

Performance Measure Summary – Allentown-Bethlehem, PA-NJ

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 Allentown-Bethlehem PA-NJ

Inventory Measures	2007	2006	2005	2004	2003	2002
Urban Area Information						
Population (1000s)	625	620	620	620	615	610
Rank	64	64	63	62	61	61
Urban Area (square miles)	340	335	335	335	330	320
Population Density (persons/sq mile)	1,838	1,851	1,851	1,851	1,864	1,906
Peak Travelers (1000s)	344	339	337	335	330	324
Freeway						
Daily Vehicle-Miles of Travel (1000s)	4,935	4,950	5,085	4,870	4,600	4,200
Lane-Miles	415	415	415	395	395	360
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	5,630	5,445	5,425	5,350	5,300	5,280
Lane-Miles	965	950	950	935	925	920
Public Transportation						
Annual Psgr-Miles of Travel (millions)	26.2	25.7	22.7	20.3	20.3	19.3
Annual Unlinked Psgr Trips (millions)	5.7	5.6	4.9	4.7	4.8	4.5
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)	2.87	2.68	2.28	1.94	1.51	1.36
System Performance	2007	2006	2005	2004	2003	2002
Congested Travel (% of peak VMT)	38	37	38	38	37	40
Congested System (% of lane-miles)	41	39	39	40	40	42
Congested Time (number of "Rush Hours")	5.6	5.4	5.6	5.6	5.4	5.4
Annual Increase Needed to Maintain Constant Congestion Level:						
Lane-miles	30	30	39	40	38	35
Transit Riders or Carpoolers (millions)	8	8	10	10	10	9
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	4,664	4,391	4,680	4,600	4,330	4,461
Rank	60	62	60	61	59	57
Fuel per Peak Traveler (gallons)	14	13	14	14	13	14
Rank	56	59	52	51	56	53
Annual Delay						
Total Delay (1000s of person-hours)	7,571	7,076	7,534	7,406	6,976	7,199
Rank	59	62	60	61	61	59
Delay per Peak Traveler (person-hours)	22	21	22	22	21	22
Rank	55	57	55	53	56	53
Delay due to Incidents (percent)	54	54	54	54	54	54
Travel Time Index	1.14	1.13	1.14	1.14	1.14	1.15
Rank	50	53	51	50	48	46
Congestion Cost						
Total Cost (\$ millions)	154	139	143	133	120	121
Rank	59	62	59	61	60	57
Cost per Peak Traveler (\$)	449	410	424	397	364	374
Rank	57	60	55	53	55	53

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 Allentown-Bethlehem PA-NJ, Continued

Inventory Measures	2001	2000	1999	1998	1997
Urban Area Information					
Population (1000s)	605	600	590	580	575
Rank	60	60	60	60	59
Urban Area (square miles)	310	300	285	275	275
Population Density (persons/sq mile)	1,952	2,000	2,070	2,109	2,091
Peak Travelers (1000s)	317	310	301	293	286
Freeway					
Daily Vehicle-Miles of Travel (1000s)	4,050	3,920	3,800	3,720	3,585
Lane-Miles	340	320	305	295	285
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	5,250	5,210	5,040	4,860	4,710
Lane-Miles	910	900	865	840	825
Public Transportation					
Annual Psgr-Miles of Travel (millions)	18.9	18.0	17.9	16.1	14.9
Annual Unlinked Psgr Trips (millions)	4.3	4.1	4.0	3.9	3.6
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)	1.54	1.51	1.11	1.06	1.19
System Performance	2001	2000	1999	1998	1997
Congested Travel (% of peak VMT)	41	42	38	43	43
Congested System (% of lane-miles)	42	42	42	46	46
Congested Time (number of "Rush Hours")	5.6	5.8	5.8	6.0	5.8
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	38	46	46	49	57
Transit Riders or Carpoolers (millions)	10	12	12	13	15
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	4,433	4,491	4,115	4,622	4,332
Rank	58	56	58	54	55
Fuel per Peak Traveler (gallons)	14	14	14	16	15
Rank	53	50	51	45	44
Annual Delay					
Total Delay (1000s of person-hours)	7,171	7,195	6,898	7,627	7,074
Rank	58	57	58	53	54
Delay per Peak Traveler (person-hours)	23	23	23	26	25
Rank	52	51	48	44	42
Delay due to Incidents (percent)	54	54	53	53	53
Travel Time Index	1.15	1.15	1.15	1.17	1.16
Rank	45	44	44	35	38
Congestion Cost					
Total Cost (\$ millions)	119	117	105	114	106
Rank	56	56	58	53	54
Cost per Peak Traveler (\$)	377	378	349	390	370
Rank	54	50	54	44	45

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 Allentown-Bethlehem PA-NJ, Continued

Inventory Measures	1996	1995	1994	1993	1992
Urban Area Information					
Population (1000s)	560	550	540	530	525
Rank	60	60	60	60	60
Urban Area (square miles)	275	270	265	260	260
Population Density (persons/sq mile)	2,036	2,037	2,038	2,038	2,019
Peak Travelers (1000s)	276	267	259	251	246
Freeway					
Daily Vehicle-Miles of Travel (1000s)	3,505	3,255	3,100	2,940	2,670
Lane-Miles	280	280	275	275	270
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	4,505	4,335	4,210	4,020	3,800
Lane-Miles	810	790	775	740	715
Public Transportation					
Annual Psgr-Miles of Travel (millions)	15.2	16.0	15.7	16.3	17.1
Annual Unlinked Psgr Trips (millions)	3.7	4.2	4.1	4.3	4.3
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)	1.26	1.19	1.04	1.09	1.14
System Performance	1996	1995	1994	1993	1992
Congested Travel (% of peak VMT)	40	36	33	32	29
Congested System (% of lane-miles)	42	41	37	37	37
Congested Time (number of "Rush Hours")	5.8	5.2	5.0	4.6	4.2
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	63	56	54	48	37
Transit Riders or Carpoolers (millions)	16	14	13	11	9
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	3,944	3,338	2,976	2,619	2,194
Rank	56	57	56	58	62
Fuel per Peak Traveler (gallons)	14	12	11	10	9
Rank	44	51	51	52	54
Annual Delay					
Total Delay (1000s of person-hours)	6,559	5,570	5,082	4,408	3,729
Rank	55	55	55	56	60
Delay per Peak Traveler (person-hours)	24	21	20	18	15
Rank	43	47	46	51	54
Delay due to Incidents (percent)	54	53	54	54	53
Travel Time Index	1.15	1.14	1.13	1.11	1.10
Rank	38	41	42	45	45
Congestion Cost					
Total Cost (\$ millions)	97	79	70	59	49
Rank	55	55	55	55	60
Cost per Peak Traveler (\$)	352	295	271	236	198
Rank	44	51	50	52	56

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 Allentown-Bethlehem PA-NJ, Continued

Inventory Measures	1991	1990	1989	1988	1987
Urban Area Information					
Population (1000s)	520	505	500	490	485
Rank	59	60	60	60	61
Urban Area (square miles)	260	255	250	250	245
Population Density (persons/sq mile)	2,000	1,980	2,000	1,960	1,980
Peak Travelers (1000s)	240	230	226	220	216
Freeway					
Daily Vehicle-Miles of Travel (1000s)	2,480	2,430	2,310	2,225	2,100
Lane-Miles	270	270	265	265	260
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	3,560	3,450	3,375	3,315	3,260
Lane-Miles	700	690	680	670	655
Public Transportation					
Annual Psgr-Miles of Travel (millions)	16.9	16.4	16.1	15.9	18.4
Annual Unlinked Psgr Trips (millions)	4.3	4.5	4.5	4.3	4.6
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)	1.16	1.30	1.06	0.98	0.98
System Performance	1991	1990	1989	1988	1987
Congested Travel (% of peak VMT)	26	26	23	23	23
Congested System (% of lane-miles)	33	34	31	31	31
Congested Time (number of "Rush Hours")	3.4	3.2	3.0	3.0	3.0
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	30	33	29	25	24
Transit Riders or Carpoolers (millions)	7	7	6	5	5
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	1,770	1,683	1,446	1,393	1,323
Rank	62	62	62	62	60
Fuel per Peak Traveler (gallons)	7	7	6	6	6
Rank	60	56	61	59	53
Annual Delay					
Total Delay (1000s of person-hours)	3,017	2,841	2,444	2,338	2,300
Rank	61	60	61	61	59
Delay per Peak Traveler (person-hours)	13	12	11	11	11
Rank	57	58	58	56	53
Delay due to Incidents (percent)	54	54	54	54	53
Travel Time Index	1.09	1.09	1.08	1.07	1.07
Rank	48	47	47	46	43
Congestion Cost					
Total Cost (\$ millions)	38	35	28	26	25
Rank	61	59	62	61	58
Cost per Peak Traveler (\$)	160	153	126	118	115
Rank	58	59	61	60	57

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.

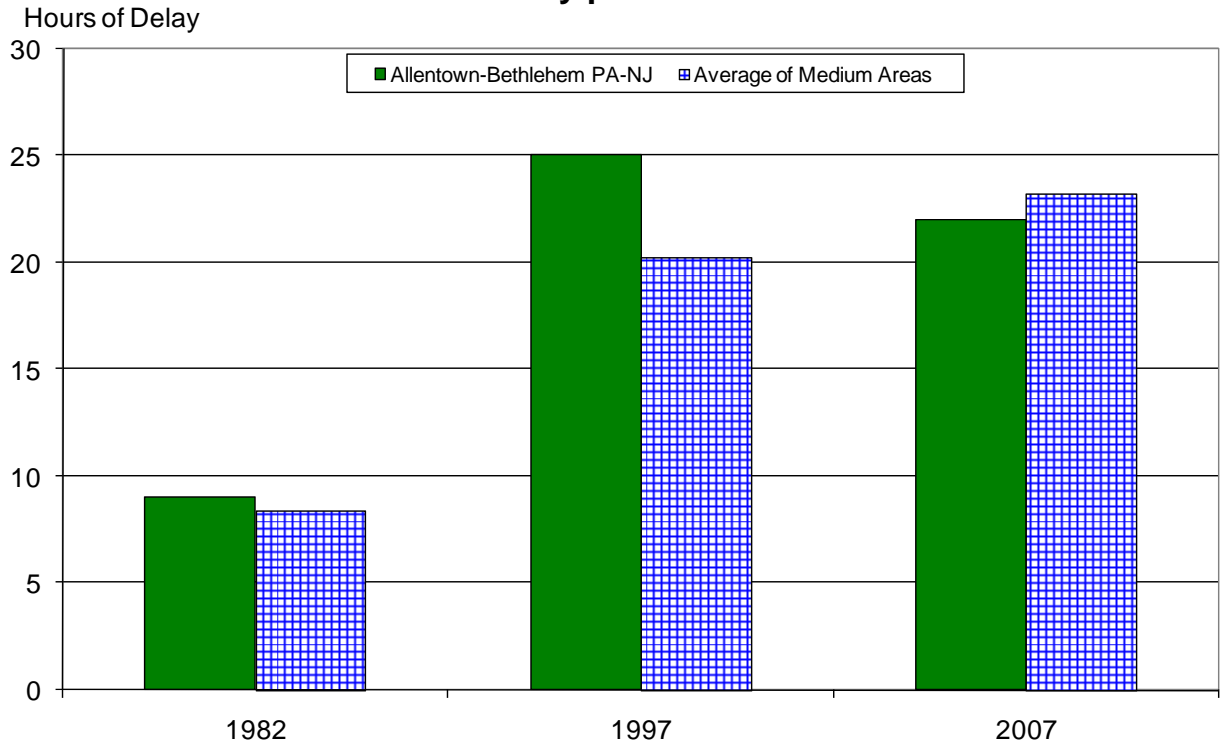
The Mobility Data for Allentown-Bethlehem PA-NJ, Continued

Inventory Measures	1986	1985	1984	1983	1982
Urban Area Information					
Population (1000s)	475	465	455	450	440
Rank	62	60	59	59	61
Urban Area (square miles)	240	230	220	210	210
Population Density (persons/sq mile)	1,979	2,022	2,068	2,143	2,095
Peak Travelers (1000s)	210	204	198	194	188
Freeway					
Daily Vehicle-Miles of Travel (1000s)	1,980	1,865	1,870	1,885	1,735
Lane-Miles	260	260	270	270	270
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	3,205	3,100	3,030	2,980	2,965
Lane-Miles	645	640	630	630	625
Public Transportation					
Annual Psgr-Miles of Travel (millions)	16.0	14.7	15.0	15.0	15.0
Annual Unlinked Psgr Trips (millions)	4.5	4.6	4.7	4.7	4.7
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)	0.96	1.25	1.27	1.30	1.35
System Performance	1986	1985	1984	1983	1982
Congested Travel (% of peak VMT)	22	22	22	22	20
Congested System (% of lane-miles)	31	31	32	32	30
Congested Time (number of "Rush Hours")	2.9	2.8	2.8	2.8	2.7
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	--	--	--	--	--
Transit Riders or Carpoolers (millions)	--	--	--	--	--
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	1,228	1,137	1,086	1,030	964
Rank	61	56	55	52	51
Fuel per Peak Traveler (gallons)	6	6	5	5	5
Rank	53	49	52	47	47
Annual Delay					
Total Delay (1000s of person-hours)	2,069	1,910	1,823	1,760	1,649
Rank	61	55	55	52	52
Delay per Peak Traveler (person-hours)	10	9	9	9	9
Rank	57	55	51	47	46
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.07	1.07	1.07	1.06	1.06
Rank	43	39	34	39	37
Congestion Cost					
Total Cost (\$ millions)	21	20	19	17	16
Rank	60	56	55	52	51
Cost per Peak Traveler (\$)	102	99	94	90	85
Rank	57	55	50	48	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.

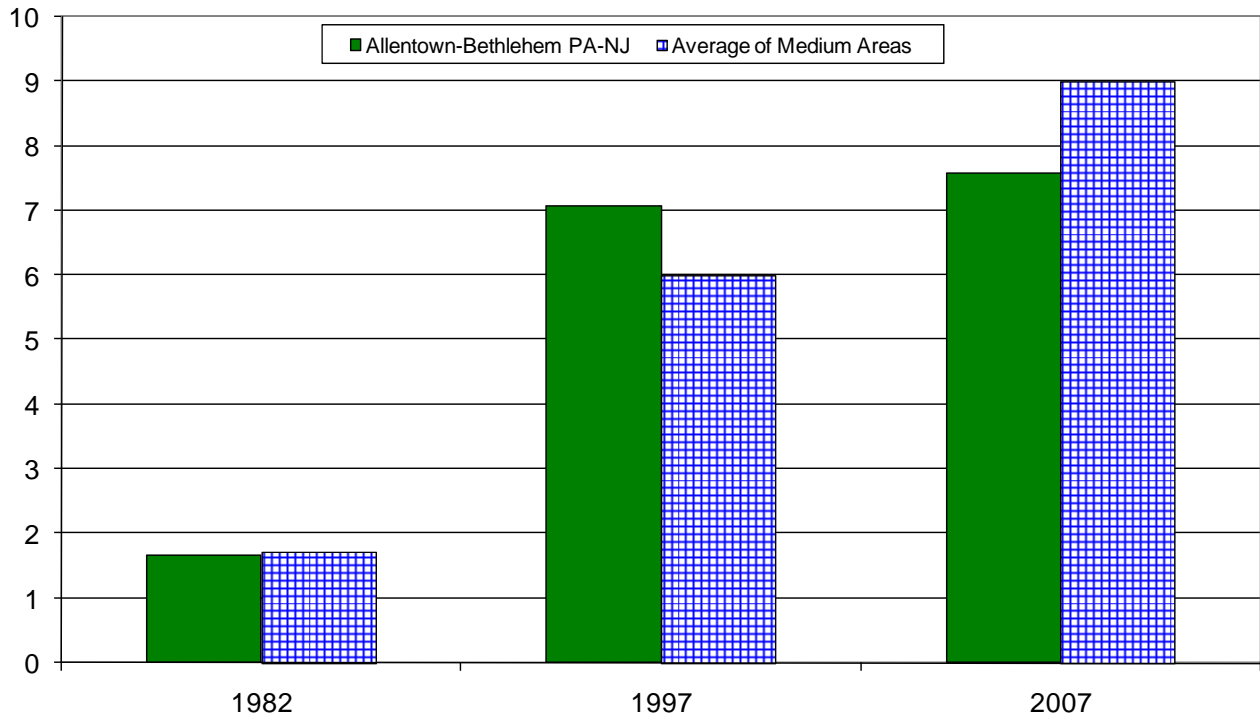
Growth in Delay per Peak Traveler



Note: Medium areas have populations between 0.5 and 1 million

Annual Hours of Delay (millions)

Growth in Total Delay



Note: Medium areas have populations between 0.5 and 1 million

**Benefits from Public Transportation Service and Operations Strategies in
Allentown-Bethlehem PA-NJ**

Operations Strategies	2007	2006	2005	2004
Freeway Ramp Metering				
Percent of Roadway Miles	8	8	8	8
Annual Delay Reduction (1000 hours)	2	2	3	2
Freeway Incident Management				
Cameras				
Percent of Roadway Miles	14	14	14	5
Service Patrols				
Percent of Roadway Miles	39	39	39	32
Annual Delay Reduction (1000 hours)	47	40	56	41
Arterial Signal Coordination				
Percent of Roadway Miles	40	37	29	29
Annual Delay Reduction (1000 hours)	39	63	63	45
Arterial Access Management				
Percent of Roadway Miles	11	9	8	8
Annual Delay Reduction (1000 hours)	116	92	69	82
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	205	197	190	170
Annual Delay Saved per Peak Traveler (hours)	1	1	1	1
Annual Congestion Cost Savings (\$million)	4.3	4.0	3.7	3.1
Travel Time Index with Strategies	1.138	1.132	1.139	1.141
Travel Time Index (Base)	1.142	1.135	1.143	1.144
Public Transportation Service	2007	2006	2005	2004
Existing Service				
Annual Passenger-miles of travel (million)	26.2	25.7	22.7	20.3
Unlinked Passenger Trips (million)	5.7	5.6	4.9	4.7
Travel Time Index (combined road and transit)	1.141	1.134	1.142	1.143
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.144	1.137	1.143	1.145
Annual Increase				
Delay (1000 hours)	202	149	109	138
Delay per Peak Traveler (hours)	1	0	0	0
Congestion Cost (\$million)	4.1	2.9	2.1	2.5

**Benefits from Public Transportation Service and Operations Strategies in
Allentown-Bethlehem PA-NJ, Continued**

Operations Strategies	2003	2002	2001	2000
Freeway Ramp Metering				
Percent of Roadway Miles	10	10	10	11
Annual Delay Reduction (1000 hours)	2	2	1	1
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	30	22	23	23
Annual Delay Reduction (1000 hours)	43	41	63	35
Arterial Access Management				
Percent of Roadway Miles	8	8	8	7
Annual Delay Reduction (1000 hours)	86	83	89	70
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	131	126	154	106
Annual Delay Saved per Peak Traveler (hours)	0	0	0	0
Annual Congestion Cost Savings (\$million)	2.2	2.1	2.5	1.7
Travel Time Index with Strategies	1.136	1.147	1.149	1.154
Travel Time Index (Base)	1.138	1.149	1.152	1.156
Public Transportation Service	2003	2002	2001	2000
Existing Service				
Annual Passenger-miles of travel (million)	20.3	19.3	18.9	18.0
Unlinked Passenger Trips (million)	4.8	4.5	4.3	4.1
Travel Time Index (combined road and transit)	1.138	1.148	1.151	1.155
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.140	1.151	1.153	1.157
Annual Increase				
Delay (1000 hours)	148	177	115	116
Delay per Peak Traveler (hours)	0	1	0	0
Congestion Cost (\$million)	2.6	3.0	1.9	1.9

**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