Performance Measure Summary – Tulsa, OK

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 Tulsa OK

Inventory Measures	2007	2006	2005	2004	2003	2002
Urban Area Information						
Population (1000s)	810	810	810	810	810	805
Rank	51	51	51	51	51	51
Urban Area (square miles)	415	415	410	410	410	405
Population Density (persons/sq mile)	1,952	1,952	1,976	1,976	1,976	1,988
Peak Travelers (1000s)	446	443	440	437	435	427
Freeway						
Daily Vehicle-Miles of Travel (1000s)	7,140	7,015	6,960	6,935	7,025	6,850
Lane-Miles	750	750	745	740	700	680
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	10,300	10,330	10,000	9,615	9,335	8,825
Lane-Miles	1,840	1,840	1,830	1,810	1,770	1,765
Public Transportation						
Annual Psgr-Miles of Travel (millions)	14.2	14.9	14.0	16.0	16.0	16.0
Annual Unlinked Psgr Trips (millions)	2.6	2.7	2.5	3.1	3.0	3.0
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 ($/gallon)	2.87	2.51	2.19	1.77	1.42	1.27
System Performance	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
Congested Travel (% of peak VMT)	26	26	24	24	27	27
Congested System (% of lane-miles)	35	35	31	31	33	34
Congested Time (number of "Rush Hours")	4.2	4.0	4.0	3.8	4.2	3.8
Annual Increase Needed to Maintain Constant Congestion Level:						
Lane-miles	56	66	69	71	73	64
Transit Riders or Carpoolers (millions)	13	15	16	16	17	14
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	5,589	5,537	4,813	4,830	5,399	5,152
Rank	57	57	59	59	54	53
Fuel per Peak Traveler (gallons)	13	12	11	11	12	12
Rank	60	64	65	66	59	60
Annual Delay						
Total Delay (1000s of person-hours)	9,826	9,777	8,479	8,428	9,248	8,746
Rank	56	55	57	57	51	51
Delay per Peak Traveler (person-hours)	22	22	19	19	21	20
Rank	55	56	61	60	56	58
Delay due to Incidents (percent)	54	54	54	54	55	56
Travel Time Index	1.10	1.10	1.09	1.09	1.10	1.10
Rank	64	63	66	67	62	61
Congestion Cost						
Total Cost ($ millions)	192	185	153	145	154	143
Rank	56	54	58	58	51	51
Cost per Peak Traveler ($)	430	417	348	331	353	334
Rank	59	56	64	64	58	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.

The Mobility Data for Tulsa OK, Continued

Inventory Measures	2001	2000	1999	1998	1997
Urban Area Information					
Population (1000s)	805	805	775	760	750
Rank	50	47	49	47	47
Urban Area (square miles)	405	405	400	390	380
Population Density (persons/sq mile)	1,988	1,988	1,938	1,949	1,974
Peak Travelers (1000s)	422	416	396	384	374
Freeway					
Daily Vehicle-Miles of Travel (1000s)	6,700	6,500	6,300	6,100	5,900
Lane-Miles	650	630	595	580	550
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	8,590	8,365	8,135	8,050	7,900
Lane-Miles	1,760	1,755	1,745	1,740	1,730
Public Transportation					
Annual Psgr-Miles of Travel (millions)	18.4	18.9	18.5	16.9	16.9
Annual Unlinked Psgr Trips (millions)	3.2	3.3	3.2	2.8	2.8
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 ($/gallon)	1.31	1.48	1.03	1.00	1.08
System Performance	**2001**	**2000**	**1999**	**1998**	**1997**
Congested Travel (% of peak VMT)	27	25	24	24	24
Congested System (% of lane-miles)	35	31	31	31	31
Congested Time (number of "Rush Hours")	4.0	3.8	4.0	3.8	4.0
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	60	64	63	60	66
Transit Riders or Carpoolers (millions)	13	14	13	13	14
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	4,957	4,611	4,270	4,165	3,995
Rank	54	55	56	57	58
Fuel per Peak Traveler (gallons)	12	11	11	11	11
Rank	61	64	65	62	60
Annual Delay					
Total Delay (1000s of person-hours)	8,446	7,924	7,267	7,123	6,733
Rank	52	53	55	56	56
Delay per Peak Traveler (person-hours)	20	19	18	19	18
Rank	58	62	64	59	60
Delay due to Incidents (percent)	55	56	55	56	55
Travel Time Index	1.10	1.09	1.09	1.09	1.09
Rank	62	67	69	64	62
Congestion Cost					
Total Cost ($ millions)	136	126	108	104	97
Rank	52	53	57	57	56
Cost per Peak Traveler ($)	322	302	273	270	260
Rank	61	63	64	61	62

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 Tulsa OK, Continued

Inventory Measures	1996	1995	1994	1993	1992
Urban Area Information					
Population (1000s)	740	730	725	710	690
Rank	47	47	46	47	47
Urban Area (square miles)	370	360	350	340	330
Population Density (persons/sq mile)	2,000	2,028	2,071	2,088	2,091
Peak Travelers (1000s)	364	355	348	337	323
Freeway					
Daily Vehicle-Miles of Travel (1000s)	5,800	5,515	5,265	5,265	4,855
Lane-Miles	530	530	525	525	480
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	7,700	7,520	7,380	7,200	7,120
Lane-Miles	1,725	1,715	1,715	1,705	1,700
Public Transportation					
Annual Psgr-Miles of Travel (millions)	18.2	18.4	18.3	17.5	19.5
Annual Unlinked Psgr Trips (millions)	2.9	3.1	3.1	3.1	3.4
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 ($/gallon)	1.21	1.06	0.97	1.05	1.03
System Performance	**1996**	**1995**	**1994**	**1993**	**1992**
Congested Travel (% of peak VMT)	24	20	18	18	17
Congested System (% of lane-miles)	31	26	21	21	22
Congested Time (number of "Rush Hours")	4.0	3.6	3.2	3.2	3.2
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	71	53	34	40	29
Transit Riders or Carpoolers (millions)	15	11	7	8	6
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	3,783	2,968	2,627	2,541	2,458
Rank	57	60	61	61	56
Fuel per Peak Traveler (gallons)	10	8	8	8	8
Rank	61	66	62	62	61
Annual Delay					
Total Delay (1000s of person-hours)	6,294	4,972	4,512	4,369	4,342
Rank	57	60	61	58	54
Delay per Peak Traveler (person-hours)	17	14	13	13	13
Rank	61	64	62	62	60
Delay due to Incidents (percent)	55	55	54	54	54
Travel Time Index	1.08	1.07	1.06	1.06	1.06
Rank	64	66	70	68	66
Congestion Cost					
Total Cost ($ millions)	89	68	60	57	54
Rank	57	59	60	58	56
Cost per Peak Traveler ($)	246	192	171	168	169
Rank	62	64	63	64	61

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 Tulsa OK, Continued

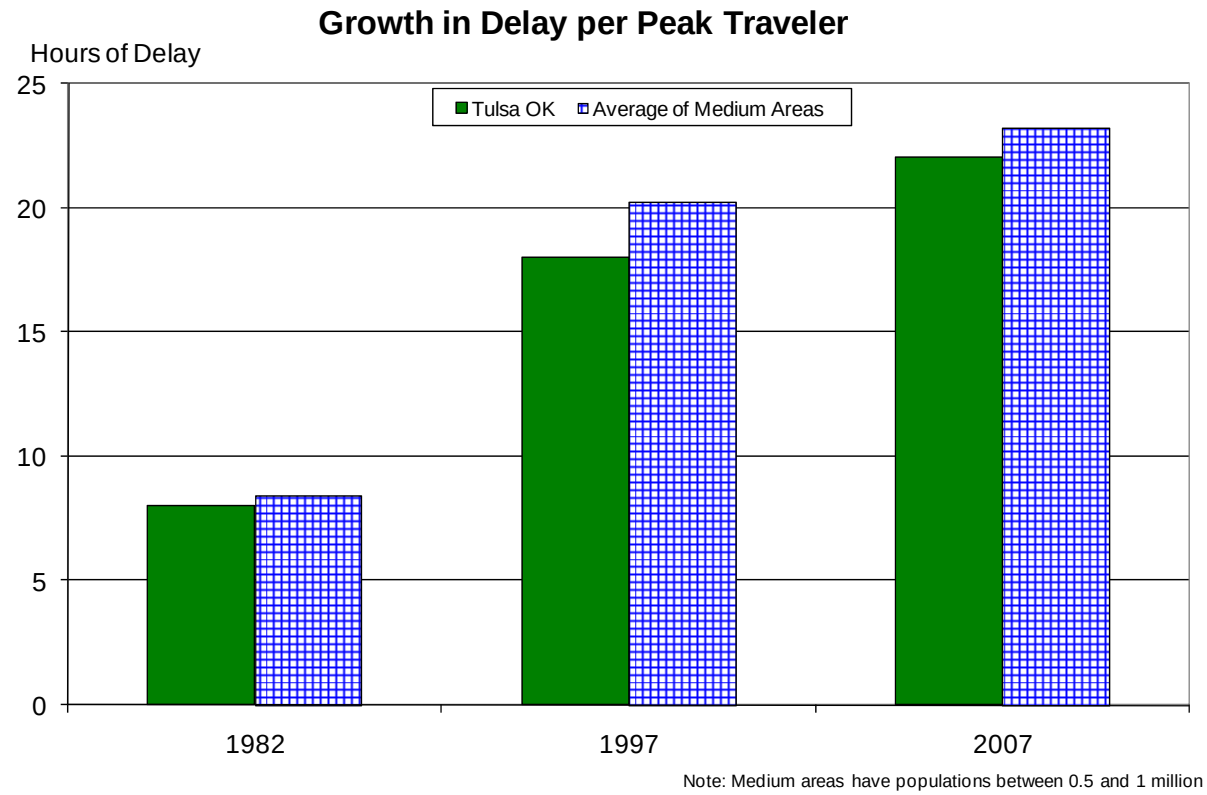
Inventory Measures	1991	1990	1989	1988	1987
Urban Area Information					
Population (1000s)	675	650	625	605	580
Rank	48	49	49	51	50
Urban Area (square miles)	320	310	300	290	280
Population Density (persons/sq mile)	2,109	2,097	2,083	2,086	2,071
Peak Travelers (1000s)	312	296	283	272	258
Freeway					
Daily Vehicle-Miles of Travel (1000s)	4,430	4,465	4,520	4,485	4,300
Lane-Miles	455	460	475	475	460
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	7,150	7,135	7,205	6,915	6,900
Lane-Miles	1,700	1,695	1,690	1,680	1,660
Public Transportation					
Annual Psgr-Miles of Travel (millions)	19.2	17.9	15.9	16.9	14.4
Annual Unlinked Psgr Trips (millions)	3.4	3.2	3.2	3.0	2.7
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 ($/gallon)	1.05	1.11	1.06	0.98	0.98
System Performance	**1991**	**1990**	**1989**	**1988**	**1987**
Congested Travel (% of peak VMT)	17	17	17	16	15
Congested System (% of lane-miles)	22	18	18	18	18
Congested Time (number of "Rush Hours")	3.0	3.0	3.0	3.0	3.0
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	23	27	47	101	148
Transit Riders or Carpoolers (millions)	4	5	9	19	27
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	2,421	2,462	2,363	2,258	1,818
Rank	52	52	52	49	50
Fuel per Peak Traveler (gallons)	8	8	8	8	7
Rank	53	53	51	46	50
Annual Delay					
Total Delay (1000s of person-hours)	4,411	4,572	4,311	4,116	3,121
Rank	52	50	48	43	50
Delay per Peak Traveler (person-hours)	14	15	15	15	12
Rank	52	51	46	43	49
Delay due to Incidents (percent)	54	53	53	54	54
Travel Time Index	1.06	1.06	1.06	1.06	1.05
Rank	56	56	56	55	58
Congestion Cost					
Total Cost ($ millions)	54	54	48	44	33
Rank	52	51	50	44	50
Cost per Peak Traveler ($)	173	183	171	163	126
Rank	55	51	47	45	50

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.

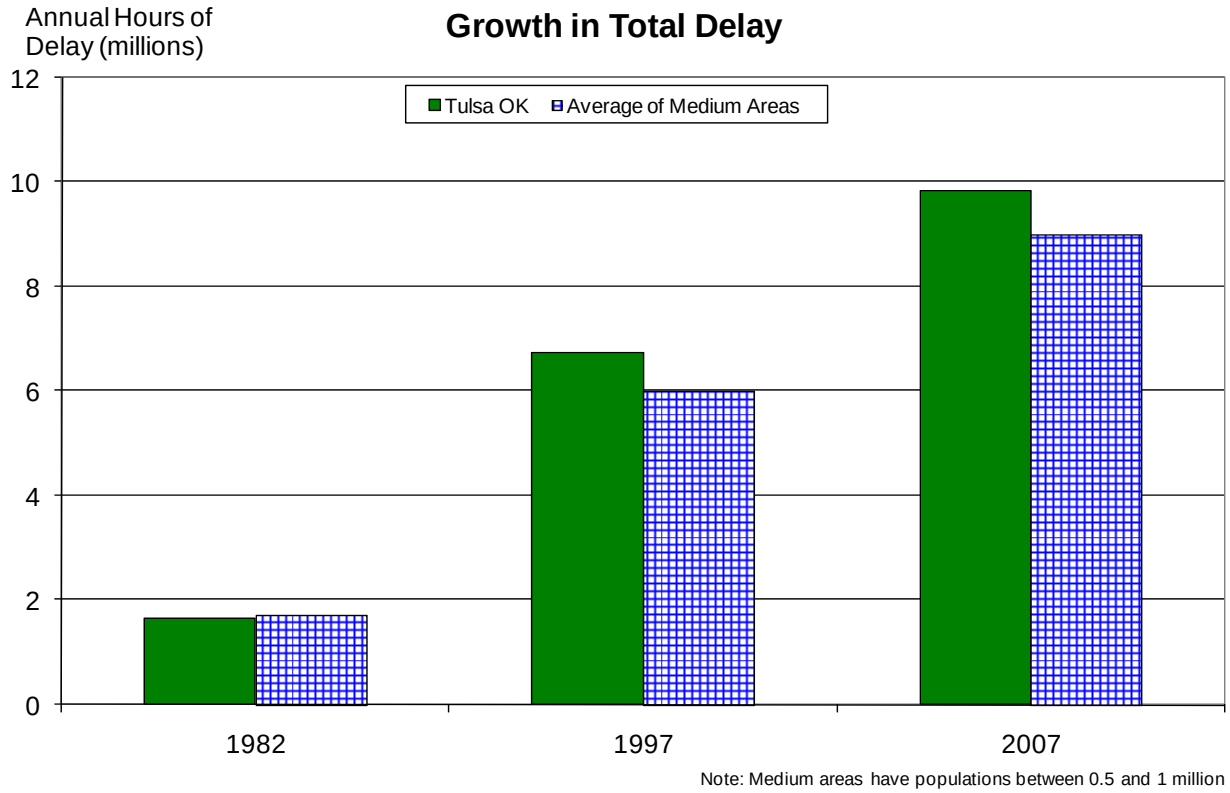
The Mobility Data for Tulsa OK, Continued

Inventory Measures	1986	1985	1984	1983	1982
Urban Area Information					
Population (1000s)	565	550	530	510	480
Rank	50	51	52	54	57
Urban Area (square miles)	270	260	250	240	230
Population Density (persons/sq mile)	2,093	2,115	2,120	2,125	2,087
Peak Travelers (1000s)	250	241	231	220	205
Freeway					
Daily Vehicle-Miles of Travel (1000s)	4,200	4,150	3,990	3,545	3,500
Lane-Miles	450	435	425	410	390
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	6,800	6,745	6,525	5,520	4,490
Lane-Miles	1,640	1,610	1,585	1,560	1,540
Public Transportation					
Annual Psgr-Miles of Travel (millions)	17.0	18.4	15.0	15.0	15.0
Annual Unlinked Psgr Trips (millions)	3.0	3.1	3.0	3.0	3.0
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 ($/gallon)	0.96	1.25	1.27	1.30	1.35
System Performance	**1986**	**1985**	**1984**	**1983**	**1982**
Congested Travel (% of peak VMT)	15	15	15	12	11
Congested System (% of lane-miles)	14	14	14	14	14
Congested Time (number of "Rush Hours")	3.0	3.0	3.0	2.7	2.6
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	- -	- -	- -	- -	- -
Transit Riders or Carpoolers (millions)	- -	- -	- -	- -	- -
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	1,772	1,807	1,696	1,194	937
Rank	46	44	42	49	54
Fuel per Peak Traveler (gallons)	7	7	7	5	5
Rank	44	40	37	47	47
Annual Delay					
Total Delay (1000s of person-hours)	3,075	3,139	2,949	2,124	1,637
Rank	45	43	41	47	53
Delay per Peak Traveler (person-hours)	12	13	13	10	8
Rank	46	37	35	43	49
Delay due to Incidents (percent)	54	54	54	54	54
Travel Time Index	1.05	1.05	1.05	1.04	1.03
Rank	55	51	47	53	62
Congestion Cost					
Total Cost ($ millions)	31	32	29	20	15
Rank	46	42	41	49	52
Cost per Peak Traveler ($)	124	132	126	92	75
Rank	49	41	38	46	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.



Note: Medium areas have populations between 0.5 and 1 million



Note: Medium areas have populations between 0.5 and 1 million

Benefits from Public Transportation Service and Operations Strategies in Tulsa OK

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	26	26	26	26
Service Patrols				
Percent of Roadway Miles	--	--	--	--
Annual Delay Reduction (1000 hours)	4	4	4	5
Arterial Signal Coordination				
Percent of Roadway Miles	3	3	3	3
Annual Delay Reduction (1000 hours)	7	9	9	6
Arterial Access Management				
Percent of Roadway Miles	3	3	2	2
Annual Delay Reduction (1000 hours)	66	17	38	30
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	78	30	50	41
Annual Delay Saved per Peak Traveler (hours)	0	0	0	0
Annual Congestion Cost Savings ($million)	1.6	0.7	1.0	0.8
Travel Time Index with Strategies	1.097	1.097	1.086	1.088
Travel Time Index (Base)	1.098	1.098	1.086	1.089
Public Transportation Service	**2007**	**2006**	**2005**	**2004**
Existing Service				
Annual Passenger-miles of travel (million)	14.2	14.9	14.0	16.0
Unlinked Passenger Trips (million)	2.6	2.7	2.5	3.1
Travel Time Index (combined road and transit)	1.098	1.097	1.086	1.088
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.098	1.099	1.086	1.089
Annual Increase				
Delay (1000 hours)	51	152	1	48
Delay per Peak Traveler (hours)	0	0	0	0
Congestion Cost ($million)	1.0	2.9	0.0	0.8

Benefits from Public Transportation Service and Operations Strategies in Tulsa OK, 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	2	2	2	2
Annual Delay Reduction (1000 hours)	3	8	8	3
Arterial Access Management				
Percent of Roadway Miles	2	2	2	2
Annual Delay Reduction (1000 hours)	34	79	78	28
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	38	87	87	31
Annual Delay Saved per Peak Traveler (hours)	0	0	0	0
Annual Congestion Cost Savings ($million)	0.6	1.4	1.4	0.5
Travel Time Index with Strategies	1.100	1.100	1.098	1.094
Travel Time Index (Base)	1.101	1.100	1.099	1.094
Public Transportation Service	**2003**	**2002**	**2001**	**2000**
Existing Service				
Annual Passenger-miles of travel (million)	16.0	16.0	18.4	18.9
Unlinked Passenger Trips (million)	3.0	3.0	3.2	3.3
Travel Time Index (combined road and transit)	1.100	1.100	1.099	1.094
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.102	1.101	1.099	1.095
Annual Increase				
Delay (1000 hours)	137	90	23	151
Delay per Peak Traveler (hours)	0	0	0	0
Congestion Cost ($million)	2.3	1.5	0.4	2.4

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	
2007 Values	**Above 1M Population**	**Below 1M Population**
Delay per Traveler -	5 Hours	3 Hours
Travel Time Index -	5 Index Points	3 Index Points
Total Delay -	5 Hours x Average Population	3 Hours x Average Population
1982 to 2007 Trends		
Delay per Traveler -	5 Hours	3 Hours
Total Delay -	5 Hours x Average Population	3 Hours x Average Population