15,402	42	10,815	40	282	42
Kansas City, MO-KS	13,737	45	8,637	46	256	44
Cleveland, OH	13,162	46	8,840	45	236	46
New Orleans, LA	10,837	49	6,917	49	207	49
Buffalo, NY	5,852	65	3,685	66	112	65
Remaining Areas						
51 Areas Over 250,000 – Total	244,210		157,741		4,601	
51 Areas Over 250,000 - Average	4,788		3,093		90	
301 Areas Under 250,000 - Total	348,023		171,546		5,896	
301 Areas Under 250,000 - Average	1,156		570		20	
All 437 Areas – Total	4,188,716		2,869,070		78,136	
All 437 Areas - Average	9,585		6,565		179	

Very Large Urban Areas—over 3 million population. Large Urban Areas—over 1 million and less than 3 million population.
Travel Delay – Travel time above that needed to complete a trip at free-flow speeds.
Excess Fuel Consumed – Increased fuel consumption due to travel in congested conditions rather than free-flow conditions.
Congestion Cost – Value of travel time delay (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).
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 2. Components of the Congestion Problem, 2005 Urban Area Totals, Continued

Urban Area	Travel Delay (1000 Hours)	Rank	Excess Fuel Consumed (1000 Gallons)	Rank	Congestion Cost ($ Million)	Rank
Medium Average (30 areas)	11,087		7,307		206	
Austin, TX	22,580	31	15,505	32	422	31
Nashville-Davidson, TN	21,707	33	13,505	36	404	34
Charlotte, NC-SC	21,204	34	14,340	34	409	32
Jacksonville, FL	20,779	35	13,997	35	376	36
Louisville, KY-IN	20,558	36	14,415	33	395	35
Raleigh-Durham, NC	18,234	38	11,700	37	346	37
Tucson, AZ	17,011	40	10,483	41	338	39
Bridgeport-Stamford, CT-NY	14,510	43	11,500	39	280	43
Salt Lake City, UT	14,236	44	9,327	42	250	45
Birmingham, AL	12,416	47	8,210	48	234	47
Oxnard-Ventura, CA	12,184	48	8,350	47	229	48
Albuquerque, NM	10,407	50	6,644	50	200	50
Richmond, VA	10,081	51	6,388	52	181	51
Oklahoma City, OK	9,468	52	6,179	54	171	52
Honolulu, HI	9,342	53	6,255	53	166	53
Hartford, CT	9,252	54	6,526	51	166	53
Sarasota-Bradenton, FL	8,840	55	5,293	57	156	56
Omaha, NE-IA	8,784	56	5,344	56	154	57
El Paso, TX-NM	8,675	57	5,745	55	159	55
Tulsa, OK	8,453	58	4,796	59	149	58
Grand Rapids, MI	7,593	60	4,404	62	138	60
Allentown-Bethlehem, PA-NJ	7,483	61	4,650	60	137	61
Dayton, OH	6,863	63	4,621	61	127	63
Fresno, CA	6,625	64	4,151	65	127	63
New Haven, CT	5,706	66	4,227	64	104	66
Albany-Schenectady, NY	4,574	69	2,848	68	86	68
Toledo, OH-MI	4,170	70	2,632	70	78	70
Springfield, MA-CT	4,053	71	2,475	71	71	72
Rochester, NY	3,527	73	2,351	73	64	74
Akron, OH	3,293	76	2,340	74	62	75
Small Average (16 areas)	3,047		1,832		56	
Charleston-North Charleston, SC	8,041	59	4,922	58	148	59
Colorado Springs, CO	7,332	62	4,377	63	131	62
Cape Coral, FL	5,322	67	3,074	67	98	67
Pensacola, FL-AL	4,773	68	2,680	69	84	69
Columbia, SC	3,730	72	2,364	72	73	71
Bakersfield, CA	3,482	74	2,113	76	66	73
Little Rock, AR	3,416	75	2,323	75	62	75
Corpus Christi, TX	1,784	77	1,088	78	32	77
Salem, OR	1,773	78	1,042	79	31	79
Eugene, OR	1,766	79	1,095	77	32	77
Spokane, WA	1,523	80	918	80	28	80
Anchorage, AK	1,496	81	838	81	27	81
Beaumont, TX	1,377	82	830	82	25	82
Laredo, TX	1,262	83	693	83	23	83
Boulder, CO	996	84	576	84	17	84
Brownsville, TX	680	85	383	85	12	85
Remaining Areas						
51 Areas Over 250,000 – Total	244,210		157,741		4,601	
51 Areas Over 250,000 - Average	4,788		3,093		90	
301 Areas Under 250,000 - Total	348,023		171,546		5,896	
301 Areas Under 250,000 - Average	1,156		570		20	
All 437 Areas - Total	4,188,716		2,869,070		78,136	
All 437 Areas - Average	9,585		6,565		179	

Medium Urban Areas—over 500,000 and less than 1 million population. Small Urban Areas—less than 500,000 population.
Travel Delay – Travel time above that needed to complete a trip at free-flow speeds.
Excess Fuel Consumed – Increased fuel consumption due to travel in congested conditions rather than free-flow conditions.
Congestion Cost – Value of travel time delay (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).
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 3. 2005 Effect of Mobility Improvements

Urban Area	Operational Treatment Savings				Public Transportation Savings		
	Treatments	Delay (1000 Hours)	Rank	Cost ($ Million)	Delay (1000 Hours)	Rank	Cost ($ Million)
Very Large Average (14 areas)		14,779		276.8	30,681		577.9
Los Angeles-LBch-Santa Ana, CA	r,i,s,a,h	56,611	1	1,067.8	28,494	3	458.7
New York-Newark, NY-NJ-CT	r,i,s,a,h	41,215	2	781.9	216,431	1	4,177.6
San Francisco-Oakland, CA	r,i,s,a,h	16,705	3	305.8	26,263	4	487.2
Houston, TX	r,i,s,a,h	13,617	4	240.8	5,959	14	96.1
Miami, FL	i,s,a,h	12,911	5	232.1	9,748	11	170.3
Dallas-Fort Worth-Arlington, TX	r,i,s,a,h	12,193	6	215.5	5,642	15	102.2
Washington, DC-VA-MD	r,i,s,a,h	8,942	7	162.8	25,655	5	456.4
Atlanta, GA	r,i,s,a,h	8,647	8	172.1	12,542	9	245.2
Chicago, IL-IN	r,i,s,a	8,384	9	163.6	39,554	2	779.4
Seattle, WA	r,i,s,a,h	7,019	11	133.5	12,661	8	225.3
Philadelphia, PA-NJ-DE-MD	r,i,s,a	6,393	12	120.1	19,155	7	359.7
Phoenix, AZ	r,i,s,a,h	5,805	13	116.7	2,720	19	55.6
Boston, MA-NH-RI	i,s,a	4,643	16	89.5	21,441	6	416.1
Detroit, MI	r,i,s,a	3,824	18	73.0	3,276	18	61.3
Large Average (25 areas)		2,143		39.6	2,558		47.7
San Diego, CA	r,i,s,a	7,949	10	146.4	8,922	12	164.6
Minneapolis-St. Paul, MN	r,i,s,a,h	5,367	14	95.6	5,337	16	95.9
Riverside-San Bernardino, CA	r,i,s,a,h	5,213	15	102.2	2,165	24	40.0
San Jose, CA	r,i,s,a	4,165	17	73.9	2,592	21	46.2
Denver-Aurora, CO	r,i,s,a,h	3,528	19	63.5	4,464	17	81.2
Tampa-St. Petersburg, FL	i,s,a	3,522	20	62.5	1,282	33	22.8
Sacramento, CA	r,i,s,a,h	3,482	21	65.2	2,089	26	37.6
Baltimore, MD	i,s,a	2,843	22	56.2	9,923	10	199.7
Portland, OR-WA	r,i,s,a,h	2,653	23	50.0	6,676	13	124.1
Virginia Beach, VA	i,s,a,h	2,165	24	39.3	1,214	35	22.4
Orlando, FL	i,s,a	1,929	25	34.9	1,909	27	34.5
Las Vegas, NV	i,s,a	1,309	26	23.4	2,439	22	46.6
San Antonio, TX	i,s,a	1,213	27	21.9	1,774	30	32.2
Milwaukee, WI	r,i,s,a	1,174	28	21.4	1,274	34	23.4
Columbus, OH	r,i,s,a	1,130	29	21.7	616	43	11.8
St. Louis, MO-IL	i,s,a	998	32	18.9	2,293	23	43.6
Memphis, TN-MS-AR	i,s,a	910	34	17.8	634	41	12.0
Cincinnati, OH-KY-IN	r,i,s,a	790	36	15.0	1,909	27	36.2
Indianapolis, IN	i,s,a	697	39	13.8	308	49	6.0
Kansas City, MO-KS	i,s,a	602	45	11.1	308	49	5.7
New Orleans, LA	i,s,a	586	46	11.1	1,070	36	20.8
Cleveland, OH	i,s,a	487	48	9.0	1,503	32	27.4
Pittsburgh, PA	i,s,a	390	52	7.0	1,882	29	33.8
Providence, RI-MA	i,s,a	295	55	5.4	976	37	17.3
Buffalo, NY	i,s,a	181	63	3.5	382	47	7.4
Remaining Areas							
51 Areas Over 250,000 – Total		7,314		136.2	4,539		83.1
51 Areas Over 250,000 - Average		143		2.7	89		1.6
301 Areas Under 250,000 - Total		10,211		171.5	26,789		490.6
301 Areas Under 250,000 - Average		34		0.6	89		1.6
All 437 Areas - Total		292,168		5,438.7	540,878		10,153.9
All 437 Areas - Average		669		12.4	1,238		23.2

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

Operational Treatments – Freeway incident management (i), freeway ramp metering (r), arterial street signal coordination (s), arterial street access management (a) and high-occupancy vehicle lanes (h).

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

Delay savings are affected by the amount of treatment or service in each area, as well as the amount of congestion and the urban area population.

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 3. 2005 Effect of Mobility Improvements, Continued

Urban Area	Operational Treatment Savings Treatments	Delay (1000 Hours)	Rank	Cost ($ Million)	Public Transportation Savings Delay (1000 Hours)	Rank	Cost ($ Million)
Medium Average (30 areas)		426		8.0	488		9.0
Austin, TX	i,s,a	1,079	30	20.3	1,709	31	32.2
Jacksonville, FL	i,s,a	1,008	31	18.4	498	46	9.1
Nashville-Davidson, TN	i,s,a	955	33	18.3	231	56	4.3
Tucson, AZ	i,s,a	896	35	17.6	567	44	11.3
Louisville, KY-IN	i,s,a	790	36	15.4	558	45	10.9
Charlotte, NC-SC	i,s,a	718	38	13.8	973	38	18.6
Omaha, NE-IA	i,s,a	674	40	11.8	188	61	3.3
El Paso, TX-NM	i,s,a	654	41	11.7	636	40	11.5
Albuquerque, NM	i,s,a	650	42	12.2	122	67	2.3
Salt Lake City, UT	r,i,s,a	611	43	11.0	2,152	25	38.3
Bridgeport-Stamford, CT-NY	i,s,a	604	44	11.8	323	48	6.4
Sarasota-Bradenton, FL	i,s,a	506	47	8.9	82	74	1.4
Birmingham, AL	i,s,a	484	49	9.8	242	55	4.7
Fresno, CA	r,i,s,a	464	50	8.9	259	53	4.9
Raleigh-Durham, NC	i,s,a	437	51	8.5	742	39	14.1
Hartford, CT	i,s,a	379	53	6.9	619	42	11.3
Richmond, VA	i,s,a	313	54	5.6	196	60	3.5
Honolulu, HI	i,s,a	241	58	4.3	2,711	20	47.6
Oxnard-Ventura, CA	i,s,a	235	59	4.3	265	52	4.9
New Haven, CT	i,s,a	211	60	3.8	158	64	2.9
Allentown-Bethlehem, PA-NJ	r,i,s,a	185	62	3.5	119	68	2.2
Dayton, OH	s,a	135	64	2.3	244	54	4.6
Rochester, NY	i,s,a	124	65	2.2	283	51	5.1
Grand Rapids, MI	s,a	123	66	2.2	85	71	1.5
Albany-Schenectady, NY	i,s,a	101	68	2.0	231	56	4.4
Springfield, MA-CT	i,s,a	56	74	1.0	173	63	3.0
Oklahoma City, OK	i,s,a	55	75	1.1	2	84	0.0
Tulsa, OK	i,s,a	50	77	1.0	-2	85	0.0
Toledo, OH-MI	s,a	26	80	0.5	144	65	2.8
Akron, OH	s,a	12	84	0.2	133	66	2.5
Small Average (16 areas)		86		1.6	89		1.6
Cape Coral, FL	i,s,a	292	56	5.4	75	76	1.4
Colorado Springs, CO	i,s,a	243	57	4.2	226	58	4.0
Bakersfield, CA	i,s,a	203	61	3.7	202	59	3.9
Little Rock, AR	i,s,a	105	67	2.1	4	83	0.1
Pensacola, FL-AL	s,a	87	69	1.5	56	79	1.0
Charleston-North Charleston, SC	i,s,a	75	70	1.5	118	69	2.2
Eugene, OR	i,s,a	72	71	1.4	174	62	3.2
Anchorage, AK	s,a	60	72	1.1	77	75	1.4
Columbia, SC	i,s,a	59	73	1.3	59	78	1.2
Spokane, WA	i,s,a	51	76	1.0	83	73	1.5
Boulder, CO	s,a	34	78	0.6	35	81	0.6
Salem, OR	s,a	29	79	0.5	85	71	1.5
Laredo, TX	i,s,a	26	80	0.5	61	77	1.1
Beaumont ,TX	s,a	17	82	0.3	10	82	0.2
Corpus Christi, TX	s,a	17	82	0.3	107	70	1.9
Brownsville, TX	s	7	85	0.1	52	80	0.9
Remaining Areas							
51 Areas Over 250,000 – Total		7,314		136.2	4,539		83.1
51 Areas Over 250,000 - Average		143		2.7	89		1.6
301 Areas Under 250,000 - Total		10,211		171.5	26,789		490.6
301 Areas Under 250,000 - Average		34		0.6	89		1.6
All 437 Areas - Total		292,168		5,438.7	540,878		10,153.9
All 437 Areas - Average		669		12.4	1,238		23.2

Medium Urban Areas—over 500,000 and less than 1 million population. Small Urban Areas—less than 500,000 population.
Operational Treatments – Freeway incident management (i), freeway ramp metering (r) arterial street signal coordination (s), arterial street access management (a) and high-occupancy vehicle lanes (h).
Public Transportation – Regular route service from all public transportation providers in an urban area.
Delay savings are affected by the amount of treatment or service in each area, as well as the amount of congestion and the urban area population.
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 4. Trends—Annual Delay per Traveler, 1982 to 2005

Urban Area	Annual Hours of Delay per Traveler				Long-Term Change 1982 to 2005	
	2005	2004	1995	1982	Hours	Rank
Very Large Average (14 areas)	54	51	43	21	33	
Dallas-Fort Worth-Arlington, TX	58	51	34	10	48	1
Washington, DC-VA-MD	60	60	53	16	44	3
San Francisco-Oakland, CA	60	56	56	24	36	7
Atlanta, GA	60	63	70	26	34	10
Boston, MA-NH-RI	46	45	30	12	34	10
Miami, FL	50	49	35	16	34	10
New York-Newark, NY-NJ-CT	46	42	30	12	34	10
Seattle, WA	45	42	52	13	32	18
Chicago, IL-IN	46	44	33	15	31	19
Detroit, MI	54	56	51	25	29	21
Los Angeles-LBch-Santa Ana, CA	72	70	71	45	27	24
Houston, TX	56	52	32	30	26	27
Philadelphia, PA-NJ-DE-MD	38	37	27	16	22	36
Phoenix, AZ	48	42	33	35	13	57
Large Average (25 areas)	37	36	30	11	26	
San Diego, CA	57	59	35	12	45	2
Riverside-San Bernardino, CA	49	47	28	5	44	3
Minneapolis-St. Paul, MN	43	40	34	6	37	5
Orlando, FL	54	56	54	18	36	7
Denver-Aurora, CO	50	46	37	16	34	10
Baltimore, MD	44	43	33	11	33	15
San Antonio, TX	39	38	19	6	33	15
San Jose, CA	54	51	51	23	31	19
Columbus, OH	33	34	27	4	29	21
Las Vegas, NV	39	39	37	10	29	21
Sacramento, CA	41	40	35	14	27	24
Providence, RI-MA	29	29	12	3	26	27
Portland, OR-WA	38	37	33	13	25	29
Indianapolis, IN	43	46	53	19	24	31
Memphis TN-MS-AR	30	29	23	6	24	31
Cincinnati, OH-KY-IN	27	27	26	5	22	36
St. Louis, MO-IL	33	31	38	12	21	40
Tampa-St. Petersburg, FL	45	46	41	24	21	40
Virginia Beach, VA	30	30	27	14	16	49
Kansas City, MO-KS	17	16	17	3	14	54
Milwaukee, WI	19	20	22	7	12	62
Cleveland, OH	13	14	16	3	10	67
Buffalo, NY	11	11	6	3	8	72
Pittsburgh, PA	16	17	19	11	5	80
New Orleans, LA	18	18	20	16	2	84
85 Area Average	**44**	**42**	**36**	**16**	**28**	
Remaining Areas						
51 Urban Areas Over 250,000 Popn	22	25	18	6	16	
301 Urban Areas Under 250,000 Popn	20	19	16	5	15	
All 437 Urban Areas	**38**	**37**	**31**	**14**	**24**	

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.

Data for years 2000 to 2005 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 4. Trends—Annual Delay per Traveler, 1982 to 2005, Continued

Urban Area	Annual Hours of Delay per Traveler				Long-Term Change 1982 to 2005	
	2005	2004	1995	1982	Hours	Rank
Medium Average (30 areas)	28	27	21	9	19	
Austin, TX	49	44	32	12	37	5
Oxnard-Ventura, CA	39	35	21	4	35	9
Charlotte, NC-SC	45	47	23	12	33	15
Raleigh-Durham, NC	35	35	26	8	27	24
Birmingham, AL	33	33	21	8	25	29
Louisville, KY-IN	42	44	34	18	24	31
Jacksonville, FL	39	41	40	16	23	34
Albuquerque, NM	33	30	30	11	22	36
Bridgeport-Stamford, CT-NY	31	28	22	9	22	36
El Paso, TX-NM	24	22	10	3	21	40
Nashville-Davidson, TN	40	40	35	20	20	43
Omaha, NE-IA	25	26	19	5	20	43
Salt Lake City, UT	27	29	32	8	19	46
Grand Rapids, MI	24	24	19	6	18	47
Tucson, AZ	42	39	23	24	18	47
Oklahoma City, OK	20	22	17	5	15	51
Hartford, CT	19	19	13	4	15	51
New Haven, CT	19	18	13	5	14	54
Richmond, VA	20	20	22	6	14	54
Albany-Schenectady, NY	16	16	8	3	13	57
Allentown-Bethlehem, PA-NJ	22	22	21	9	13	57
Toledo, OH-MI	15	17	12	2	13	57
Tulsa, OK	19	19	14	8	11	65
Honolulu, HI	24	22	26	14	10	67
Sarasota-Bradenton, FL	25	26	19	15	10	67
Akron, OH	10	11	9	2	8	72
Fresno, CA	20	19	17	12	8	72
Dayton, OH	17	19	22	10	7	76
Rochester, NY	10	10	7	3	7	76
Springfield, MA-CT	11	10	10	7	4	83
Small Average (16 areas)	17	17	13	6	11	
Colorado Springs, CO	27	22	12	4	23	34
Pensacola, FL-AL	25	24	16	5	20	43
Charleston-North Charleston, SC	31	32	28	15	16	49
Cape Coral, FL	24	24	28	9	15	51
Little Rock, AR	17	17	10	4	13	57
Bakersfield, CA	14	12	7	2	12	62
Columbia, SC	16	16	11	4	12	62
Salem, OR	14	14	12	3	11	65
Laredo, TX	12	11	7	2	10	67
Boulder, CO	16	16	16	7	9	71
Eugene, OR	14	12	7	6	8	72
Beaumont, TX	11	11	6	4	7	76
Brownsville, TX	8	8	4	2	6	79
Corpus Christi, TX	10	10	7	5	5	80
Spokane, WA	8	8	10	3	5	80
Anchorage, AK	10	10	9	10	0	85
85 Area Average	**44**	**42**	**36**	**16**	**28**	
Remaining Areas						
51 Urban Areas Over 250,000 Popn	22	25	18	6	16	
301 Urban Areas Under 250,000 Popn	20	19	16	5	15	
All 437 Urban Areas	**38**	**37**	**31**	**14**	**24**	

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.
Data for years 2000 to 2005 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 5. Trends—Travel Time Index, 1982 to 2005

Urban Area	Travel Time Index 2005	2004	1995	1982	Point Change in Peak-Period Time Penalty Points	Rank
Very Large Area Average (14 areas)	1.38	1.36	1.29	1.14	24	
Chicago, IL-IN	1.47	1.44	1.31	1.12	35	1
Dallas-Fort Worth-Arlington, TX	1.35	1.31	1.16	1.05	30	4
New York-Newark, NY-NJ-CT	1.39	1.36	1.24	1.10	29	5
Miami, FL	1.38	1.37	1.26	1.11	27	6
San Francisco-Oakland, CA	1.41	1.38	1.35	1.15	26	7
Los Angeles-LBch-Santa Ana, CA	1.50	1.48	1.44	1.25	25	9
Washington, DC-VA-MD	1.37	1.37	1.32	1.12	25	9
Atlanta, GA	1.34	1.32	1.25	1.10	24	11
Seattle, WA	1.30	1.28	1.30	1.07	23	15
Boston, MA-NH-RI	1.27	1.27	1.20	1.08	19	22
Houston, TX	1.36	1.32	1.19	1.19	17	24
Phoenix, AZ	1.31	1.27	1.17	1.15	16	25
Detroit, MI	1.29	1.30	1.26	1.13	16	25
Philadelphia, PA-NJ-DE-MD	1.28	1.27	1.18	1.12	16	25
Large Area Average (25 areas)	1.24	1.24	1.18	1.07	17	
San Diego, CA	1.40	1.41	1.22	1.07	33	2
Riverside-San Bernardino, CA	1.35	1.35	1.19	1.03	32	3
Sacramento, CA	1.32	1.32	1.21	1.06	26	7
Denver-Aurora, CO	1.33	1.30	1.22	1.09	24	11
Las Vegas, NV	1.30	1.31	1.25	1.06	24	11
Baltimore, MD	1.30	1.29	1.20	1.07	23	15
Portland, OR-WA	1.29	1.27	1.20	1.07	22	17
Minneapolis-St. Paul, MN	1.26	1.24	1.18	1.04	22	17
San Jose, CA	1.34	1.32	1.25	1.13	21	19
Orlando, FL	1.30	1.30	1.27	1.10	20	21
San Antonio, TX	1.23	1.23	1.10	1.04	19	22
Columbus, OH	1.19	1.20	1.15	1.03	16	25
Indianapolis, IN	1.22	1.23	1.24	1.08	14	32
Cincinnati, OH-KY-IN	1.18	1.18	1.16	1.04	14	32
Providence, RI-MA	1.16	1.17	1.08	1.03	13	37
Virginia Beach, VA	1.18	1.18	1.16	1.07	11	43
St. Louis, MO-IL	1.16	1.16	1.18	1.07	9	46
Memphis TN-MS-AR	1.13	1.14	1.11	1.04	9	46
Tampa-St. Petersburg, FL	1.28	1.29	1.30	1.20	8	50
Milwaukee, WI	1.13	1.13	1.13	1.05	8	50
Cleveland, OH	1.09	1.10	1.11	1.03	6	64
Kansas City, MO-KS	1.08	1.08	1.07	1.02	6	64
Buffalo, NY	1.08	1.08	1.04	1.03	5	70
New Orleans, LA	1.15	1.15	1.16	1.11	4	77
Pittsburgh, PA	1.09	1.10	1.10	1.06	3	79
85 Area Average	**1.30**	**1.29**	**1.22**	**1.11**	**19**	
Remaining Areas						
51 Urban Areas Over 250,000 Popn	1.15	1.16	1.10	1.05	10	
301 Urban Areas Under 250,000 Popn	1.12	1.11	1.09	1.03	9	
All 437 Urban Areas	**1.26**	**1.25**	**1.19**	**1.09**	**17**	

Very Large Urban Areas—over 3 million population. Large Urban Areas—over 1 million and less than 3 million population.
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. Free-flow speeds (60 mph on freeways and 35 mph on principal arterials) are used as the comparison threshold.
Data for years 2000 to 2005 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 5. Trends—Travel Time Index, 1982 to 2005, Continued

Urban Area	Travel Time Index 2005	2004	1995	1982	Point Change in Peak-Period Time Penalty Points	Rank
Medium Area Average (30 areas)	1.16	1.16	1.12	1.05	11	
Austin, TX	1.31	1.29	1.18	1.07	24	11
Oxnard-Ventura, CA	1.24	1.22	1.12	1.03	21	19
Charlotte, NC-SC	1.23	1.25	1.13	1.07	16	25
Bridgeport-Stamford, CT-NY	1.22	1.21	1.16	1.06	16	25
El Paso, TX-NM	1.17	1.16	1.07	1.02	15	31
Jacksonville, FL	1.21	1.22	1.20	1.07	14	32
Salt Lake City, UT	1.19	1.21	1.19	1.05	14	32
Raleigh-Durham, NC	1.18	1.17	1.11	1.04	14	32
Tucson, AZ	1.23	1.22	1.13	1.10	13	37
Louisville, KY-IN	1.23	1.23	1.17	1.11	12	39
Albuquerque, NM	1.17	1.16	1.16	1.05	12	39
Omaha, NE-IA	1.16	1.16	1.11	1.04	12	39
Honolulu, HI	1.22	1.20	1.21	1.11	11	43
Birmingham, AL	1.15	1.15	1.09	1.04	11	43
Sarasota-Bradenton, FL	1.19	1.19	1.15	1.10	9	46
Nashville-Davidson, TN	1.17	1.17	1.13	1.09	8	50
Allentown-Bethlehem, PA-NJ	1.14	1.14	1.14	1.06	8	50
Hartford, CT	1.11	1.11	1.08	1.03	8	50
New Haven, CT	1.11	1.10	1.08	1.03	8	50
Fresno, CA	1.12	1.12	1.11	1.05	7	58
Grand Rapids, MI	1.10	1.11	1.09	1.03	7	58
Oklahoma City, OK	1.09	1.09	1.07	1.02	7	58
Toledo, OH-MI	1.09	1.10	1.07	1.02	7	58
Tulsa, OK	1.09	1.09	1.07	1.03	6	64
Albany-Schenectady, NY	1.08	1.08	1.04	1.02	6	64
Richmond, VA	1.09	1.09	1.09	1.04	5	70
Akron, OH	1.07	1.08	1.06	1.02	5	70
Rochester, NY	1.07	1.07	1.05	1.02	5	70
Dayton, OH	1.10	1.11	1.12	1.07	3	79
Springfield, MA-CT	1.06	1.06	1.06	1.04	2	83
Small Area Average (16 areas)	1.09	1.09	1.07	1.03	6	
Colorado Springs, CO	1.14	1.12	1.07	1.02	12	39
Charleston-North Charleston, SC	1.17	1.18	1.14	1.08	9	46
Pensacola, FL-AL	1.11	1.11	1.08	1.03	8	50
Bakersfield, CA	1.09	1.08	1.04	1.01	8	50
Laredo, TX	1.09	1.09	1.06	1.02	7	58
Salem, OR	1.09	1.09	1.07	1.02	7	58
Eugene, OR	1.10	1.08	1.04	1.04	6	64
Boulder, CO	1.10	1.09	1.09	1.04	6	64
Cape Coral, FL	1.12	1.12	1.15	1.07	5	70
Little Rock, AR	1.07	1.07	1.04	1.02	5	70
Columbia, SC	1.07	1.07	1.04	1.02	5	70
Brownsville, TX	1.06	1.07	1.04	1.02	4	77
Corpus Christi, TX	1.06	1.05	1.04	1.03	3	79
Beaumont, TX	1.05	1.05	1.03	1.02	3	79
Spokane, WA	1.04	1.05	1.05	1.02	2	83
Anchorage, AK	1.07	1.07	1.06	1.06	1	85
85 Area Average	**1.30**	**1.29**	**1.22**	**1.11**	**19**	
Remaining Areas						
51 Urban Areas Over 250,000 Popn	1.15	1.16	1.10	1.05	10	
301 Urban Areas Under 250,000 Popn	1.12	1.11	1.09	1.03	9	
All 437 Urban Areas	**1.26**	**1.25**	**1.19**	**1.09**	**17**	

Medium Urban Areas—over 500,000 and less than 1 million population. Small Urban Areas—less than 500,000 population.

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. Free-flow speeds (60 mph on freeways and 35 mph on principal arterials) are used as the comparison threshold.

Data for years 2000 to 2005 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 6. Summary of Congestion Measures and Trends

Urban Area	Congestion Levels in 2005			Congestion Increase 1982 to 2005	
	Delay per Traveler (Hours)	Travel Time Index	Total Delay (1000 Hours)	Delay per Traveler (Hours)	Total Delay (1000 Hours)
Very Large Average (14 areas)	**54**	**1.38**	**169,278**	**33**	**131,206**
New York-Newark, NY-NJ-CT	L	0	H+	0	F+
Los Angeles-LBch-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-
Large Average (25 areas)	**37**	**1.24**	**33,811**	**26**	**28,565**
San Diego, CA	H+	H+	H+	F+	F+
Minneapolis-St. Paul, MN	H	0	H+	F+	F+
Baltimore, MD	H+	H	H+	F	F+
Tampa-St. Petersburg, FL	H+	H	H+	S	F+
St. Louis, MO-IL	L	L-	H	S	0
Denver-Aurora, CO	H+	H+	H+	F+	F+
Pittsburgh, PA	L-	L-	L-	S-	S-
Riverside-San Bernardino, CA	H+	H+	H+	F+	F+
Cleveland, OH	L-	L-	L-	S-	S-
Sacramento, CA	H	H+	H	0	F+
Portland, OR-WA	0	H	0	0	0
San Jose, CA	H+	H+	H+	F	F+
Cincinnati, OH-KY-IN	L-	L	L	S	S-
Virginia Beach, VA	L	L	L	S-	S-
Kansas City, MO-KS	L-	L-	L-	S-	S-
Milwaukee, WI	L-	L-	L-	S-	S-
Las Vegas, NV	H	H	0	F	0
Orlando, FL	H+	H	H	F+	F+
San Antonio, TX	H	0	0	F	0
Providence, RI-MA	L	L-	L-	0	S-
Columbus, OH	L	L	L	F	S-
Buffalo, NY	L-	L-	L-	S-	S-
New Orleans, LA	L-	L-	L-	S-	S-
Indianapolis, IN	H	0	L	0	S-
Memphis, TN-MS-AR	L	L-	L-	0	S-
Interval Values – Very Large and Large	5 hours	5 index points	(5 hours x average popn. for group)	5 hours	(5 hours x average change in popn. for group)

0 – *Average congestion levels or average congestion growth (within 1 interval)*
(Note: Interval – If the difference in values is less than this, it may not indicate a difference in congestion level).

Between 1 and 2 intervals above or below the average
H *Higher congestion*; F *Faster congestion growth*;
L *Lower congestion*; S *Slower congestion growth*;

More than 2 intervals above or below the average
H+ *Much higher congestion*; F+ *Much faster growth*
L- *Much lower congestion*; S- *Much slower growth*

Table 6. Summary of Congestion Measures and Trends, Continued

Urban Area	Congestion Levels in 2005: Delay per Traveler (Hours)	Congestion Levels in 2005: Travel Time Index	Congestion Levels in 2005: Total Delay (1000 Hours)	Congestion Increase 1982 to 2005: Delay per Traveler (Hours)	Congestion Increase 1982 to 2005: Total Delay (1000 Hours)
Medium Average (30 areas)	**28**	**1.16**	**11,087**	**19**	**9,129**
Jacksonville, FL	H+	H+	H+	F	F+
Nashville-Davidson, TN	H+	0	H+	0	F+
Salt Lake City, UT	0	H	H	0	F+
Raleigh-Durham, NC	H+	H	H+	F+	F+
Richmond, VA	L-	L-	0	S-	S
Louisville, KY-IN	H+	H+	H+	F+	F+
Hartford, CT	L-	L-	L	S	S-
Bridgeport-Stamford, CT-NY	H	H+	H+	F	F+
Charlotte, NC-SC	H+	H+	H+	F+	F+
Austin, TX	H+	H+	H+	F+	F+
Oklahoma City, OK	L-	L-	L-	S-	S-
Tulsa, OK	L-	L-	L	S-	S-
Tucson, AZ	H+	H+	H+	0	F+
Dayton, OH	L-	L-	L-	S-	S-
Honolulu, HI	L	H+	L	S-	S-
Birmingham, AL	H+	0	H	F+	F+
El Paso, TX-NM	L	0	L	F	S-
Rochester, NY	L-	L-	L-	S-	S-
Springfield, MA-CT	L-	L-	L-	S-	S-
Omaha, NE-IA	L	0	L	0	S-
Sarasota-Bradenton, FL	L	H	L	S-	S-
Allentown-Bethlehem, PA-NJ	L-	L	L-	S-	S-
Akron, OH	L-	L-	L-	S-	S-
Fresno, CA	L-	L	L-	S-	S-
Grand Rapids, MI	L	L-	L-	0	S-
Oxnard-Ventura, CA	H+	H+	0	F+	F+
Albuquerque, NM	H+	0	0	F	S
New Haven, CT	L-	L-	L-	S-	S-
Albany-Schenectady, NY	L-	L-	L-	S-	S-
Toledo, OH-MI	L-	L-	L-	S-	S-
Small Average (16 areas)	**17**	**1.09**	**3,047**	**11**	**2,540**
Colorado Springs, CO	H+	H+	H+	F+	F+
Charleston-North Charleston, SC	H+	H+	H+	F	F+
Bakersfield, CA	L	0	0	0	F+
Columbia, SC	0	L	H	0	F+
Cape Coral, FL	H+	H	H+	F	F+
Little Rock, AR	0	L	0	0	F
Spokane, WA	L-	L-	L-	S-	S-
Pensacola, FL-AL	H+	H	H+	F+	F+
Corpus Christi, TX	L-	L	L	S-	S-
Anchorage, AK	L-	L	L-	S-	S-
Eugene, OR	L	0	L	S-	S-
Beaumont, TX	L-	L	L-	S-	S-
Salem, OR	L	0	L	0	S-
Laredo, TX	L-	0	L-	S	S-
Brownsville, TX	L-	L	L-	S-	S-
Boulder, CO	0	0	L-	S	S-
Interval Values – Medium and Small	3 hours	3 index points	(3 hours x average popn. for group)	3 hours	(3 hours x average change in popn. for group)

0 – *Average congestion levels or average congestion growth (within 1 interval)*
(Note: Interval – If the difference in values is less than this, it may not indicate a difference in congestion level).

Between 1 and 2 intervals above or below the average
H *Higher congestion*; F *Faster congestion growth*;
L *Lower congestion*; S *Slower congestion growth*;

More than 2 intervals above or below the average
H+ *Much higher congestion*; F+ *Much faster growth*
L- *Much lower congestion*; S- *Much slower growth*

Table 7. Urban Area Demand and Roadway Growth Trends

Less than 15% Faster (5)	30% to 40% Faster (38)	45% Faster (15)
Anchorage, AK	Akron, OH	Atlanta, GA
Dayton, OH	Albany-Schenectady, NY	Baltimore, MD
New Orleans, LA	Albuquerque, NM	Chicago, IL-IN
Pittsburgh, PA	Allentown-Bethlehem, PA-NJ	Columbus, OH
St. Louis, MO-IL	Austin, TX	Dallas-Fort Worth-Arlington, TX
	Bakersfield, CA	El Paso, TX-NM
15% to 30% Faster (27)	Birmingham, AL	Las Vegas, NV
Beaumont, TX	Boston, MA-NH-RI	Miami, FL
Boulder, CO	Bridgeport-Stamford, CT-NY	Minneapolis-St. Paul, MN
Brownsville, TX	Charlotte, NC-SC	Orlando, FL
Buffalo, NY	Cincinnati, OH-KY-IN	Riverside-San Bernardino, CA
Cape Coral, FL	Colorado Springs, CO	Sacramento, CA
Charleston-North Charleston, SC	Columbia, SC	San Diego, CA
Cleveland, OH	Denver-Aurora, CO	Sarasota-Bradenton, FL
Corpus Christi, TX	Detroit, MI	Washington, DC-VA-MD
Eugene, OR	Hartford, CT	
Fresno, CA	Indianapolis, IN	
Grand Rapids, MI	Jacksonville, FL	
Honolulu, HI	Laredo, TX	
Houston, TX	Little Rock, AR	
Kansas City, MO-KS	Los Angeles-LBch-Santa Ana, CA	
Memphis, TN-MS-AR	Louisville, KY-IN	
Milwaukee, WI	New Haven, CT	
Nashville-Davidson, TN	New York-Newark, NY-NJ-CT	
Oklahoma City, OK	Omaha, NE-IA	
Philadelphia, PA-NJ-DE-MD	Oxnard-Ventura, CA	
Phoenix, AZ	Pensacola, FL-AL	
Richmond, VA	Portland, OR-WA	
Spokane, WA	Providence, RI-MA	
Springfield, MA-CT	Raleigh-Durham, NC	
Tampa-St. Petersburg, FL	Rochester, NY	
Tucson, AZ	Salem, OR	
Tulsa, OK	Salt Lake City, UT	
Virginia Beach, VA	San Antonio, TX	
	San Francisco-Oakland, CA	
	San Jose, CA	
	Seattle, WA	
	Toledo, OH	

Note: See Exhibit 15 for comparison of growth in demand, road supply and congestion.

Congestion Data for Additional Years

The new calculation procedure for the *2007 Urban Mobility Report* has been used to calculate new values for all urban areas and all years to provide a consistent trend in congestion performance measures. As such, values in all previous reports are not valid for comparison. Because some readers are curious about how the numbers have changed, however, Table 8 presents the data for 2000, 2003 and 2005.

Several changes are described in the report section, "Since You Asked – Here's Why the Numbers are Different." More detailed data on every year for each of the 85 intensively studied urban areas can be found on the "Congestion Data for Your City" section of the Mobility Report website: http://mobility.tamu.edu/ums

Table 8. Additional Congestion Data: 85 Urban Areas
(Note: These data do not compare to the statistics in Exhibit 1; those measure congestion for the 437 U.S. urban areas)

Characteristic	2000 Value	2003 Value	2005 Value	Change 2000-2005	Change 2003-2005
Hours of Delay per Traveler					
Very Large (14 areas)	46	49	54	8	5
Large (25 areas)	34	35	37	3	2
Subtotal Very Large and Large Areas (39 areas)	42	44	48	6	4
Medium (30 areas)	25	26	28	3	2
Small (16 areas)	15	16	17	2	1
Subtotal Medium and Small Areas (46 areas)	23	25	26	3	1
Subtotal Identified Areas (85 areas)	39	41	44	5	3
New Other (352 areas)	17	19	21	4	2
Total All Areas (437 areas)	34	36	38	4	2
Wasted Fuel per Traveler (gallons)					
Very Large (14 areas)	32	35	38	6	3
Large (25 areas)	23	24	25	2	1
Subtotal Very Large and Large Areas (39 areas)	29	31	34	5	3
Medium (30 areas)	16	17	18	2	1
Small (16 areas)	9	10	10	1	0
Subtotal Medium and Small Areas (46 areas)	15	16	17	2	1
Subtotal Identified Areas (85 areas)	27	28	31	4	3
New Other (352 areas)	10	12	13	3	1
Total All Areas (437 areas)	23	24	26	3	1
Total Cost of Congestion (billions of 2005 $)					
Very Large (14 areas)	33.4	38.2	44.9	11.5	6.2
Large (25 areas)	12.4	14.1	15.7	3.3	1.6
Subtotal Very Large and Large Areas (39 areas)	45.9	52.6	60.6	14.7	8.0
Medium (30 areas)	4.8	5.6	6.2	1.4	0.6
Small (16 areas)	0.7	0.8	0.9	0.2	0.1
Subtotal Medium and Small Areas (46 areas)	5.5	6.4	7.1	1.6	0.7
Subtotal Identified Areas (85 areas)	51.4	59.0	67.7	16.3	8.7
New Other (352 areas)	6.2	8.3	10.5	4.3	2.2
Total All Areas (437 areas)	57.6	67.2	78.2	20.6	11.0

Table 8. Additional Congestion Data: 85 Urban Areas, Continued

Characteristic	2000 Value	2003 Value	2005 Value	Change 2000-2005	Change 2003-2005
Annual Hours of Delay (billions of hours)					
Very Large (14 areas)	1.81	2.10	2.37	1.19	0.27
Large (25 areas)	0.69	0.78	0.85	0.16	0.07
Subtotal Very Large and Large Areas (39 areas)	1.87	2.87	3.22	1.35	0.34
Medium (30 areas)	0.27	0.31	0.33	0.07	0.03
Small (16 areas)	0.04	0.04	0.05	0.01	0.01
Subtotal Medium and Small Areas (46 areas)	0.30	0.35	0.38	0.08	0.03
Subtotal Identified Areas (85 areas)	2.17	3.23	3.60	1.43	0.37
New Other (352 areas)	0.37	0.48	0.59	0.22	0.11
Total All Areas (437 areas)	3.17	3.70	4.19	1.65	0.49
Annual Wasted Fuel (billions of gallons)					
Very Large (14 areas)	1.28	1.49	1.68	0.41	0.19
Large (25 areas)	0.47	0.54	0.58	0.11	0.05
Subtotal Very Large and Large Areas (39 areas)	1.75	2.03	2.27	0.52	0.24
Medium (30 areas)	0.17	0.20	0.22	0.05	0.02
Small (16 areas)	0.02	0.03	0.03	0.01	0.00
Subtotal Medium and Small Areas (46 areas)	0.20	0.23	0.25	0.05	0.02
Subtotal Identified Areas (85 areas)	1.94	2.26	2.51	0.57	0.26
New Other (352 areas)	0.22	0.29	0.36	0.14	0.07
Total All Areas (437 areas)	2.16	2.54	2.87	0.71	0.33
Delay Savings due to Operational Treatments					
Very Large (14 areas)	119.5	174.0	206.9	87.4	32.9
Large (25 areas)	34.8	46.5	53.6	18.8	7.1
Subtotal Very Large and Large Areas (39 areas)	154.3	219.6	258.9	104.6	39.3
Medium (30 areas)	8.8	11.3	12.8	4.0	1.5
Small (16 areas)	0.9	1.1	1.4	0.5	0.3
Subtotal Medium and Small Areas (46 areas)	9.7	12.4	14.2	4.5	1.8
Subtotal Identified Areas (85 areas)	164.0	232.0	273.1	109.1	41.1
New Other (352 areas)	10.9	14.2	17.5	6.6	3.3
Total All Areas (437 areas)	174.9	247.1	292.2	117.3	45.1
Delay Savings due to Public Transportation (million hours)					
Very Large (14 areas)	396.4	404.2	429.5	33.1	25.3
Large (25 areas)	62.0	60.7	63.9	1.9	3.2
Subtotal Very Large and Large Areas (39 areas)	458.4	464.9	493.4	35.0	28.5
Medium (30 areas)	13.6	15.4	14.6	1.0	-0.8
Small (16 areas)	1.4	1.2	1.4	0.0	0.2
Subtotal Medium and Small Areas (46 areas)	15.0	16.6	16.0	1.0	-0.6
Subtotal Identified Areas (85 areas)	473.4	481.5	509.4	36.0	27.9
New Other (352 areas)	23.5	26.5	31.3	7.8	4.8
Total All Areas (437 areas)	496.9	508.0	540.7	43.8	32.7

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TXDT0784.0907.250