THE 2004 URBAN MOBILITY REPORT

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2004 Urban Mobility Report

Congestion continues to grow in America's urban areas. The 2004 Annual Urban Mobility Report presents details on the trends, findings and what can be done to address the growing transportation problems. Trend data from 1982 to 2002 for 85 urban areas provides both a local view and a national perspective on the growth and extent of traffic congestion.

The 2004 Report provides clear evidence that the time for improvements has arrived. Communicating the congestion levels and the need for improvements is a goal of this report. The decisions about which, and how much, improvement to fund will be made at the local level according to a variety of goals, but there are some broad conclusions that can be drawn from this database.

The complete report, methodology, data, charts and tables can be found at: http://mobility.tamu.edu/ums

Major Findings for 2004 – The Big Numbers

The problem can be stated simply – ***congestion has grown everywhere in areas of all sizes. Congestion occurs during longer portions of the day and delays more travelers and goods than ever before.*** There are ways to address congestion problems, but there are not enough solutions being implemented to keep pace with the growing travel demands. Some important statistics are shown below.

Performance Measure	1982	2001	2002
Annual delay per peak traveler (hours)	16	45	46
Travel Time Index	1.12	1.36	1.37
Number of urban areas with more than 20 hours of delay per peak traveler	7	52	52
Number of areas with worse or same congestion as previous year (of the 85 studied)	NA	69	62
Total hours of delay (billion)	0.7	3.4	3.5
Total gallons of "wasted" fuel (billion)	1.2	5.4	5.7
Cost of congestion (billions of 2002 $)	$14.2	$61.0	$63.2
Congestion occurs on:			
Percent of peak travel	32	66	67
Percent of road system	34	58	58
Hours per day	4.5	7.1	7.1
Hours of delay saved by			
Operational treatments (million)	NA	294	335
Public transportation (million)	271	1,084	1,120
Congestion costs saved by			
Operational treatments (billions of 2002 $)	NA	$5.4	$6.0
Public transportation (billions of 2002 $)	$5.3	$19.8	$20.0

NA – No Estimate Available
Pre-2000 data do not include effect of operational strategies and public transportation.
Travel Time Index – The ratio of travel time in the peak period to travel time at free-flow conditions. A TTI 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.

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What's New?

Each year the Urban Mobility Report revises procedures and improves the processes and data used in the estimates. In doing so, the report also revises all previous estimates so that true trends can be developed whenever possible. Some key changes for this year are:

- An increase from 75 to 85 areas studied. The new urban areas mean that all urbanized areas in the U.S. with a population greater than 500,000 and all of the top 70 urbanized population areas are included in the report database.
- Five urbanized areas in the 2003 report were combined into two areas for the 2004 report. The US Census Bureau combined Fort Lauderdale, West Palm Beach and Miami into one urban center of 5.0 million persons and Tacoma was combined with Seattle for a total population of 2.7 million persons.
- The value of truck delay cost is lower than estimated in previous reports, which lowers the total congestion cost. The new values include the efficiencies gained by the trucking industry in the last 20 years, rather than a trend based on the Consumer Price Index.
- Arterial street access management programs were added to the operational treatment list. These elements smooth traffic flow and reduce collisions through a variety of treatments such as deceleration lanes, restricting turns across medians and combining driveways.
- The operational treatment effects are included for 2000, 2001 and 2002 mobility estimates. The data provide a better picture of the travel conditions in those three years. Unfortunately, the long-term trend analysis does not yet include this information.
- The delay per traveler measure uses the number of persons beginning their travel using a motorized mode during the peak periods (6 to 9 a.m. and 4 to 7 p.m.). This is a more appropriate mobility measure than the previous delay per capita statistics.
- The Annual Report seeks to provide the best estimate of travel conditions for each year. This year, as in other years, some previous statistics were slightly modified based on better understanding of trends and updated data.

The Problem

Mobility problems have increased at a relatively consistent rate during the two decades studied. Congestion is present on more of the transportation systems, affecting more of the trips and a greater portion of the average week in urban areas of all sizes.

Congestion affects more of the roads, trips and time of day. The worst congestion levels increased from 12% to 40% of peak period travel. And free-flowing travel is less than half of the amount in 1982 (Exhibit 1).

Congestion has grown in areas of every size. Measures in all of the population size categories show more severe congestion that lasts a longer period of time and affects more of the transportation network in 2002 than in 1982. The average annual delay for every person using motorized travel in the peak periods in the 85 urban areas studied climbed from 16 hours in 1982 to 46 hours in 2002 (Exhibit 2).

The delay statistics in Exhibit 2 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, medium-sized regions will have the traffic problems that large areas have now, if trends do not change.

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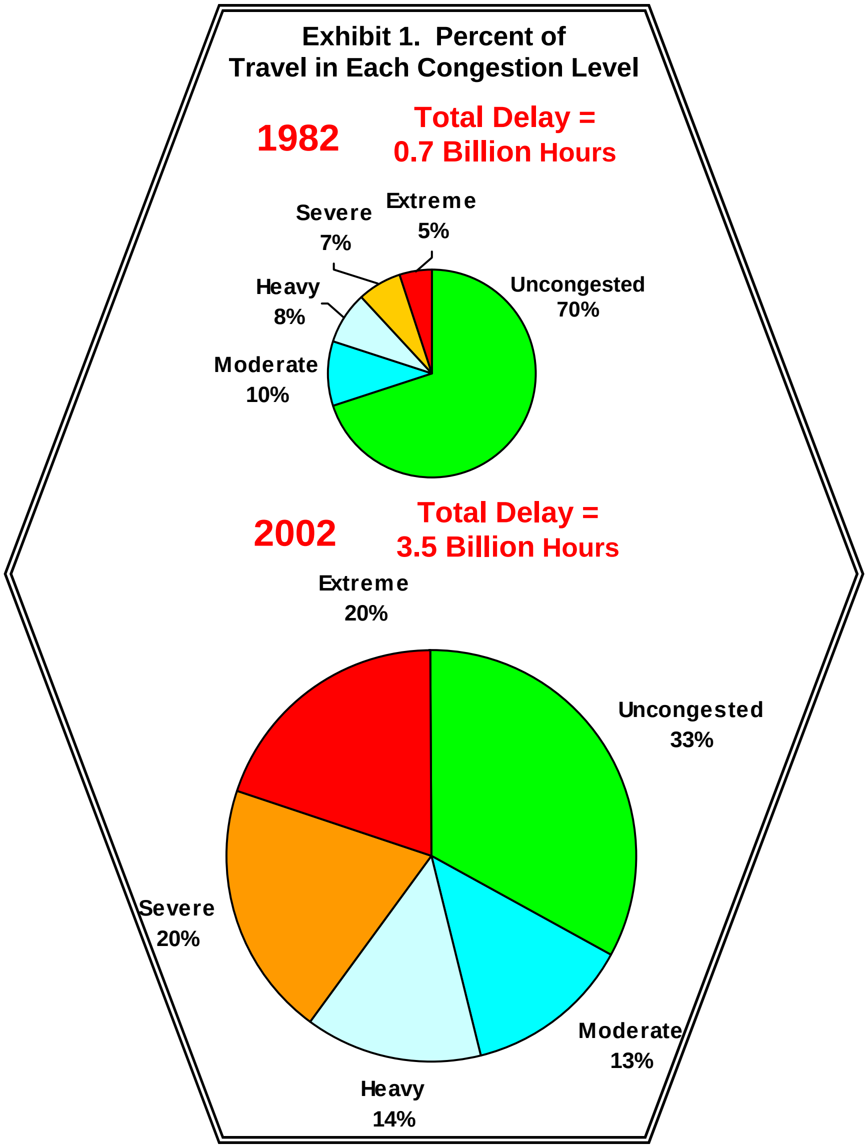
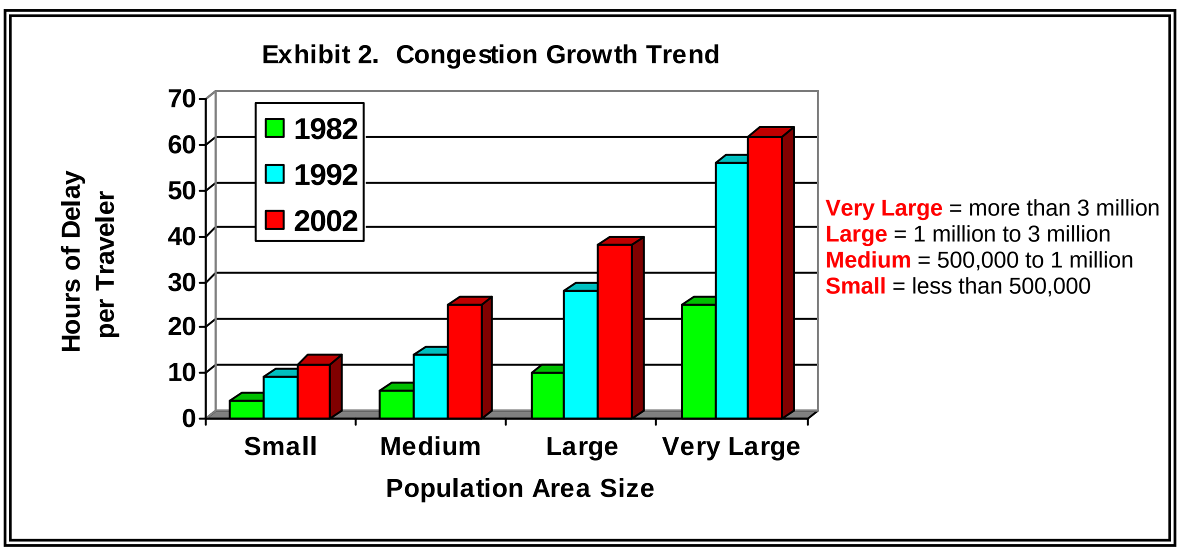
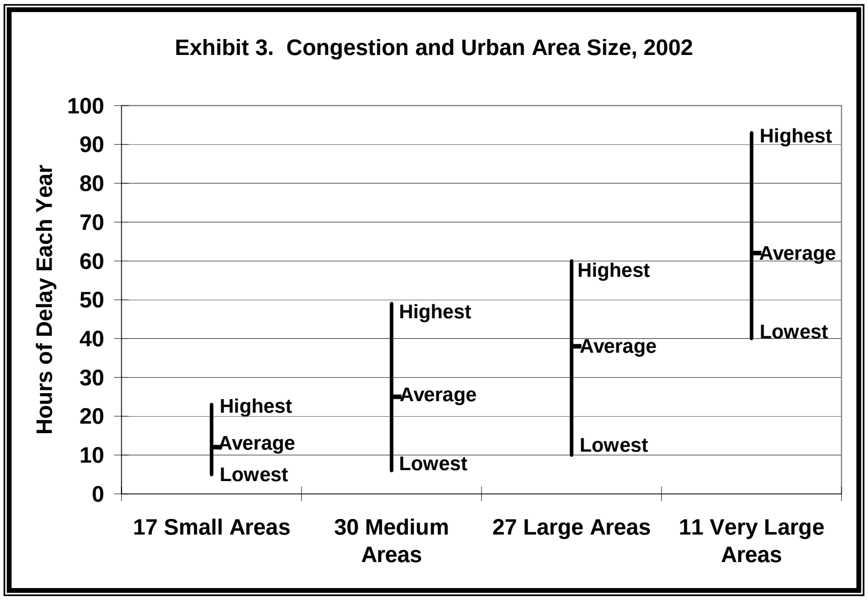




Congestion costs are increasing. The total congestion "invoice" for the 85 areas in 2002 was $63 billion, an increase from $61 billion in 2001. The 3.5 billion hours of delay and 5.7 billion gallons of fuel consumed due to congestion are only the elements that are easiest to estimate. The effect of uncertain or longer delivery times, missed meetings, business relocations and other congestion results are not included.

Congestion is more severe in larger areas. Exhibit 3 shows the range of congestion levels for each population size group. It is not surprising that congestion is more severe in larger cities. What might not be expected is the large range of values. Congestion problems occur in many ways. Some congestion is determined by the design of an area, some is determined by geographic features, weather, collisions and vehicle breakdowns, and some congestion is the result of decisions about investment levels. Likewise, the mobility levels targeted by agencies in each area will vary as well. 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.



The Solutions

The problem has grown too rapidly and is too complex for only one technology or service to be deployed. A broad range of solutions are recommended to address current problems and meet growing travel demand including:

- more road and public transportation projects
- efficient utilization of current facilities
- managing the demand to avoid peak period travel
- providing land use options that reduce the effect of growth

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 approach***—begin to plan and design ***major projects, plans or policy changes*** while relieving critical ***bottlenecks*** or chokepoints, and aggressively pursuing ***minor capacity*** additions, ***operations*** improvements and ***demand*** management options that are available.

The solutions will vary not only by the state or city they are implemented in, but also by the type of development, the level of activity and 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, efficiency improvements and land use pattern or redevelopment solutions.

The "Solution" is really a diverse set of options that require the commitment of decision-makers, businesses and the public to boost transportation investment levels, as well as a variety of changes in the ways the transportation system is used. The effectiveness of options will vary from area to area, but the growth in congestion over the past 20 years suggests that more needs to be done in the future.

- **More capacity**—More road and public transportation improvement projects are part of the equation. Some of the growth in travel demand must be accommodated with new roads and systems and expansions of existing systems. And more capacity is needed to address some of the mobility deficiencies that currently exist (see Exhibit 4).

- **Greater efficiency**—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 educating travelers about their options, and some are the result of providing a more diverse set of travel and development options than are currently available.

- **Manage the demand**—The way that travelers use the transportation network can be modified to accommodate more demand. 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 both transportation needs and economic equity concerns. The key will be to provide better conditions and more travel options for shopping, school, health care and a variety of other activities.

- **Development patterns**—There are a variety of techniques that are being tested in urban areas to change the way that commercial, office and residential developments occur. These also appear to be part, but not all, of the solution. Sustaining the urban "quality of life" and gaining an increment of economic development without the typical increment of mobility decline is one way to state this goal.

- **Realistic expectations** are also part of the solution. Large cities will be congested. Some locations near key activity centers in smaller cities 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.

The Benefits of Action

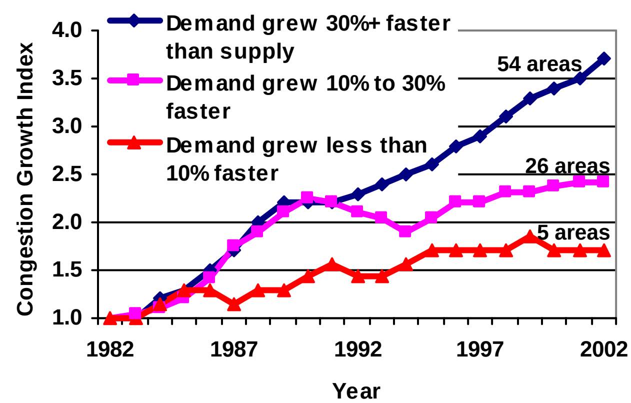
All types of improvement actions are necessary. Without a detailed analysis it is impossible to say which action or set of actions will best meet the corridor or community needs. But, it is important to recognize that actions can make a difference. It is possible to at least slow the growth and in the right circumstances, reduce congestion.

Roadway Capacity Increases

Cities that address the growing travel demand have seen lower delay growth than areas where travel growth greatly exceeds supply growth. Exhibit 4 illustrates that when changes in supply more closely match changes in demand, there is less increase in delay. The three groups were studied using data from 1982 to 2002. The change in miles traveled was compared to the change in lane-miles for each of the 85 urban areas. The change in congestion level was calculated for the following groups:

- **Significant mismatch**—Traffic growth was more than 30 percent faster than the growth in road capacity for the 54 urban areas in this group.
- **Closer match**—Traffic growth was between 10 percent and 30 percent more than road capacity growth. There were 26 urban areas in this group.
- **Narrow gap**—Road growth was within 10 percent of traffic growth for the 5 urban areas in this group.

Exhibit 4. Road Growth and Mobility Level



Additional roadways reduce the rate of increase in the time it takes travelers to make congested period trips. 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 clear that adding roadway at about the same rate as traffic grows will slow the growth of congestion.

It is equally 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.

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 cities in the U.S. If public transportation service was discontinued and the riders traveled in private vehicles, the 85 urban areas would have suffered an additional 1.1 billion hours of delay in 2002.

Public transportation service provides many additional benefits in the corridors and areas it serves. Access to jobs, shops, medical, school and other destinations for those who do not have access to private transportation may provide more societal benefits than the congestion relief, but this report only examined part of the mobility aspect. 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.

In the 85 urban areas studied there were approximately 44 billion passenger-miles of travel on public transportation systems in 2002 (1). The annual travel ranges from an average of 17 million miles per year in Small urban areas to about 3.1 billion miles in Very Large areas. Overall, if these riders did not have access to public transportation systems, the 1.1 billion hours of additional roadway delay would represent a 32 percent increase in delay and an additional congestion cost of $20 billion. 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 915 million hours per year (37 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 180 million additional hours of delay per year if public transportation service were not available.

Exhibit 5. Delay Increase if Public Transportation Service Were Eliminated – 85 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 (11)	3,143	913	37	16,353
Large (27)	265	179	17	3,197
Medium (30)	59	26	9	466
Small (17)	17	2	5	33
85 Area Total	43,791	1,120	29	20,049

Source: APTA Operating Statistics and TTI Review

High-Occupancy Vehicle Lanes

High-occupancy vehicle lanes (also known as diamond lanes, bus and carpool lanes, transitways) provide a high-speed travel option to buses and carpools as an incentive to reduce the number of vehicle trips. 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 HOV lanes also provide more reliable service because they are less affected by collisions or vehicle breakdowns.

The Urban Mobility Report includes estimates of the mobility improvements provided by HOV lanes in eight regions where detailed project data are available. Because HOV lane travel is not included in the basic freeway statistics, the person miles traveled and the travel time can be added directly to the mobility measures. The effect of this is to create an estimate of the mobility level provided to the combination of travelers in the slow speed freeway lanes and the higher speed HOV lanes. While only a partial list of HOV projects are included in the current study database (see http://mobility.tamu.edu/ums/hov), it provides a way to understand the measures and the mobility contribution provided by HOV facilities.

Data for the 19 significantly congested corridors studied showed a median decline of 0.20 for the Travel Time Index measure. This involved comparing the mainlane freeway congestion levels and the combined freeway and mainlane value. This is equivalent to 10 to 15 years worth of congestion growth in the average area. These HOV lanes carry one-third of the peak-direction passenger load, providing significant passenger movement at much higher speeds and with more reliable travel times than the congested mainlanes.

Operational Treatments

The 2004 Urban Mobility Report includes the effect of four technologies or treatments designed to gain more benefits from the existing infrastructure (2). These four techniques provide smoother and more regular traffic flow, which also reduces collision rates and the effect of vehicle breakdowns. Freeway entrance ramp metering, freeway incident management, traffic signal coordination and arterial street access management were estimated to provide 335 million hours of delay reduction and $6 billion in congestion savings for the 85 cities studied with 2002 data. If these treatments were deployed on all the major roads in every area, an estimated 700 million hours of delay and more than $12 billion would be saved.

Freeway Entrance Ramp Metering

Entrance ramp meters regulate the flow of traffic on freeway entrance 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 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 (3).

Twenty-three of the urban areas reported ramp metering on some portion of their freeway system in 2002 (4,5) for a total of 17 percent of the freeway miles. The effect was to reduce delay by 101 million person hours, approximately 5 percent of the freeway delay in those areas.

Freeway Incident Management Programs

Freeway Service Patrol, Highway Angel, Highway Helper, The Minutemen and Motorists Assistance Patrol are all names that have been applied to the operations that attempt to remove crashed and disabled vehicles from the freeway lanes and shoulders. They work in conjunction with surveillance cameras, cell phone reported incident call-in programs and other elements to remove these disruptions, decrease delay 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 (6). An incident management program can also reduce "secondary" crashes—collisions within the stop-and-go traffic caused by the initial incident. The range of benefits is related to traffic flow characteristics as well as to the aggressiveness and timeliness of the service.

Seventy areas reported one or both treatments in 2002, with the coverage representing from 31 percent to 63 percent of the freeway miles in the cities (4,5). The effect was to reduce delay by 170 million person hours, approximately 7 percent of the freeway delay in those areas.

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.

All 85 areas reported some level of traffic signal coordination in 2002, with the coverage representing slightly over half of the street miles in the cities (4,5). Signal coordination projects have the highest percentage treatment within the cities 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 18 million person hours, approximately one and one-half percent of the street delay. 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 were not necessary?

Arterial Street Access Management Programs

Providing smooth traffic flow and reducing collisions are the goal of a variety of individual treatments that make up a statewide or municipal access management program. Typical treatments include consolidating driveways to minimize the disruptions to traffic flow, median turn lanes or turn restrictions, acceleration and deceleration lanes and other approaches to reduce the potential collision and conflict points. Such programs are a combination of design standards, public sector regulations and private sector development actions.

Eighty-three areas reported characteristics of an access management treatment in 2002, with the coverage representing just less than 40 percent of the major street miles in the cities (4,5). The effect was to reduce delay by 46 million person hours, approximately 3.6 percent of the street delay in those areas.

Operational Treatment Summary

Estimating the effect of a few operational projects on urban area congestion levels with a "national default value" sort of analysis may not be a particularly useful exercise. This type of methodology misses the importance of addressing the operating bottlenecks in the system and do not accommodate the benefits from exceptionally aggressive operating practices or policies aimed at congested locations. Recognizing these shortcomings, the information suggests that 9 percent of the roadway delay is being addressed by these four operational treatments for a total of 335 million hours in 2002 (Exhibit 6). And if the treatments were deployed on all major freeways and streets, the benefit would expand to about 18 percent of delay. 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.

Exhibit 6. Operational Improvement Summary

Operations Treatment	Delay Reduction from Current Projects		Possible Delay Reduction if Implemented on All Roads (million hours)
	Hours Saved (million)	Dollars Saved (million $)	
Ramp Metering	101	1,814	322
Incident Management	170	3,031	239
Signal Coordination	18	315	36
Access Management	46	826	103
TOTAL	335	5,986	700

Note: This analysis uses nationally consistent data and relatively simplistic 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.

Other Actions

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. It also seems that big city residents should expect congestion for 1 or 2 hours in the morning and in the evening. The agencies should be able to improve the performance and reliability of the service at other hours and they may be able to slow the growth of congestion, but they cannot expand the system or improve the operation rapidly enough to eliminate congestion.

Methodology

The base data for the 2004 Annual Report come from the states and the US Department of Transportation (4,5). The travel and road inventory statistics are analyzed with a set of procedures developed from computer models and empirical studies. The travel time and speed estimation process is described at: 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 2002.

The "base" estimates, however, do not include the effect of many transportation improvements. The 2004 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, 2001 and 2002 include these treatments and identify them as "with strategies." The national datasets do not, however, include deployment information for other years and the trend information will not be compatible with the decade of the 1990s when many areas began investing in operational treatments. While this currently does not provide a long-term trend analysis of the true "on the ground" conditions, the project database will be expanded in coming years. The effects of public transportation 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 available at http://mobility.tamu.edu/ums/report/volume_2.stm Operational treatment estimates are calculated from national statistics and computer modeling techniques based on the effects of implemented projects (4,5,7). Public transportation service effects are estimated for 1982 to 2002 based on national ridership statistics (1) and assumptions about the effect of eliminating the service and placing travelers in the general purpose lanes.

Combining Performance Measures

The congestion problem has many dimensions and no single performance measure or statistic has been developed to illustrate all of them. Urban regions large and small are also pursuing different combinations of improvement strategies that are evaluated with different measures. Urban area population, as depicted in Figure 3, also has an affect on the amount and intensity of congestion and on the scale of improvements that might be implemented. The Urban Mobility Report, therefore, has several measures to assess mobility solutions or congestion problems.

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 2002 values. The change in values since 1982 is described as "faster" or "slower" growth in congestion. These descriptions do not indicate any judgment about the extent of mobility problems. Cities 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.

The intervals used in Table 6 are tied to the authors' estimate of discernible differences in the data. Large urban areas differences of less than five hours of delay per peak traveler, for example, may not have significantly different congestion levels. The national averages and "one-size-fits-all" methodology used in the Annual Report, combined with variations in traffic and data collection practices, make it difficult to say that congestion statistics within these ranges indicate a real difference in mobility.

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Table 1. Key Mobility Measures, 2002

Urban Area	Annual Delay per Traveler		Travel Time Index	
	2002 Hours	Rank	2002 Values	Rank
85 Area Average	46		1.37	
Very Large Average	62		1.50	
Very Large				
Los Angeles-Long Beach-Santa Ana CA	93	1	1.77	1
San Francisco-Oakland CA	73	2	1.55	2
Washington DC-VA-MD	67	3	1.50	4
Dallas-Fort Worth-Arlington TX	61	4	1.34	21
Houston TX	58	6	1.39	10
Chicago IL-IN	56	8	1.54	3
Boston MA-NH-RI	54	9	1.45	5
Detroit MI	53	10	1.36	15
Miami FL	52	12	1.40	7
New York-Newark NY-NJ-CT	50	14	1.40	7
Philadelphia PA-NJ-DE-MD	40	26	1.35	17
85 Area Average	46		1.37	
Large Average	38		1.29	
Large				
Atlanta GA	60	5	1.42	6
Riverside-San Bernardino CA	57	7	1.39	10
San Jose CA	53	10	1.39	10
Orlando FL	51	13	1.29	27
Baltimore MD	48	16	1.36	15
San Diego CA	47	17	1.39	10
Seattle WA	46	18	1.35	17
Denver-Aurora CO	45	19	1.40	7
Phoenix AZ	45	19	1.35	17
Minneapolis-St. Paul MN	42	22	1.34	21
Tampa-St. Petersburg FL	42	22	1.31	24
Portland OR-WA	41	24	1.38	14
Cincinnati OH-KY-IN	38	27	1.25	31
Indianapolis IN	37	29	1.24	33
Sacramento CA	36	30	1.33	23
St. Louis MO-IL	36	30	1.24	33
San Antonio TX	36	30	1.23	37
Columbus OH	29	39	1.18	45
Virginia Beach VA	28	41	1.21	39
Las Vegas NV	27	43	1.35	17
Milwaukee WI	23	46	1.24	33
New Orleans LA	17	56	1.18	45
Kansas City MO-KS	15	58	1.10	65
Oklahoma City OK	14	63	1.11	61
Pittsburgh PA	12	69	1.10	65
Cleveland OH	11	72	1.10	65
Buffalo NY	10	73	1.08	72

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

2002 values include the effects of operational treatments.

Note: Users of this data are cautioned to avoid placing too much value on the rankings of all 85 urban areas. Often, there is little difference between being 6th on the list and being 12th, for example. Furthermore, these rankings compare all cities without respect to population or other differences which can significantly influence the ranking outcomes. Rankings should be used to make broad, general comparisons only and not distinguish between cities based on small differences in ranking outcomes.

Table 1. Key Mobility Measures, 2002, Continued

Urban Area	Annual Delay per Traveler		Travel Time Index	
	2002 Hours	Rank	2002 Values	Rank
85 Area Average	46		1.37	
Medium Average	25		1.18	
Medium				
Austin TX	49	15	1.31	24
Charlotte NC-SC	45	19	1.31	24
Nashville-Davidson TN	41	24	1.19	42
Louisville KY-IN	38	27	1.24	33
Providence RI-MA	33	33	1.20	40
Salt Lake City UT	32	34	1.27	30
Bridgeport-Stamford CT-NY	31	35	1.28	29
Memphis TN-MS-AR	31	35	1.22	38
Oxnard-Ventura CA	31	35	1.20	40
Jacksonville FL	31	35	1.16	52
Tucson AZ	29	39	1.29	27
Albuquerque NM	28	41	1.19	42
Raleigh-Durham NC	26	44	1.18	45
Birmingham AL	26	44	1.16	52
Omaha NE-IA	23	46	1.17	50
New Haven CT	22	49	1.14	58
Sarasota-Bradenton FL	20	51	1.25	31
Grand Rapids MI	20	51	1.15	55
El Paso TX-NM	19	53	1.16	52
Honolulu HI	18	55	1.18	45
Hartford CT	17	56	1.12	59
Fresno CA	15	58	1.15	55
Dayton OH	15	58	1.10	65
Richmond VA	15	58	1.08	72
Tulsa OK	14	63	1.11	61
Toledo OH-MI	13	68	1.11	61
Akron OH	12	69	1.09	70
Albany-Schenectady NY	12	69	1.07	74
Springfield MA-CT	9	74	1.07	74
Rochester NY	6	82	1.06	80
85 Area Average	46		1.37	
Small Average	12		1.10	
Small				
Colorado Springs CO	23	46	1.19	42
Charleston-North Charleston SC	22	49	1.18	45
Pensacola FL-AL	19	53	1.12	59
Beaumont TX	15	58	1.07	74
Cape Coral FL	14	63	1.17	50
Allentown-Bethlehem PA-NJ	14	63	1.15	55
Salem OR	14	63	1.11	61
Eugene OR	9	74	1.10	65
Boulder CO	9	74	1.09	70
Spokane WA	9	74	1.07	74
Little Rock AR	9	74	1.06	80
Columbia SC	8	79	1.05	83
Laredo TX	7	80	1.07	74
Bakersfield CA	7	80	1.06	80
Corpus Christi TX	6	82	1.04	85
Brownsville TX	5	84	1.07	74
Anchorage AK	5	84	1.05	83

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.

2002 Values include the effects of operational treatments.

Note: Users of this data are cautioned to avoid placing too much value on the rankings of all 85 urban areas. Often, there is little difference between being 6th on the list and being 12th, for example. Furthermore, these rankings compare all cities without respect to population or other differences which can significantly influence the ranking outcomes. Rankings should be used to make broad, general comparisons only and not distinguish between cities based on small differences in ranking outcomes.

CAUTION: See http://mobility.tamu.edu/ums for improved performance measures and updated data.

Table 2. Components of the Congestion Problem, 2002 Urban Area Totals

Urban Area	Travel Delay (1000 Hours)	Rank	Excess Fuel Consumed (Million Gallons)	Rank	Congestion Cost ($ million)	Rank
85 Area Total	3,534,675		5,661		63,152	
85 Area Average	41,584		67		743	
Very Large Average	204,453		321		3,652	
Very Large						
Los Angeles-Long Beach-Santa Ana CA	625,063	1	931	1	11,231	1
New York-Newark NY-NJ-CT	394,709	2	646	2	7,079	2
Chicago IL-IN	237,849	3	365	3	4,221	3
San Francisco-Oakland CA	153,195	4	245	4	2,779	4
Dallas-Fort Worth-Arlington TX	147,482	5	239	5	2,603	5
Miami FL	144,824	6	221	6	2,558	6
Washington DC-VA-MD	126,626	7	203	7	2,274	7
Houston TX	123,547	8	198	8	2,178	8
Detroit MI	109,056	9	176	9	1,939	9
Philadelphia PA-NJ-DE-MD	105,528	10	172	10	1,871	10
Boston MA-NH-RI	81,105	12	130	12	1,440	12
85 Area Total	3,534,675		5,661		63,152	
85 Area Average	41,584		67		743	
Large Average	35,712		59		639	
Large						
Atlanta GA	97,220	11	168	11	1,717	11
Phoenix AZ	72,148	13	116	14	1,289	14
San Diego CA	72,126	14	119	13	1,314	13
Seattle WA	65,276	15	110	15	1,175	15
Baltimore MD	59,760	16	101	16	1,069	16
Minneapolis-St. Paul MN	54,606	17	93	17	971	17
Denver-Aurora CO	54,123	18	83	18	954	18
Riverside-San Bernardino CA	49,800	19	80	19	904	19
San Jose CA	48,015	20	77	20	871	20
Tampa-St. Petersburg FL	45,777	21	69	22	808	21
St. Louis MO-IL	40,481	22	70	21	719	22
Orlando FL	34,579	23	54	23	613	23
Portland OR-WA	32,705	24	54	23	589	24
Sacramento CA	28,771	25	49	25	526	25
Cincinnati OH-KY-IN	27,917	26	49	25	500	26
San Antonio TX	24,456	27	41	27	434	27
Virginia Beach VA	23,261	28	39	28	412	28
Indianapolis IN	20,852	31	35	30	369	31
Las Vegas NV	20,089	32	33	32	364	32
Milwaukee WI	17,746	33	30	33	318	33
Columbus OH	16,241	36	29	34	292	36
Kansas City MO-KS	12,025	42	22	42	215	42
Pittsburgh PA	11,472	43	18	44	203	44
Cleveland OH	11,471	44	20	43	206	43
New Orleans LA	9,966	47	16	47	176	47
Oklahoma City OK	8,090	51	14	50	143	51
Buffalo NY	5,258	63	9	59	95	62

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 $13.45 per hour of person travel and $71.05 per hour of truck time) and excess fuel consumption (estimated using state average cost per gallon).

2002 Values include the effects of operational treatments.

Note: Users of this data are cautioned to avoid placing too much value on the rankings of all 85 urban areas. Often, there is little difference between being 6th on the list and being 12th, for example. Furthermore, these rankings compare all cities without respect to population or other differences which can significantly influence the ranking outcomes. Rankings should be used to make broad, general comparisons only and not distinguish between cities based on small differences in ranking outcomes.

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Table 2. Components of the Congestion Problem, 2002 Urban Area Totals, Continued

Urban Area	Travel Delay (1000 Hours)	Rank	Excess Fuel Consumed (Million Gallons)	Rank	Congestion Cost ($ million)	Rank
85 Area Total	3,534,675		5,661		63,152	
85 Area Average	41,584		67		743	
Medium Average	9,548		16		170	
Medium						
Austin TX	21,831	29	37	29	387	29
Providence RI-MA	21,504	30	35	30	384	30
Charlotte NC-SC	17,095	34	28	36	303	34
Louisville KY-IN	16,967	35	29	34	302	35
Memphis TN-MS-AR	16,093	37	26	37	285	37
Salt Lake City UT	15,490	38	26	37	277	38
Nashville-Davidson TN	15,374	39	26	37	273	39
Jacksonville FL	15,004	40	25	40	268	40
Bridgeport-Stamford CT-NY	14,150	41	25	40	256	41
Tucson AZ	10,754	45	17	46	191	45
Raleigh-Durham NC	10,717	46	18	44	190	46
Birmingham AL	9,425	48	16	47	168	49
Oxnard-Ventura CA	9,419	49	16	47	172	48
Albuquerque NM	8,677	50	14	50	154	50
Hartford CT	7,908	52	14	50	143	51
Omaha NE-IA	7,758	53	13	53	138	53
Richmond VA	6,830	54	12	54	121	55
Honolulu HI	6,679	55	11	55	123	54
El Paso TX-NM	6,560	56	11	55	116	56
New Haven CT	6,255	57	11	55	113	57
Tulsa OK	5,976	58	10	58	105	58
Sarasota-Bradenton FL	5,766	60	8	63	101	60
Grand Rapids MI	5,699	61	9	59	101	60
Fresno CA	4,614	64	7	65	84	64
Dayton OH	4,599	65	8	63	83	65
Akron OH	3,557	67	6	67	64	67
Toledo OH-MI	3,452	68	6	67	62	68
Albany-Schenectady NY	3,215	69	5	69	58	69
Springfield MA-CT	3,093	71	5	69	55	70
Rochester NY	1,987	73	4	72	36	73
85 Area Total	3,534,675		5,661		63,152	
85 Area Average	41,584		67		743	
Small Average	2,059		3		36	
Small						
Colorado Springs CO	5,776	59	9	59	102	59
Charleston-North Charleston SC	5,427	62	9	59	95	62
Allentown-Bethlehem PA-NJ	4,322	66	7	65	77	66
Pensacola FL-AL	3,104	70	5	69	55	70
Cape Coral FL	2,369	72	3	73	42	72
Columbia SC	1,795	74	3	73	32	74
Salem OR	1,649	75	3	73	30	75
Spokane WA	1,629	76	3	73	29	76
Bakersfield CA	1,607	77	3	73	29	76
Little Rock AR	1,604	78	3	73	29	76
Beaumont TX	1,146	79	2	79	20	79
Eugene OR	1,128	80	2	79	20	79
Corpus Christi TX	1,061	81	2	79	19	81
Laredo TX	724	82	1	82	13	82
Anchorage AK	701	83	1	82	12	83
Boulder CO	555	84	1	82	10	84
Brownsville TX	413	85	1	82	7	85

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 $13.45 per hour of person travel and $71.05 per hour of truck time) and excess fuel consumption (estimated using state average cost per gallon).

2002 Values include the effects of operational treatments.

Note: Users of this data are cautioned to avoid placing too much value on the rankings of all 85 urban areas. Often, there is little difference between being 6th on the list and being 12th, for example. Furthermore, these rankings compare all cities without respect to population or other differences which can significantly influence the ranking outcomes. Rankings should be used to make broad, general comparisons only and not distinguish between cities based on small differences in ranking outcomes.

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Table 3. 2002 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)
85 Area Total		334,462		5,985	1,119,841		20,048
85 Area Average		3,934		70	13,175		236
Very Large Average		21,255		380	83,039		1,487
Very Large							
Los Angeles-Long Beach-Santa Ana CA	r,i,s,a	75,644	1	1,359	130,041	2	2,337
New York-Newark NY-NJ-CT	i,s,a	57,731	2	1,036	381,212	1	6,837
San Francisco-Oakland CA	r,i,s,a	22,046	3	400	83,693	4	1,518
Houston TX	r,i,s,a	15,068	4	266	21,607	10	381
Chicago IL-IN	r,i,s,a	13,107	5	233	91,319	3	1,621
Miami FL	i,s,a	12,542	6	222	20,334	11	359
Dallas-Fort Worth-Arlington TX	i,s,a	10,067	8	178	11,066	15	195
Philadelphia PA-NJ-DE-MD	i,s,a	8,433	11	150	36,330	7	644
Washington DC-VA-MD	r,i,s,a	6,921	12	124	69,155	5	1,242
Detroit MI	r,i,s,a	6,671	15	119	6,128	19	109
Boston MA-NH-RI	i,s,a	5,577	17	99	62,543	6	1,110
85 Area Total		334,462		5,985	1,119,841		20,048
85 Area Average		3,934		70	13,175		236
Large Average		3,163		57	6,615		118
Large							
Minneapolis-St. Paul MN	r,i,s,a	10,497	7	187	10,121	16	180
San Diego CA	r,i,s,a	8,948	9	163	12,951	14	236
Atlanta GA	i,s,a	8,932	10	158	29,489	9	521
Riverside-San Bernardino CA	r,i,s,a	6,917	13	126	3,428	28	62
Seattle WA	r,i,s,a	6,911	14	124	32,504	8	585
Phoenix AZ	r,i,s,a	6,071	16	108	5,501	20	98
San Jose CA	r,i,s,a	5,297	18	96	6,158	18	112
Portland OR-WA	r,i,s,a	4,260	19	77	14,185	13	256
Sacramento CA	r,i,s,a	3,975	20	73	3,083	29	56
Tampa-St. Petersburg FL	i,s,a	3,246	21	57	1,273	39	23
Denver-Aurora CO	r,i,s,a	3,229	22	57	8,133	17	143
Baltimore MD	i,s,a	2,282	23	41	18,362	12	329
Virginia Beach VA	i,s,a	2,089	24	37	1,495	36	27
St. Louis MO-IL	i,s,a	1,911	25	34	3,673	25	65
Milwaukee WI	r,i,s,a	1,618	26	29	4,165	23	75
Orlando FL	i,s,a	1,493	28	27	2,428	33	43
Cincinnati OH-KY-IN	i,s,a	1,169	30	21	2,954	30	53
San Antonio TX	i,s,a	1,151	31	20	3,753	24	67
Columbus OH	r,i,s,a	1,045	33	19	1,074	41	19
Indianapolis IN	i,s,a	928	35	16	665	45	12
Pittsburgh PA	i,s,a	703	41	12	3,480	27	62
Las Vegas NV	i,s,a	692	42	13	4,294	22	78
Cleveland OH	i,s,a	668	44	12	2,486	32	45
New Orleans LA	i,s,a	579	46	10	1,735	35	31
Kansas City MO-KS	i,s,a	578	47	10	457	51	8
Buffalo NY	i,s,a	121	61	2	581	49	11
Oklahoma City OK	s,a	76	68	1	174	69	3

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) and arterial street access management (a).

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: Users of this data are cautioned to avoid placing too much value on the rankings of all 85 urban areas. Often, there is little difference between being 6th on the list and being 12th, for example. Furthermore, these rankings compare all cities without respect to population or other differences which can significantly influence the ranking outcomes. Rankings should be used to make broad, general comparisons only and not distinguish between cities based on small differences in ranking outcomes.

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Table 3. 2002 Effect of Mobility Improvements, Continued

Urban Area	Operational Treatment Savings				Public Transportation Savings		
	Treatments	Delay (1000 Hours)	Rank	Cost ($ million)	Delay (1000 Hours)	Rank	Cost ($ million)
85 Area Total		334,462		5,985	1,119,841		20,048
85 Area Average		3,934		70	13,175		236
Medium Average		475		8	866		16
Medium							
Salt Lake City UT	r,i,s,a	1,559	27	28	3,526	26	63
Austin TX	i,s,a	1,275	29	23	2,574	31	46
Nashville-Davidson TN	i,s,a	1,060	32	19	576	50	10
Jacksonville FL	i,s,a	1,036	34	19	595	48	11
Charlotte NC-SC	i,s,a	906	36	16	1,820	34	32
Memphis TN-MS-AR	i,s	849	37	15	1,349	37	24
Louisville KY-IN	i,s,a	821	38	15	992	43	18
Omaha NE-IA	i,s,a	762	39	14	205	62	4
Tucson AZ	i,s,a	728	40	13	938	44	17
Bridgeport-Stamford CT-NY	i,s,a	672	43	12	308	54	6
Albuquerque NM	i,s,a	594	45	11	294	55	5
El Paso TX-NM	i,s,a	537	48	10	1,033	42	18
Birmingham AL	i,s,a	468	49	8	87	76	2
Hartford CT	i,s,a	459	50	8	1,348	38	24
Sarasota-Bradenton FL	i,s,a	423	51	7	141	70	3
Fresno CA	r,i,s,a	335	52	6	381	52	7
New Haven CT	i,s,a	266	53	5	609	47	11
Oxnard-Ventura CA	i,s,a	258	54	5	283	57	5
Raleigh-Durham NC	i,s,a	254	55	4	614	46	11
Richmond VA	i,s,a	233	56	4	358	53	6
Providence RI-MA	i,s,a	219	57	4	1,126	40	20
Honolulu HI	i,s,a	180	58	3	5,251	21	97
Grand Rapids MI	s,a	86	63	2	205	62	4
Albany-Schenectady NY	i,s,a	62	70	1	188	67	3
Springfield MA-CT	i,s,a	55	71	1	113	73	2
Rochester NY	i,s,a	48	73	1	260	58	5
Dayton OH	s	29	76	1	287	56	5
Tulsa OK	s,a	29	76	1	124	72	2
Toledo OH-MI	s,a	25	80	0	193	65	4
Akron OH	s,a	15	82	0	193	65	4
85 Area Total		334,462		5,985	1,119,841		20,048
85 Area Average		3,934		70	13,175		236
Small Average		60		1	108		2
Small							
Colorado Springs CO	i,s,a	170	59	3	224	59	4
Cape Coral FL	i,s,a	143	60	3	102	74	2
Allentown-Bethlehem PA-NJ	s,a	103	62	2	194	64	3
Spokane WA	i,s,a	85	64	2	221	60	4
Little Rock AR	i,s,a	81	65	2	44	83	1
Bakersfield CA	i,s,a	80	66	1	178	68	3
Eugene OR	i,s,a	79	67	1	208	61	4
Pensacola FL-AL	s,a	63	69	1	54	80	1
Charleston-North Charleston SC	i,s	52	72	1	136	71	2
Columbia SC	i,s,a	36	74	1	29	85	1
Boulder CO	s,a	33	75	1	52	81	1
Anchorage AK	s,a	27	78	1	47	82	1
Laredo TX	s,a	26	79	1	80	77	1
Brownsville TX	s,a	20	81	0	67	79	1
Salem OR	s,a	13	83	0	78	78	1
Beaumont TX	s,a	10	84	0	40	84	1
Corpus Christi TX	s,a	4	85	0	90	75	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) and arterial street access management (a).

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.

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Table 4. Trends—Annual Delay per Traveler, 1982 to 2002

Urban Area	Annual Hours of Delay per Traveler				Long-Term Change 1982 to 2002	
	2002	2001	1992	1982	Hours	Rank
85 Area Average	46	45	38	16	30	
Very Large Average	62	60	55	24	38	
Very Large						
Dallas-Fort Worth-Arlington TX	61	55	43	13	48	1
Los Angeles-Long Beach-Santa Ana CA	93	94	114	47	46	3
Washington DC-VA-MD	67	66	48	21	46	3
San Francisco-Oakland CA	73	73	60	30	43	6
Miami FL	52	50	39	11	41	7
Chicago IL-IN	56	50	43	16	40	8
Detroit MI	53	51	65	17	36	14
Boston MA-NH-RI	54	54	40	20	34	16
New York-Newark NY-NJ-CT	50	48	33	18	32	21
Philadelphia PA-NJ-DE-MD	40	39	31	14	26	31
Houston TX	58	57	32	39	19	44
85 Area Average	46	45	38	16	30	
Large Average	38	38	28	10	28	
Large						
Riverside-San Bernardino CA	57	54	55	9	48	1
Atlanta GA	60	52	26	14	46	3
Baltimore MD	48	40	29	9	39	9
Minneapolis-St. Paul MN	42	43	23	3	39	9
Orlando FL	51	60	36	12	39	9
San Diego CA	47	40	31	8	39	9
Cincinnati OH-KY-IN	38	36	18	4	34	16
Portland OR-WA	41	41	27	7	34	16
Seattle WA	46	47	63	12	34	16
Indianapolis IN	37	40	15	4	33	20
Denver-Aurora CO	45	61	32	16	29	22
San Antonio TX	36	35	14	7	29	22
Phoenix AZ	45	48	42	17	28	25
San Jose CA	53	60	58	25	28	25
Columbus OH	29	30	22	4	25	33
Sacramento CA	36	31	28	12	24	35
Tampa-St. Petersburg FL	42	43	39	18	24	35
St. Louis MO-IL	36	35	24	14	22	39
Las Vegas NV	27	28	23	7	20	42
Milwaukee WI	23	25	14	5	18	47
Virginia Beach VA	28	23	19	12	16	50
Kansas City MO-KS	15	16	9	2	13	53
Oklahoma City OK	14	12	7	3	11	56
Cleveland OH	11	13	8	1	10	63
New Orleans LA	17	19	16	9	8	66
Buffalo NY	10	10	5	3	7	69
Pittsburgh PA	12	13	15	10	2	82

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.

2001 and 2002 data include the effects of operational treatments.

Note: Users of this data are cautioned to avoid placing too much value on the rankings of all 85 urban areas. Often, there is little difference between being 6th on the list and being 12th, for example. Furthermore, these rankings compare all cities without respect to population or other differences which can significantly influence the ranking outcomes. Rankings should be used to make broad, general comparisons only and not distinguish between cities based on small differences in ranking outcomes.

Table 4. Trends—Annual Delay per Traveler, 1982 to 2002, Continued

Urban Area	Annual Hours of Delay per Traveler				Long-Term Change 1982 to 2002	
	2002	2001	1992	1982	Hours	Rank
85 Area Average	46	45	38	16	30	
Medium Average	25	24	14	6	19	
Medium						
Austin TX	49	50	20	11	38	13
Charlotte NC-SC	45	39	29	10	35	15
Salt Lake City UT	32	26	13	3	29	22
Louisville KY-IN	38	34	19	10	28	25
Memphis TN-MS-AR	31	30	15	3	28	25
Providence RI-MA	33	23	15	5	28	25
Nashville-Davidson TN	41	37	16	14	27	30
Bridgeport-Stamford CT-NY	31	31	17	5	26	31
Oxnard-Ventura CA	31	33	15	6	25	33
Tucson AZ	29	25	13	5	24	35
Jacksonville FL	31	29	28	8	23	38
Albuquerque NM	28	34	21	6	22	39
Birmingham AL	26	25	11	6	20	42
Omaha NE-IA	23	22	14	4	19	44
Raleigh-Durham NC	26	31	20	7	19	44
New Haven CT	22	28	10	4	18	47
El Paso TX-NM	19	20	8	2	17	49
Grand Rapids MI	20	19	14	5	15	51
Hartford CT	17	17	12	4	13	53
Dayton OH	15	19	9	3	12	55
Richmond VA	15	13	12	4	11	56
Toledo OH-MI	13	14	4	2	11	56
Tulsa OK	14	14	6	3	11	56
Akron OH	12	14	8	2	10	63
Honolulu HI	18	20	30	10	8	66
Sarasota-Bradenton FL	20	17	12	12	8	66
Fresno CA	15	16	14	8	7	69
Albany-Schenectady NY	12	12	7	7	5	76
Rochester NY	6	6	4	1	5	76
Springfield MA-CT	9	8	8	7	2	82
85 Area Average	46	45	38	16	30	
Small Average	12	12	9	4	8	
Small						
Colorado Springs CO	23	24	7	2	21	41
Pensacola FL-AL	19	19	15	4	15	51
Cape Coral FL	14	13	10	3	11	56
Charleston-North Charleston SC	22	21	23	11	11	56
Salem OR	14	12	8	3	11	56
Beaumont TX	15	11	7	5	10	63
Allentown-Bethlehem PA-NJ	14	13	13	7	7	69
Boulder CO	9	10	5	2	7	69
Eugene OR	9	10	5	2	7	69
Little Rock AR	9	11	5	3	6	74
Spokane WA	9	9	7	3	6	74
Bakersfield CA	7	7	6	2	5	76
Columbia SC	8	8	7	3	5	76
Laredo TX	7	8	2	2	5	76
Brownsville TX	5	6	3	1	4	81
Corpus Christi TX	6	7	7	5	1	84
Anchorage AK	5	5	4	5	0	85

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.

2001 and 2002 data include the effects of operational treatments.

Note: Users of this data are cautioned to avoid placing too much value on the rankings of all 85 urban areas. Often, there is little difference between being 6th on the list and being 12th, for example. Furthermore, these rankings compare all cities without respect to population or other differences which can significantly influence the ranking outcomes. Rankings should be used to make broad, general comparisons only and not distinguish between cities based on small differences in ranking outcomes.

CAUTION: See http://mobility.tamu.edu/ums for improved performance measures and updated data.

Table 5. Trends—Travel Time Index, 1982 to 2002

Urban Area	Travel Time Index				Point Change in Peak-Period Time Penalty 1982 to 2002	
	2002	2001	1992	1982	Points	Rank
85 Area Average	1.37	1.35	1.28	1.12	25	
Very Large Area Average	1.50	1.48	1.41	1.19	31	
Very Large						
Los Angeles-Long Beach-Santa Ana CA	1.77	1.77	1.76	1.30	47	1
Chicago IL-IN	1.54	1.47	1.35	1.18	36	2
San Francisco-Oakland CA	1.55	1.54	1.41	1.21	34	4
Washington DC-VA-MD	1.50	1.46	1.37	1.18	32	8
Boston MA-NH-RI	1.45	1.45	1.29	1.14	31	9
Miami FL	1.40	1.37	1.26	1.09	31	9
New York-Newark NY-NJ-CT	1.40	1.38	1.27	1.13	27	16
Dallas-Fort Worth-Arlington TX	1.34	1.31	1.20	1.07	27	16
Detroit MI	1.36	1.35	1.34	1.12	24	19
Philadelphia PA-NJ-DE-MD	1.35	1.35	1.22	1.13	22	25
Houston TX	1.39	1.37	1.24	1.28	11	51
85 Area Average	1.37	1.35	1.28	1.12	25	
Large Area Average	1.30	1.29	1.19	1.07	23	
Large						
Riverside-San Bernardino CA	1.39	1.35	1.29	1.04	35	3
Atlanta GA	1.42	1.37	1.14	1.08	34	4
San Diego CA	1.39	1.32	1.23	1.06	33	6
Portland OR-WA	1.38	1.39	1.20	1.05	33	6
Minneapolis-St. Paul MN	1.34	1.34	1.14	1.03	31	9
Denver-Aurora CO	1.40	1.46	1.21	1.10	30	12
Baltimore MD	1.36	1.30	1.19	1.07	29	13
Las Vegas NV	1.35	1.35	1.24	1.07	28	14
Seattle WA	1.35	1.35	1.38	1.07	28	14
Sacramento CA	1.33	1.29	1.18	1.07	26	18
Phoenix AZ	1.35	1.40	1.27	1.13	22	25
San Jose CA	1.39	1.43	1.34	1.18	21	27
Cincinnati OH-KY-IN	1.25	1.25	1.15	1.04	21	27
Indianapolis IN	1.24	1.25	1.10	1.03	21	27
Orlando FL	1.29	1.31	1.19	1.09	20	30
Milwaukee WI	1.24	1.24	1.15	1.05	19	31
San Antonio TX	1.23	1.22	1.08	1.05	18	33
St. Louis MO-IL	1.24	1.22	1.14	1.09	15	36
Columbus OH	1.18	1.18	1.13	1.03	15	36
Virginia Beach VA	1.21	1.18	1.14	1.08	13	42
Tampa-St. Petersburg FL	1.31	1.31	1.29	1.19	12	47
Oklahoma City OK	1.11	1.10	1.04	1.02	9	56
Kansas City MO-KS	1.10	1.10	1.05	1.01	9	56
New Orleans LA	1.18	1.17	1.18	1.10	8	63
Cleveland OH	1.10	1.12	1.07	1.02	8	63
Buffalo NY	1.08	1.08	1.04	1.03	5	71
Pittsburgh PA	1.10	1.10	1.09	1.08	2	80

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.

2001 and 2002 data include the effects of operational treatments.

Note: Users of this data are cautioned to avoid placing too much value on the rankings of all 85 urban areas. Often, there is little difference between being 6th on the list and being 12th, for example. Furthermore, these rankings compare all cities without respect to population or other differences which can significantly influence the ranking outcomes. Rankings should be used to make broad, general comparisons only and not distinguish between cities based on small differences in ranking outcomes.

Table 5. Trends—Travel Time Index, 1982 to 2002, Continued

Urban Area	Travel Time Index 2002	2001	1992	1982	Point Change in Peak-Period Time Penalty 1982 to 2002 Points	Rank
85 Area Average	1.37	1.35	1.28	1.12	25	
Medium Area Average	1.18	1.17	1.10	1.05	13	
Medium						
Charlotte NC-SC	1.31	1.26	1.19	1.07	24	19
Salt Lake City UT	1.27	1.24	1.13	1.03	24	19
Austin TX	1.31	1.30	1.12	1.08	23	22
Tucson AZ	1.29	1.24	1.13	1.06	23	22
Bridgeport-Stamford CT-NY	1.28	1.28	1.15	1.05	23	22
Memphis TN-MS-AR	1.22	1.21	1.11	1.03	19	31
Oxnard-Ventura CA	1.20	1.21	1.10	1.04	16	35
Louisville KY-IN	1.24	1.22	1.13	1.09	15	36
Providence RI-MA	1.20	1.16	1.10	1.05	15	36
Albuquerque NM	1.19	1.22	1.13	1.04	15	36
El Paso TX-NM	1.16	1.17	1.07	1.02	14	41
Sarasota-Bradenton FL	1.25	1.22	1.16	1.12	13	42
Raleigh-Durham NC	1.18	1.19	1.12	1.05	13	42
Omaha NE-IA	1.17	1.16	1.11	1.04	13	42
Nashville-Davidson TN	1.19	1.18	1.08	1.07	12	47
Jacksonville FL	1.16	1.15	1.14	1.04	12	47
Grand Rapids MI	1.15	1.14	1.09	1.03	12	47
Birmingham AL	1.16	1.15	1.07	1.05	11	51
New Haven CT	1.14	1.17	1.07	1.03	11	51
Fresno CA	1.15	1.16	1.13	1.05	10	54
Tulsa OK	1.11	1.12	1.05	1.02	9	56
Toledo OH-MI	1.11	1.11	1.03	1.02	9	56
Honolulu HI	1.18	1.19	1.22	1.10	8	63
Hartford CT	1.12	1.12	1.08	1.04	8	63
Dayton OH	1.10	1.11	1.06	1.03	7	68
Akron OH	1.09	1.10	1.05	1.02	7	68
Richmond VA	1.08	1.07	1.06	1.03	5	71
Rochester NY	1.06	1.06	1.04	1.01	5	71
Springfield MA-CT	1.07	1.06	1.06	1.05	2	80
Albany-Schenectady NY	1.07	1.06	1.04	1.06	1	83
85 Area Average	1.37	1.35	1.28	1.12	25	
Small Area Average	1.10	1.10	1.07	1.04	6	
Small						
Colorado Springs CO	1.19	1.20	1.05	1.02	17	34
Cape Coral FL	1.17	1.14	1.11	1.04	13	42
Charleston-North Charleston SC	1.18	1.17	1.16	1.08	10	54
Allentown-Bethlehem PA-NJ	1.15	1.14	1.11	1.06	9	56
Pensacola FL-AL	1.12	1.12	1.09	1.03	9	56
Salem OR	1.11	1.09	1.05	1.02	9	56
Eugene OR	1.10	1.11	1.05	1.02	8	63
Boulder CO	1.09	1.09	1.04	1.02	7	68
Spokane WA	1.07	1.07	1.05	1.02	5	71
Brownsville TX	1.07	1.08	1.04	1.02	5	71
Bakersfield CA	1.06	1.06	1.04	1.01	5	71
Laredo TX	1.07	1.08	1.04	1.03	4	77
Beaumont TX	1.07	1.06	1.04	1.03	4	77
Little Rock AR	1.06	1.07	1.03	1.02	4	77
Columbia SC	1.05	1.05	1.04	1.03	2	80
Anchorage AK	1.05	1.05	1.04	1.04	1	83
Corpus Christi TX	1.04	1.05	1.04	1.03	1	83

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.

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Table 6. Congestion—A Multi-Dimensional Problem

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	Total Cost	Congestion Increase 1982 to 2002: Delay per Traveler	Congestion Increase 1982 to 2002: Total Delay
Very Large						
Boston MA-NH-RI	L	L	LL	L	LL	LL
Chicago IL-IN	L	O	H	O	LL	H
Dallas-Fort Worth-Arlington TX	O	LL	L	O	LL	O
Detroit MI	L	LL	LL	L	LL	LL
Houston TX	O	LL	LL	L	LL	LL
Los Angeles-Long Beach-Santa Ana CA	HH	HH	HH	HH	LL	HH
Miami FL	LL	LL	L	O	LL	O
New York-Newark NY-NJ-CT	LL	LL	HH	HH	LL	HH
Philadelphia PA-NJ-DE-MD	LL	LL	LL	L	LL	LL
San Francisco-Oakland CA	HH	H	L	O	LL	L
Washington DC-VA-MD	H	O	LL	L	LL	L
Large						
Atlanta GA	HH	HH	HH	HH	H	HH
Baltimore MD	HH	H	HH	H	O	HH
Buffalo NY	LL	LL	LL	L	LL	LL
Cincinnati OH-KY-IN	O	L	O	O	O	O
Cleveland OH	LL	LL	LL	L	LL	LL
Columbus OH	L	LL	LL	L	LL	L
Denver-Aurora CO	H	H	HH	O	L	H
Indianapolis IN	O	L	L	O	L	L
Kansas City MO-KS	LL	LL	LL	L	LL	LL
Las Vegas NV	LL	H	L	O	LL	L
Milwaukee WI	LL	L	LL	O	LL	L
Minneapolis-St. Paul MN	O	O	HH	H	O	HH
New Orleans LA	LL	LL	LL	L	LL	LL
Oklahoma City OK	LL	LL	LL	L	LL	LL
Orlando FL	HH	O	O	O	O	O
Phoenix AZ	H	H	HH	H	LL	HH
Pittsburgh PA	LL	LL	LL	L	LL	LL
Portland OR-WA	O	H	O	O	O	O
Riverside-San Bernardino CA	HH	H	H	O	HH	H
Sacramento CA	O	O	O	O	LL	O
San Antonio TX	O	L	L	O	L	L
San Diego CA	H	H	HH	HH	O	HH
San Jose CA	HH	H	H	O	LL	O
Seattle WA	H	H	HH	H	O	HH
St. Louis MO-IL	O	L	O	O	LL	O
Tampa-St. Petersburg FL	O	O	H	O	LL	O
Virginia Beach VA	LL	L	L	O	LL	L
Interval Values – Very Large and Large	5 hours	5 index points	(5 hours x average popn. for group)	($0.2 M x average popn. for group)	5 hours	(5 hours x average popn. for group)

O – Average (within 1 interval of population group average)

H – Higher congestion or faster increase in congestion (between 1 and 2 intervals)

L – Lower congestion or slower congestion increase (between 1 and 2 intervals)

LL or HH – Lower / Slower or Higher / Faster by more than 2 intervals.

Interval – Within this value there may not be a difference in congestion level

CAUTION: See http://mobility.tamu.edu/ums for improved performance measures and updated data.

Table 6. Congestion—A Multi-Dimensional Problem, Continued

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	Total Cost	Congestion Increase 1982 to 2002: Delay per Traveler	Congestion Increase 1982 to 2002: Total Delay
Medium						
Akron OH	LL	LL	LL	LL	LL	LL
Albany-Schenectady NY	LL	LL	LL	LL	LL	LL
Albuquerque NM	H	O	O	O	L	O
Austin TX	HH	HH	HH	HH	HH	HH
Birmingham AL	O	O	O	O	L	O
Bridgeport-Stamford CT-NY	H	HH	H	H	O	H
Charlotte NC-SC	HH	HH	HH	HH	HH	HH
Dayton OH	LL	LL	L	L	LL	L
El Paso TX-NM	L	O	L	L	LL	L
Fresno CA	LL	L	L	L	LL	L
Grand Rapids MI	L	L	L	L	LL	L
Hartford CT	LL	L	O	O	LL	O
Honolulu HI	LL	O	L	L	LL	L
Jacksonville FL	H	O	HH	HH	O	H
Louisville KY-IN	HH	H	HH	HH	H	HH
Memphis TN-MS-AR	H	H	HH	HH	H	HH
Nashville-Davidson TN	HH	O	HH	HH	O	H
New Haven CT	L	L	L	L	LL	L
Omaha NE-IA	O	O	O	O	L	O
Oxnard-Ventura CA	H	O	O	O	O	O
Providence RI-MA	HH	O	HH	HH	H	HH
Raleigh-Durham NC	O	O	O	O	L	O
Richmond VA	LL	LL	L	L	LL	L
Rochester NY	LL	LL	LL	LL	LL	LL
Salt Lake City UT	HH	HH	HH	HH	H	HH
Sarasota-Bradenton FL	L	HH	L	L	LL	L
Springfield MA-CT	LL	LL	LL	LL	LL	LL
Toledo OH-MI	LL	L	LL	LL	LL	LL
Tucson AZ	H	HH	O	O	O	O
Tulsa OK	LL	L	L	L	LL	L
Small						
Allentown-Bethlehem PA-NJ	O	H	HH	H	L	H
Anchorage AK	LL	L	L	L	LL	L
Bakersfield CA	L	L	O	O	LL	O
Beaumont TX	H	L	O	L	O	O
Boulder CO	O	O	L	L	L	L
Brownsville TX	LL	L	L	L	LL	L
Cape Coral FL	O	H	O	O	O	O
Charleston-North Charleston SC	HH	HH	HH	HH	O	H
Colorado Springs CO	HH	HH	HH	HH	HH	HH
Columbia SC	L	L	O	O	LL	O
Corpus Christi TX	L	L	L	L	LL	L
Eugene OR	L	O	O	L	L	O
Laredo TX	L	L	L	L	LL	L
Little Rock AR	L	L	O	O	L	O
Pensacola FL-AL	HH	O	H	H	H	H
Salem OR	O	O	O	O	O	O
Spokane WA	L	L	O	O	L	O
Interval Values – Medium and Small	3 hours	3 index points	(3 hours x average popn. for group)	($0.05 M x average popn. for group)	3 hours	(3 hours x average popn. for group)

O – Average (within 1 interval of population group average)

H – Higher congestion or faster increase in congestion (between 1 and 2 intervals)

L – Lower congestion or slower congestion increase (between 1 and 2 intervals)

LL or HH – Lower / Slower or Higher / Faster by more than 2 intervals.

Interval – Within this value there may not be a difference in congestion level

References

1 American Public Transportation Association Statistics (www.apta.com).

2 2003 Annual Mobility Report, Volume 2, Five Congestion Reduction Strategies and Their Effects on Mobility, September 2003.

3 Cambridge Systematics, Inc. Twin Cities Ramp Meter Evaluation. February 2001.

4 Federal Highway Administration. "Highway Performance Monitoring System," 1982 to 2002 Data. February 2004.

5 ITS Deployment Tracking System (itsdeployment2.ed.ornl.gov/its2002/default.asp).

6 Fenno, D. and Ogden, M. Freeway Service Patrols: A State of the Practice. Transportation Research Record No. 1634, Transportation Research Board, Washington, D.C., 1998.

7 ITS Deployment Analysis System (IDAS): www.camsys.com/tod/idas/index.html

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