

Performance Measure Summary – Dayton, OH

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 Dayton OH

Inventory Measures	2007	2006	2005	2004	2003	2002
Urban Area Information						
Population (1000s)	745	745	745	745	740	735
Rank	53	53	53	52	52	52
Urban Area (square miles)	480	480	480	480	480	470
Population Density (persons/sq mile)	1,552	1,552	1,552	1,552	1,542	1,564
Peak Travelers (1000s)	410	408	405	402	397	390
Freeway						
Daily Vehicle-Miles of Travel (1000s)	7,360	7,460	7,485	7,505	6,870	6,500
Lane-Miles	565	560	560	550	550	535
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	6,250	6,400	6,365	6,400	6,460	6,350
Lane-Miles	1,510	1,510	1,510	1,450	1,415	1,335
Public Transportation						
Annual Psgr-Miles of Travel (millions)	45.1	48.8	43.4	47.6	47.1	42.4
Annual Unlinked Psgr Trips (millions)	11.0	12.9	12.2	12.9	13.9	13.8
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)	2.88	2.58	2.24	1.81	1.52	1.38
System Performance	2007	2006	2005	2004	2003	2002
Congested Travel (% of peak VMT)	34	36	36	39	35	36
Congested System (% of lane-miles)	29	33	33	36	35	39
Congested Time (number of "Rush Hours")	5.2	5.4	5.4	5.6	5.0	5.0
Annual Increase Needed to Maintain Constant Congestion Level:						
Lane-miles	24	44	51	56	44	37
Transit Riders or Carpoolers (millions)	5	10	12	14	10	9
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	4,000	4,583	4,621	5,099	4,197	4,372
Rank	66	60	61	56	62	60
Fuel per Peak Traveler (gallons)	10	11	11	13	11	11
Rank	68	67	65	57	65	64
Annual Delay						
Total Delay (1000s of person-hours)	5,800	6,730	6,863	7,614	6,540	6,883
Rank	68	65	64	59	62	61
Delay per Peak Traveler (person-hours)	14	17	17	19	16	18
Rank	73	68	65	60	66	62
Delay due to Incidents (percent)	54	54	54	54	53	53
Travel Time Index	1.09	1.10	1.10	1.11	1.10	1.10
Rank	70	63	62	58	62	61
Congestion Cost						
Total Cost (\$ millions)	120	134	131	137	111	114
Rank	69	65	65	59	64	61
Cost per Peak Traveler (\$)	293	329	323	340	279	291
Rank	73	70	66	62	67	64

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 Dayton OH, Continued

Inventory Measures	2001	2000	1999	1998	1997
Urban Area Information					
Population (1000s)	730	720	710	695	685
Rank	52	52	51	52	52
Urban Area (square miles)	460	450	440	430	420
Population Density (persons/sq mile)	1,587	1,600	1,614	1,616	1,631
Peak Travelers (1000s)	383	372	363	351	341
Freeway					
Daily Vehicle-Miles of Travel (1000s)	6,200	6,000	5,850	5,700	5,555
Lane-Miles	520	510	495	480	470
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	6,300	6,280	6,260	6,220	6,100
Lane-Miles	1,285	1,240	1,205	1,160	1,120
Public Transportation					
Annual Psgr-Miles of Travel (millions)	51.8	51.3	52.4	49.8	49.7
Annual Unlinked Psgr Trips (millions)	14.9	14.7	14.6	14.5	14.8
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)	1.30	1.55	1.14	1.11	1.13
System Performance	2001	2000	1999	1998	1997
Congested Travel (% of peak VMT)	36	38	39	36	36
Congested System (% of lane-miles)	39	42	42	37	37
Congested Time (number of "Rush Hours")	5.0	5.0	5.0	5.2	5.2
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	35	37	65	41	54
Transit Riders or Carpoolers (millions)	8	9	16	10	14
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	4,504	5,028	5,255	4,741	4,676
Rank	57	53	52	53	52
Fuel per Peak Traveler (gallons)	12	14	14	14	14
Rank	61	50	51	50	49
Annual Delay					
Total Delay (1000s of person-hours)	7,187	8,088	8,498	7,687	7,595
Rank	57	52	51	52	52
Delay per Peak Traveler (person-hours)	19	22	23	22	22
Rank	61	53	48	50	48
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.11	1.13	1.13	1.12	1.12
Rank	59	52	49	49	49
Congestion Cost					
Total Cost (\$ millions)	118	132	131	116	114
Rank	58	52	51	52	51
Cost per Peak Traveler (\$)	309	355	361	330	334
Rank	63	53	50	53	48

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 Dayton OH, Continued

Inventory Measures	1996	1995	1994	1993	1992
Urban Area Information					
Population (1000s)	675	660	645	620	605
Rank	51	50	50	51	52
Urban Area (square miles)	410	400	390	380	370
Population Density (persons/sq mile)	1,646	1,650	1,654	1,632	1,635
Peak Travelers (1000s)	332	321	310	294	283
Freeway					
Daily Vehicle-Miles of Travel (1000s)	5,365	5,175	4,225	4,845	4,335
Lane-Miles	465	460	455	450	435
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	5,995	5,900	5,810	5,710	5,550
Lane-Miles	1,110	1,060	1,030	995	980
Public Transportation					
Annual Psgr-Miles of Travel (millions)	44.0	41.2	42.7	43.4	54.1
Annual Unlinked Psgr Trips (millions)	14.0	14.5	12.2	11.7	13.7
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)	1.28	1.12	1.08	1.09	1.11
System Performance	1996	1995	1994	1993	1992
Congested Travel (% of peak VMT)	34	34	30	33	31
Congested System (% of lane-miles)	36	37	37	37	37
Congested Time (number of "Rush Hours")	5.0	5.0	4.0	4.8	4.4
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	52	49	32	67	54
Transit Riders or Carpoolers (millions)	13	12	8	17	13
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	4,278	4,313	3,367	3,749	3,255
Rank	53	48	54	48	49
Fuel per Peak Traveler (gallons)	13	13	11	13	11
Rank	52	48	51	43	46
Annual Delay					
Total Delay (1000s of person-hours)	7,053	7,112	5,628	6,098	5,374
Rank	52	48	53	49	49
Delay per Peak Traveler (person-hours)	21	22	18	21	19
Rank	50	42	54	41	41
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.11	1.12	1.10	1.11	1.10
Rank	50	47	50	45	45
Congestion Cost					
Total Cost (\$ millions)	104	101	77	82	70
Rank	52	49	53	49	50
Cost per Peak Traveler (\$)	314	314	249	278	245
Rank	50	46	53	44	44

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 Dayton OH, Continued

Inventory Measures	1991	1990	1989	1988	1987
Urban Area Information					
Population (1000s)	600	595	595	595	595
Rank	52	52	52	52	49
Urban Area (square miles)	360	360	360	360	360
Population Density (persons/sq mile)	1,667	1,653	1,653	1,653	1,653
Peak Travelers (1000s)	277	271	269	267	265
Freeway					
Daily Vehicle-Miles of Travel (1000s)	4,235	4,220	3,850	3,415	3,300
Lane-Miles	420	410	400	400	395
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	5,410	5,255	5,160	5,005	4,900
Lane-Miles	965	945	920	910	880
Public Transportation					
Annual Psgr-Miles of Travel (millions)	59.5	62.4	59.9	43.9	45.2
Annual Unlinked Psgr Trips (millions)	13.4	16.1	15.2	11.9	11.3
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	1.06	1.08	1.00	1.00
System Performance	1991	1990	1989	1988	1987
Congested Travel (% of peak VMT)	30	30	26	22	21
Congested System (% of lane-miles)	36	36	31	29	26
Congested Time (number of "Rush Hours")	4.4	4.4	4.2	3.4	3.4
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	57	54	54	46	52
Transit Riders or Carpoolers (millions)	14	13	13	10	12
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	3,076	2,988	2,530	2,018	1,787
Rank	49	48	48	52	51
Fuel per Peak Traveler (gallons)	11	11	9	8	7
Rank	44	43	46	46	50
Annual Delay					
Total Delay (1000s of person-hours)	5,073	4,885	4,209	3,397	2,987
Rank	48	48	50	52	51
Delay per Peak Traveler (person-hours)	18	18	16	13	11
Rank	43	42	43	50	53
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.10	1.10	1.08	1.07	1.06
Rank	41	40	47	46	51
Congestion Cost					
Total Cost (\$ millions)	64	59	48	36	31
Rank	48	48	50	53	51
Cost per Peak Traveler (\$)	230	216	178	137	117
Rank	44	43	46	51	54

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

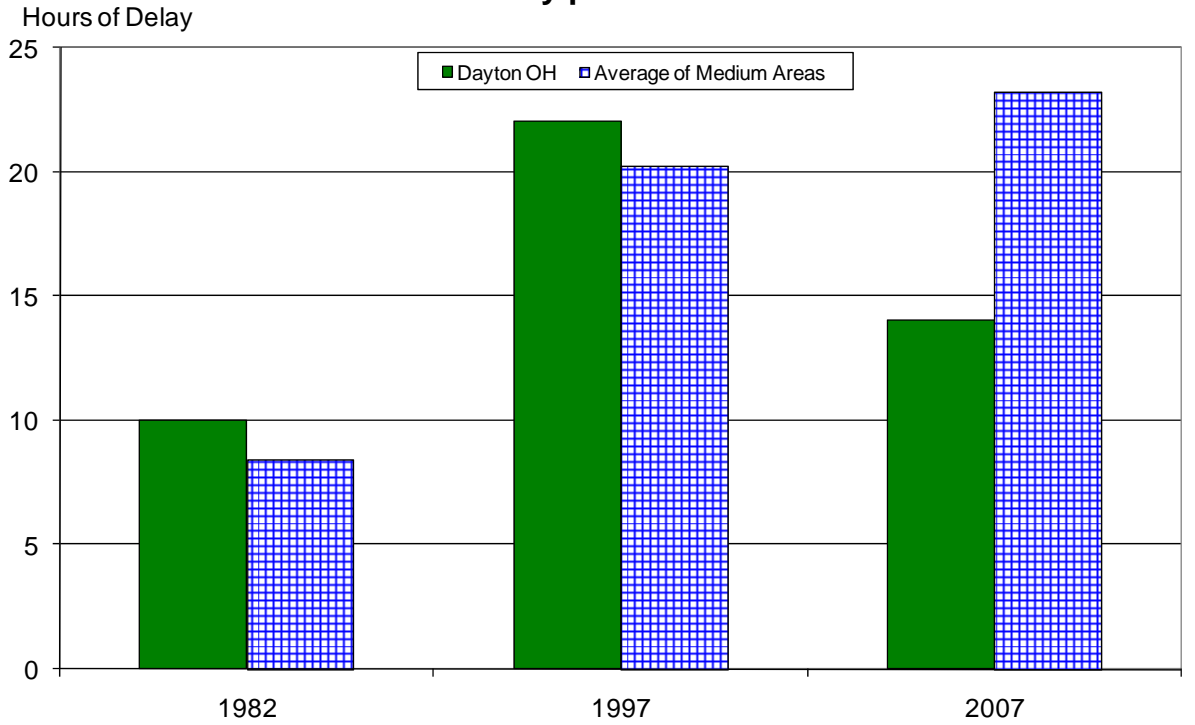
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Inventory Measures	1986	1985	1984	1983	1982
Urban Area Information					
Population (1000s)	595	595	595	595	595
Rank	48	48	48	48	48
Urban Area (square miles)	360	360	360	360	360
Population Density (persons/sq mile)	1,653	1,653	1,653	1,653	1,653
Peak Travelers (1000s)	263	261	259	257	254
Freeway					
Daily Vehicle-Miles of Travel (1000s)	3,145	3,190	3,015	2,935	2,700
Lane-Miles	390	360	340	305	290
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	4,740	4,600	4,360	4,150	4,000
Lane-Miles	850	830	810	795	750
Public Transportation					
Annual Psgr-Miles of Travel (millions)	60.0	71.5	89.2	89.2	89.2
Annual Unlinked Psgr Trips (millions)	14.0	15.8	21.4	21.4	21.4
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)	0.98	1.28	1.29	1.32	1.38
System Performance	1986	1985	1984	1983	1982
Congested Travel (% of peak VMT)	20	22	21	22	22
Congested System (% of lane-miles)	26	26	26	27	27
Congested Time (number of "Rush Hours")	3.2	3.6	3.6	3.8	3.8
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	--	--	--	--	--
Transit Riders or Carpoolers (millions)	--	--	--	--	--
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	1,672	1,848	1,648	1,676	1,565
Rank	49	42	43	39	37
Fuel per Peak Traveler (gallons)	6	7	6	7	6
Rank	53	40	44	33	36
Annual Delay					
Total Delay (1000s of person-hours)	2,809	3,119	2,779	2,811	2,626
Rank	49	44	43	38	36
Delay per Peak Traveler (person-hours)	11	12	11	11	10
Rank	52	44	42	38	38
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.06	1.07	1.07	1.07	1.07
Rank	49	39	34	32	26
Congestion Cost					
Total Cost (\$ millions)	28	32	27	27	24
Rank	49	42	42	37	36
Cost per Peak Traveler (\$)	107	121	106	104	96
Rank	55	45	47	42	43

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

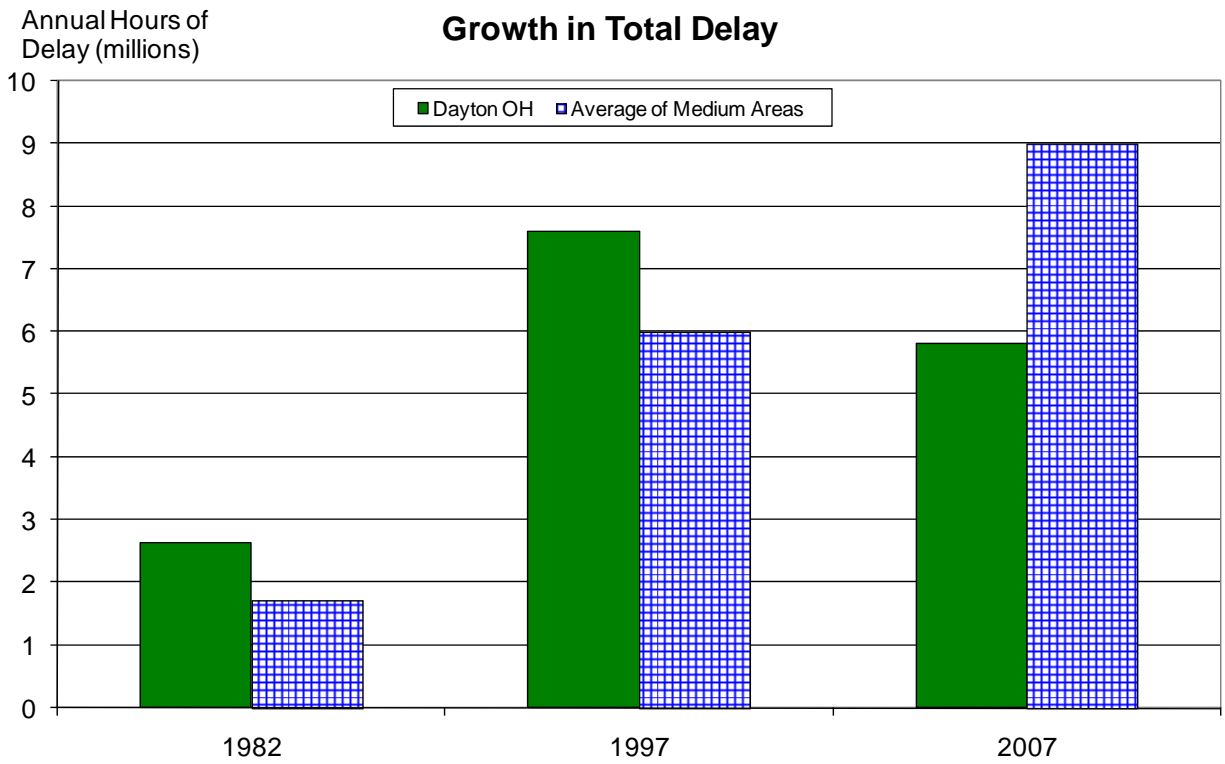
Note: Zeroes in the table reflect values less than 0.5.

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
Dayton OH**

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	50	50	50	47
Annual Delay Reduction (1000 hours)	35	44	48	59
Arterial Access Management				
Percent of Roadway Miles	23	22	22	22
Annual Delay Reduction (1000 hours)	50	65	87	105
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	85	108	135	164
Annual Delay Saved per Peak Traveler (hours)	0	0	0	0
Annual Congestion Cost Savings (\$million)	1.6	2.0	2.4	2.8
Travel Time Index with Strategies	1.089	1.101	1.102	1.112
Travel Time Index (Base)	1.090	1.102	1.103	1.114
Public Transportation Service	2007	2006	2005	2004
Existing Service				
Annual Passenger-miles of travel (million)	45.1	48.8	43.4	47.6
Unlinked Passenger Trips (million)	11.0	12.9	12.2	12.9
Travel Time Index (combined road and transit)	1.089	1.101	1.102	1.113
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.091	1.105	1.106	1.116
Annual Increase				
Delay (1000 hours)	169	279	244	231
Delay per Peak Traveler (hours)	0	1	1	1
Congestion Cost (\$million)	3.6	5.7	4.7	4.2

**Benefits from Public Transportation Service and Operations Strategies in
Dayton OH, 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	49	49	50	46
Annual Delay Reduction (1000 hours)	41	38	33	46
Arterial Access Management				
Percent of Roadway Miles	23	24	24	24
Annual Delay Reduction (1000 hours)	90	20	21	62
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	131	57	54	108
Annual Delay Saved per Peak Traveler (hours)	0	0	0	0
Annual Congestion Cost Savings (\$million)	2.1	0.9	0.9	1.7
Travel Time Index with Strategies	1.096	1.104	1.110	1.126
Travel Time Index (Base)	1.097	1.105	1.111	1.128
Public Transportation Service	2003	2002	2001	2000
Existing Service				
Annual Passenger-miles of travel (million)	47.1	42.4	51.8	51.3
Unlinked Passenger Trips (million)	13.9	13.8	14.9	14.7
Travel Time Index (combined road and transit)	1.096	1.104	1.110	1.126
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.100	1.108	1.115	1.132
Annual Increase				
Delay (1000 hours)	268	286	382	395
Delay per Peak Traveler (hours)	1	1	1	1
Congestion Cost (\$million)	4.6	4.8	6.4	6.5

**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