

Performance Measure Summary – Grand Rapids, MI

There are several inventory and performance measures listed in the pages of this Urban Area Report for the years from 1982 to 2007. There is no single performance measure that experts agree “says it all.” The best comparison of congestion levels and trends is done between regions of similar size, over several years, and with a few measures of congestion. Examining a few measures over many years reduces the chance that data variations or the estimating procedures may have caused a “spike” in any single year. A few key points should be recognized by users of the Urban Mobility Report data.

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

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

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

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

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

Performance Measures and Definition of Terms

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

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

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

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

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

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

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

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

Congestion Cost – Value of travel delay for 2007 (estimated at \$15.47 per hour of person travel and \$102.12 per hour of truck time) and excess fuel consumption (estimated using state average cost per gallon).

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

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

Number of Rush Hours – Time when system might have congestion.

The Mobility Data for Grand Rapids MI

Inventory Measures	2007	2006	2005	2004	2003	2002
Urban Area Information						
Population (1000s)	600	600	595	590	585	570
Rank	66	66	66	66	66	65
Urban Area (square miles)	445	445	445	445	440	420
Population Density (persons/sq mile)	1,348	1,348	1,337	1,326	1,330	1,357
Peak Travelers (1000s)	330	328	323	319	314	303
Freeway						
Daily Vehicle-Miles of Travel (1000s)	5,090	4,945	4,885	4,895	4,515	4,300
Lane-Miles	450	445	445	440	400	370
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	8,560	8,585	8,150	7,715	7,300	7,005
Lane-Miles	1,755	1,750	1,700	1,660	1,615	1,585
Public Transportation						
Annual Psgr-Miles of Travel (millions)	35.0	30.8	27.0	24.4	24.9	24.0
Annual Unlinked Psgr Trips (millions)	8.2	7.5	6.5	5.7	5.8	5.6
Cost Components						
Value of Time (\$/hour)	15.47	15.06	14.58	14.10	13.73	13.43
Commercial Cost (\$/hour)	102.12	98.77	94.06	86.24	82.38	79.96
Fuel Cost (\$/gallon)	3.06	2.64	2.33	1.90	1.51	1.41
System Performance	2007	2006	2005	2004	2003	2002
Congested Travel (% of peak VMT)	29	29	30	30	30	31
Congested System (% of lane-miles)	31	31	35	36	36	36
Congested Time (number of "Rush Hours")	4.8	4.6	4.4	4.4	4.4	4.4
Annual Increase Needed to Maintain Constant Congestion Level:						
Lane-miles	84	99	97	92	70	73
Transit Riders or Carpoolers (millions)	18	21	21	19	14	15
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	4,335	4,443	4,404	4,444	4,131	3,970
Rank	63	61	62	62	63	64
Fuel per Peak Traveler (gallons)	13	14	14	14	13	13
Rank	60	56	52	51	56	55
Annual Delay						
Total Delay (1000s of person-hours)	7,324	7,620	7,593	7,505	7,043	6,723
Rank	61	60	59	60	60	62
Delay per Peak Traveler (person-hours)	22	23	24	24	22	22
Rank	55	55	53	50	53	53
Delay due to Incidents (percent)	54	54	53	54	54	54
Travel Time Index	1.10	1.10	1.10	1.11	1.11	1.11
Rank	64	63	62	58	59	58
Congestion Cost						
Total Cost (\$ millions)	148	150	142	135	120	112
Rank	62	60	60	60	60	63
Cost per Peak Traveler (\$)	450	458	440	424	382	370
Rank	56	55	54	51	53	54

Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.

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

The Mobility Data for Grand Rapids MI, Continued

Inventory Measures	2001	2000	1999	1998	1997
Urban Area Information					
Population (1000s)	555	540	525	510	500
Rank	66	66	65	67	67
Urban Area (square miles)	405	390	370	350	340
Population Density (persons/sq mile)	1,370	1,385	1,419	1,457	1,471
Peak Travelers (1000s)	291	279	268	258	249
Freeway					
Daily Vehicle-Miles of Travel (1000s)	4,100	4,000	3,900	3,800	3,550
Lane-Miles	345	330	320	305	295
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	6,750	6,440	6,280	6,165	5,880
Lane-Miles	1,535	1,500	1,460	1,410	1,375
Public Transportation					
Annual Psgr-Miles of Travel (millions)	21.5	17.9	16.2	15.6	13.6
Annual Unlinked Psgr Trips (millions)	5.6	4.6	4.3	3.8	3.5
Cost Components					
Value of Time (\$/hour)	13.22	12.85	12.43	12.17	11.98
Commercial Cost (\$/hour)	80.88	80.75	74.23	72.61	74.32
Fuel Cost (\$/gallon)	1.50	1.63	1.13	1.11	1.12
System Performance	2001	2000	1999	1998	1997
Congested Travel (% of peak VMT)	33	33	33	32	31
Congested System (% of lane-miles)	37	37	37	33	33
Congested Time (number of "Rush Hours")	4.6	4.6	4.6	4.8	4.6
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	64	51	39	29	34
Transit Riders or Carpoolers (millions)	13	10	8	6	7
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	3,993	3,923	3,971	3,774	3,148
Rank	63	63	61	60	62
Fuel per Peak Traveler (gallons)	14	14	15	15	13
Rank	53	50	46	46	52
Annual Delay					
Total Delay (1000s of person-hours)	6,708	6,561	6,607	6,193	5,219
Rank	62	63	62	60	62
Delay per Peak Traveler (person-hours)	23	24	25	24	21
Rank	52	48	46	46	52
Delay due to Incidents (percent)	54	54	54	55	54
Travel Time Index	1.11	1.11	1.12	1.11	1.10
Rank	59	59	55	57	57
Congestion Cost					
Total Cost (\$ millions)	112	107	102	94	78
Rank	61	61	61	59	61
Cost per Peak Traveler (\$)	384	384	379	365	315
Rank	51	49	46	46	52

Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.

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

The Mobility Data for Grand Rapids MI, Continued

Inventory Measures	1996	1995	1994	1993	1992
Urban Area Information					
Population (1000s)	490	480	470	460	450
Rank	69	69	69	69	69
Urban Area (square miles)	335	330	325	320	320
Population Density (persons/sq mile)	1,463	1,455	1,446	1,438	1,406
Peak Travelers (1000s)	241	233	226	218	211
Freeway					
Daily Vehicle-Miles of Travel (1000s)	3,345	3,270	3,360	3,490	3,180
Lane-Miles	295	295	295	295	295
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	5,840	5,810	5,765	5,670	5,350
Lane-Miles	1,330	1,285	1,270	1,285	1,240
Public Transportation					
Annual Psgr-Miles of Travel (millions)	14.0	15.3	16.2	18.0	15.4
Annual Unlinked Psgr Trips (millions)	3.5	3.3	3.5	3.9	3.6
Cost Components					
Value of Time (\$/hour)	11.71	11.37	11.06	10.78	10.47
Commercial Cost (\$/hour)	74.17	71.54	69.53	67.77	66.19
Fuel Cost (\$/gallon)	1.29	1.12	1.02	1.10	1.08
System Performance	1996	1995	1994	1993	1992
Congested Travel (% of peak VMT)	28	26	28	29	24
Congested System (% of lane-miles)	32	28	29	29	25
Congested Time (number of "Rush Hours")	4.2	4.2	4.4	4.6	3.8
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	55	64	76	90	81
Transit Riders or Carpoolers (millions)	11	13	15	18	16
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	2,926	2,638	2,865	3,021	2,301
Rank	62	61	58	53	59
Fuel per Peak Traveler (gallons)	12	11	13	14	11
Rank	54	54	44	40	46
Annual Delay					
Total Delay (1000s of person-hours)	4,904	4,395	4,753	4,989	3,782
Rank	62	61	59	53	59
Delay per Peak Traveler (person-hours)	20	19	21	23	18
Rank	53	53	44	38	46
Delay due to Incidents (percent)	54	54	55	55	55
Travel Time Index	1.10	1.09	1.09	1.10	1.08
Rank	57	58	55	48	53
Congestion Cost					
Total Cost (\$ millions)	73	63	67	69	51
Rank	61	62	56	53	58
Cost per Peak Traveler (\$)	302	270	295	315	241
Rank	53	53	44	38	46

Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.

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

The Mobility Data for Grand Rapids MI, Continued

Inventory Measures	1991	1990	1989	1988	1987
Urban Area Information					
Population (1000s)	445	440	430	420	415
Rank	69	68	68	68	67
Urban Area (square miles)	310	300	285	270	250
Population Density (persons/sq mile)	1,435	1,467	1,509	1,556	1,660
Peak Travelers (1000s)	206	201	194	189	185
Freeway					
Daily Vehicle-Miles of Travel (1000s)	2,800	2,635	2,530	2,370	2,115
Lane-Miles	290	285	280	275	270
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	4,990	4,805	4,670	4,590	4,485
Lane-Miles	1,225	1,210	1,195	1,175	1,140
Public Transportation					
Annual Psgr-Miles of Travel (millions)	16.1	16.7	16.3	15.4	15.9
Annual Unlinked Psgr Trips (millions)	3.8	3.9	3.9	3.9	3.8
Cost Components					
Value of Time (\$/hour)	10.17	9.75	9.25	8.83	8.48
Commercial Cost (\$/hour)	64.55	62.47	59.16	56.03	54.62
Fuel Cost (\$/gallon)	1.13	1.10	1.12	1.03	1.04
System Performance	1991	1990	1989	1988	1987
Congested Travel (% of peak VMT)	19	18	16	15	15
Congested System (% of lane-miles)	24	23	19	18	18
Congested Time (number of "Rush Hours")	3.0	2.9	2.9	2.8	2.7
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	58	74	90	99	94
Transit Riders or Carpoolers (millions)	10	13	15	16	15
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	1,673	1,567	1,304	1,207	1,166
Rank	63	63	63	63	62
Fuel per Peak Traveler (gallons)	8	8	7	6	6
Rank	53	53	55	59	53
Annual Delay					
Total Delay (1000s of person-hours)	2,842	2,725	2,275	2,177	2,124
Rank	62	62	63	63	62
Delay per Peak Traveler (person-hours)	14	14	12	12	12
Rank	52	53	55	52	49
Delay due to Incidents (percent)	54	54	54	53	53
Travel Time Index	1.06	1.06	1.05	1.05	1.05
Rank	56	56	63	59	58
Congestion Cost					
Total Cost (\$ millions)	37	34	27	24	23
Rank	62	61	63	63	62
Cost per Peak Traveler (\$)	179	169	139	129	124
Rank	53	53	56	54	51

Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.

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

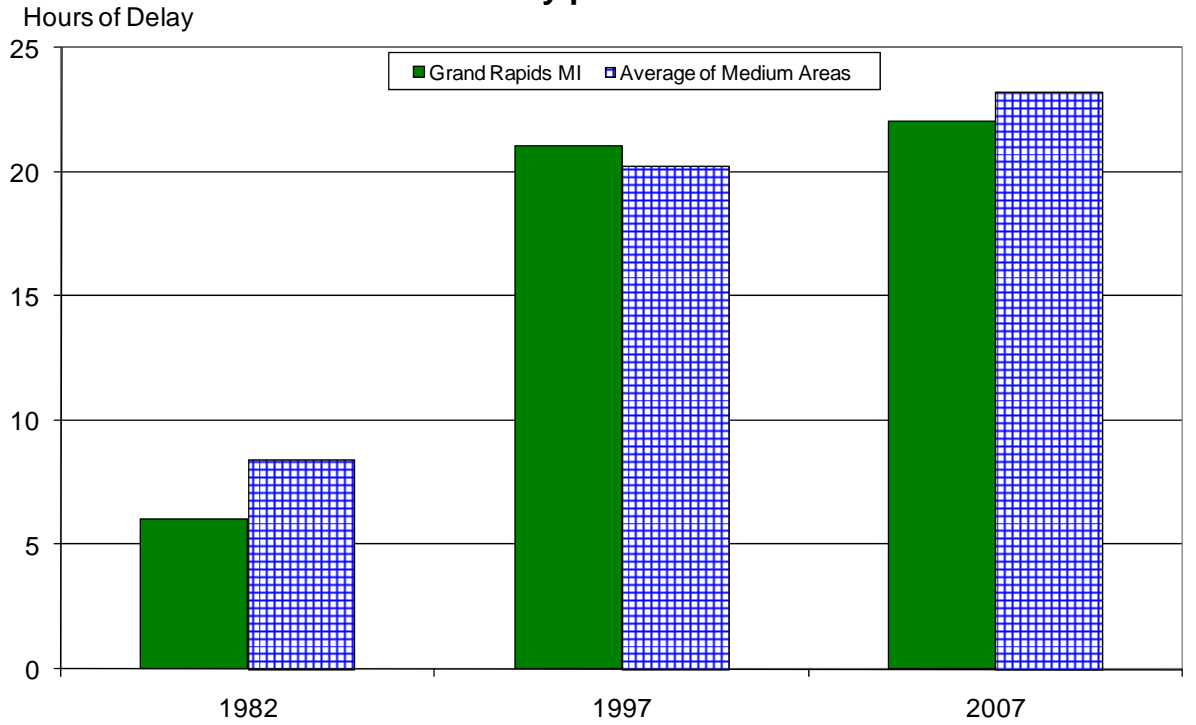
The Mobility Data for Grand Rapids MI, Continued

Inventory Measures	1986	1985	1984	1983	1982
Urban Area Information					
Population (1000s)	410	400	390	380	370
Rank	67	67	66	66	66
Urban Area (square miles)	235	220	210	205	200
Population Density (persons/sq mile)	1,745	1,818	1,857	1,854	1,850
Peak Travelers (1000s)	181	176	170	164	158
Freeway					
Daily Vehicle-Miles of Travel (1000s)	2,060	1,955	1,785	1,700	1,625
Lane-Miles	265	260	250	240	235
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	4,405	3,875	3,575	3,315	3,160
Lane-Miles	1,110	1,070	1,040	1,005	965
Public Transportation					
Annual Psgr-Miles of Travel (millions)	16.6	16.0	15.7	15.7	15.7
Annual Unlinked Psgr Trips (millions)	3.9	4.5	5.2	5.2	5.2
Cost Components					
Value of Time (\$/hour)	8.18	8.03	7.75	7.43	7.20
Commercial Cost (\$/hour)	52.63	55.80	54.65	52.70	52.13
Fuel Cost (\$/gallon)	1.01	1.32	1.34	1.37	1.43
System Performance	1986	1985	1984	1983	1982
Congested Travel (% of peak VMT)	14	12	11	9	9
Congested System (% of lane-miles)	18	17	17	13	13
Congested Time (number of "Rush Hours")	2.7	2.6	2.5	2.4	2.4
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	--	--	--	--	--
Transit Riders or Carpoolers (millions)	--	--	--	--	--
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	1,128	839	709	541	513
Rank	62	64	65	69	67
Fuel per Peak Traveler (gallons)	6	5	4	3	3
Rank	53	57	58	64	58
Annual Delay					
Total Delay (1000s of person-hours)	2,112	1,535	1,308	983	935
Rank	59	63	63	68	65
Delay per Peak Traveler (person-hours)	12	9	8	6	6
Rank	46	55	54	59	55
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.05	1.04	1.04	1.03	1.03
Rank	55	59	55	63	62
Congestion Cost					
Total Cost (\$ millions)	22	16	13	10	9
Rank	57	63	63	65	65
Cost per Peak Traveler (\$)	120	91	79	59	57
Rank	50	57	57	61	59

Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.

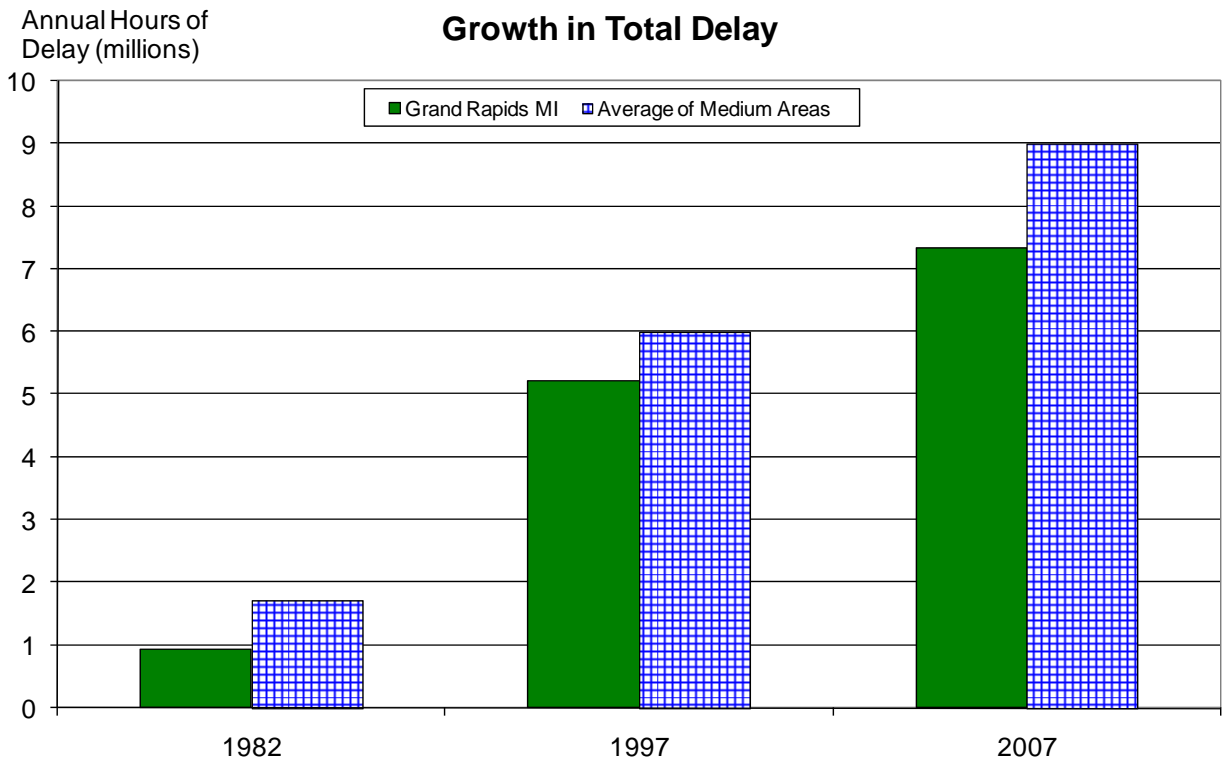
Note: Zeroes in the table reflect values less than 0.5.

Growth in Delay per Peak Traveler



Note: Medium areas have populations between 0.5 and 1 million

Growth in Total Delay



Note: Medium areas have populations between 0.5 and 1 million

**Benefits from Public Transportation Service and Operations Strategies in
Grand Rapids MI**

Operations Strategies	2007	2006	2005	2004
Freeway Ramp Metering				
Percent of Roadway Miles	--	--	--	--
Annual Delay Reduction (1000 hours)	--	--	--	--
Freeway Incident Management				
Cameras				
Percent of Roadway Miles	--	--	--	--
Service Patrols				
Percent of Roadway Miles	--	--	--	--
Annual Delay Reduction (1000 hours)	--	--	--	--
Arterial Signal Coordination				
Percent of Roadway Miles	19	19	20	19
Annual Delay Reduction (1000 hours)	42	33	52	43
Arterial Access Management				
Percent of Roadway Miles	4	4	4	4
Annual Delay Reduction (1000 hours)	146	48	71	56
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	188	80	123	100
Annual Delay Saved per Peak Traveler (hours)	1	0	0	0
Annual Congestion Cost Savings (\$million)	3.7	1.6	2.3	1.8
Travel Time Index with Strategies	1.096	1.099	1.102	1.107
Travel Time Index (Base)	1.098	1.100	1.104	1.108
Public Transportation Service	2007	2006	2005	2004
Existing Service				
Annual Passenger-miles of travel (million)	35.0	30.8	27.0	24.4
Unlinked Passenger Trips (million)	8.2	7.5	6.5	5.7
Travel Time Index (combined road and transit)	1.097	1.100	1.103	1.108
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.100	1.101	1.104	1.110
Annual Increase				
Delay (1000 hours)	245	169	96	186
Delay per Peak Traveler (hours)	1	1	0	1
Congestion Cost (\$million)	5.0	3.3	1.8	3.3

**Benefits from Public Transportation Service and Operations Strategies in
Grand Rapids MI, Continued**

Operations Strategies	2003	2002	2001	2000
Freeway Ramp Metering				
Percent of Roadway Miles	--	--	--	--
Annual Delay Reduction (1000 hours)	--	--	--	--
Freeway Incident Management				
Cameras				
Percent of Roadway Miles	--	--	--	--
Service Patrols				
Percent of Roadway Miles	--	--	--	--
Annual Delay Reduction (1000 hours)	--	--	--	--
Arterial Signal Coordination				
Percent of Roadway Miles	19	19	20	20
Annual Delay Reduction (1000 hours)	38	39	40	42
Arterial Access Management				
Percent of Roadway Miles	4	4	4	4
Annual Delay Reduction (1000 hours)	52	44	48	23
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	90	83	89	65
Annual Delay Saved per Peak Traveler (hours)	0	0	0	0
Annual Congestion Cost Savings (\$million)	1.5	1.4	1.5	1.1
Travel Time Index with Strategies	1.106	1.107	1.112	1.115
Travel Time Index (Base)	1.107	1.108	1.113	1.116
Public Transportation Service	2003	2002	2001	2000
Existing Service				
Annual Passenger-miles of travel (million)	24.9	24.0	21.5	17.9
Unlinked Passenger Trips (million)	5.8	5.6	5.6	4.6
Travel Time Index (combined road and transit)	1.107	1.107	1.113	1.115
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.110	1.108	1.113	1.118
Annual Increase				
Delay (1000 hours)	201	76	69	151
Delay per Peak Traveler (hours)	1	0	0	1
Congestion Cost (\$million)	3.4	1.3	1.1	2.5

**Comparison of Several Key Mobility Performance Measures
Medium Group – 500,000 to 1 million population urban areas**

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	1982 to 2007	
				Delay per Traveler	Total Delay
Nashville-Davidson, TN	H+	0	H+	F	F+
Salt Lake City, UT	H	H+	H+	F	F+
Richmond, VA	L	L-	H	0	F+
Louisville, KY-IN	H+	H+	H+	F+	F+
Hartford, CT	L	L	H	F	F+
Bridgeport-Stamford, CT-NY	H+	H+	H+	F+	F+
Oklahoma City, OK	H	L	H+	F+	F+
Tulsa, OK	0	L	0	0	F
Tucson, AZ	H+	H+	H+	F	F+
Dayton, OH	L-	L-	L-	S-	S-
Rochester, NY	L-	L-	L-	S-	S-
Birmingham, AL	H+	0	H+	F+	F+
Lancaster-Palmdale, CA	L-	L	L-	S-	S-
Honolulu, HI	H	H+	H	S	S
El Paso, TX-NM	L	L	L	0	S
Oxnard-Ventura, CA	H+	H+	H+	F+	F+
Sarasota-Bradenton, FL	H	H+	0	S-	0
Springfield, MA-CT	L-	L-	L-	S-	S-
Omaha, NE-IA	H	H	0	F+	F
Fresno, CA	L	0	L	S-	S-
Allentown-Bethlehem, PA-NJ	0	0	L	S	S-
Akron, OH	L-	L-	L-	S-	S-
Grand Rapids, MI	0	L	L	0	S
Albany-Schenectady, NY	L	L	L	0	S-
Albuquerque, NM	H+	H	H	F+	F+
New Haven, CT	L	L	L-	0	S-
Indio-Cathedral City-Palm Springs, CA	L-	0	L-	S-	S-
Toledo, OH-MI	L-	L-	L-	S	S-
Poughkeepsie-Newburgh, NY	L-	L-	L-	S-	S-
Bakersfield, CA	L-	L-	L-	S-	S-
Colorado Springs, CO	0	0	L	F	S-

0 – Average congestion levels or average congestion growth

H Higher congestion; H+ Much higher congestion; F Faster congestion growth; F+ Much faster growth

L Lower congestion; L- Much lower congestion; S Slower congestion growth; S- Much slower growth

Key Mobility Performance Measure Labels

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

Measures	Differences Within These Values May Not Indicate a Difference in Congestion Level	
	Above 1M Population	Below 1M Population
2007 Values Delay per Traveler - Travel Time Index - Total Delay -	Above 1M Population 5 Hours 5 Index Points 5 Hours x Average Population	Below 1M Population 3 Hours 3 Index Points 3 Hours x Average Population
1982 to 2007 Trends Delay per Traveler - Total Delay -	5 Hours 5 Hours x Average Population	3 Hours 3 Hours x Average Population