

## Performance Measure Summary

There are several inventory and performance measures listed in the pages of this Urban Area Report for the years from 1982 to 2005. 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 aspects. 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).*

### Comparison of Several Key Mobility Performance Measures Large Group – 1 million to 3 million population urban areas

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	1982 to 2005	
				Delay per Traveler	Total Delay
San Diego, CA	H+	H+	H+	F+	F+
Minneapolis-St. Paul, MN	H	0	H+	F+	F+
Baltimore, MD	H	H	H+	F	F+
Tampa-St. Petersburg, FL	H+	H	H+	S	F+
St. Louis, MO-IL	L	L-	0	S	0
Denver-Aurora, CO	H+	H+	H+	F+	F+
Pittsburgh, PA	L-	L-	L-	S-	S-
Riverside-San Bernardino, CA	H+	H+	H+	F+	F+
Cleveland, OH	L-	L-	L-	S-	S-
Sacramento, CA	H	H+	H	0	F+
Portland, OR-WA	0	H	0	0	0
San Jose, CA	H+	H+	H+	F	F+
Cincinnati, OH-KY-IN	L-	L	L	S	S-
Virginia Beach, VA	L	L	L	S-	S-
Kansas City, MO-KS	L-	L-	L-	S-	S-
Milwaukee, WI	L-	L-	L-	S-	S-
Las Vegas, NV	0	H	L	F	0
Orlando, FL	H+	H	H	F+	F+
<b>San Antonio, TX</b>	<b>0</b>	<b>0</b>	<b>L</b>	<b>F</b>	<b>S</b>
Providence, RI-MA	L-	L-	L-	0	S-
Columbus, OH	L	L	L	F	S-
Buffalo, NY	L-	L-	L-	S-	S-
New Orleans, LA	L-	L-	L-	S-	S-
Indianapolis, IN	H	0	L	0	S-
Memphis, TN-MS-AR	L	L-	L-	0	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

## 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 2005 (estimated at \$14.60 per hour of person travel and \$77.10 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

### 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
<b>2005 Values</b> Delay per Traveler - Travel Time Index - Total Delay -	5 Hours 5 Index Points 5 Hours x Average Population	3 Hours 3 Index Points 3 Hours x Average Population
<b>1982 to 2005 Trends</b> Delay per Traveler - Total Delay -	5 Hours 5 Hours x Average Population	3 Hours 3 Hours x Average Population

### The Mobility Data for San Antonio, TX

Inventory Measures	2005	2004	2003	2002	2001	2000
<b>Urban Area Information</b>						
Population (1000s)	1,360	1,360	1,330	1,280	1,260	1,255
Rank	32	32	32	32	32	32
Urban Area (square miles)	565	565	545	530	520	505
Popn Density (persons/sq mile)	2,407	2,407	2,440	2,415	2,423	2,485
Peak Travelers (1000s)	751	747	726	689	667	654
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	17,065	16,790	16,250	15,905	15,600	15,775
Lane Miles	1,090	1,075	1,075	1,070	1,065	1,065
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	11,245	11,030	10,600	10,430	10,340	10,400
Lane Miles	2,235	2,190	2,160	2,140	2,140	2,115
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	181	164	162	191	187	183
Annual Unlinked Psgr Trips (millions)	41	43	40	45	47	45
<b>Cost Components</b>						
Value of Time (\$/hour)	14.60	14.10	13.75	13.45	13.25	12.85
Commercial Cost (\$/hour)	77.10	74.60	72.65	71.05	69.95	68.00
Fuel Cost (\$/gallon)	2.23	1.83	1.45	1.32	1.46	1.47
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	61	61	54	51	50	51
<b>Congested System</b> (% of lane-miles)	45	45	40	38	38	38
<b>Congested Time</b> (number of "Rush Hours")	7.0	7.0	6.8	6.6	6.4	6.6
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	52	70	73	74	87	136
Transit Riders or Carpoolers (millions)	16	21	21	21	24	39
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	20,425	20,062	17,075	16,376	15,915	17,058
Rank	26	26	28	30	27	26
Fuel per Peak Traveler (gallons)	27	27	24	24	24	26
Rank	27	26	30	29	26	22
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	29,380	28,737	24,841	24,125	23,714	25,210
Rank	27	27	30	29	28	26
Delay per Peak Traveler (person-hrs)	39	38	34	35	36	39
Rank	29	31	33	28	22	20
Delay due to Incidents (percent)	52	52	52	52	52	52
<b>Travel Time Index</b>						
Rank	1.23	1.23	1.20	1.20	1.20	1.21
Rank	28	28	34	32	31	29
<b>Congestion Cost</b>						
Total Cost (\$ millions)	530	493	410	386	375	388
Rank	27	27	30	30	29	27
Cost per Peak Traveler (\$)	706	661	564	561	563	594
Rank	32	31	34	35	31	23

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

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

**The Mobility Data for San Antonio, TX, Continued**

<b>Inventory Measures</b>	<b>1999</b>	<b>1998</b>	<b>1997</b>	<b>1996</b>	<b>1995</b>	<b>1994</b>
<b>Urban Area Information</b>						
Population (1000s)	1,240	1,235	1,230	1,225	1,220	1,210
Rank	31	31	31	31	31	31
Urban Area (square miles)	495	490	485	485	480	480
Popn Density (persons/sq mile)	2,505	2,520	2,536	2,526	2,542	2,521
Peak Travelers (1000s)	635	622	610	598	586	572
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	15,420	14,515	13,730	13,275	12,910	12,000
Lane Miles	1,065	1,065	1,065	1,065	1,060	1,055
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	9,590	9,495	9,785	9,410	8,320	9,040
Lane Miles	2,100	2,090	2,090	2,090	2,090	2,090
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	184	177	164	157	192	179
Annual Unlinked Psgr Trips (millions)	45	42	39	39	48	47
<b>Cost Components</b>						
Value of Time (\$/hour)	12.40	12.15	12.00	11.70	11.40	11.05
Commercial Cost (\$/hour)	65.80	64.35	63.40	61.95	60.20	58.50
Fuel Cost (\$/gallon)	1.07	1.01	1.12	1.21	1.14	1.03
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	47	42	38	34	30	25
<b>Congested System</b> (% of lane-miles)	38	37	32	32	30	25
<b>Congested Time</b> (number of "Rush Hours")	6.2	5.8	5.4	5.0	4.6	4.0
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	111	115	135	146	134	165
Transit Riders or Carpoolers (millions)	31	31	35	37	32	38
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	14,675	11,757	9,800	8,633	7,129	5,542
Rank	29	30	34	36	37	43
Fuel per Peak Traveler (gallons)	23	19	16	14	12	10
Rank	30	38	42	44	52	57
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	21,387	17,382	14,758	13,130	10,919	8,378
Rank	30	30	35	35	37	41
Delay per Peak Traveler (person-hrs)	34	28	24	22	19	15
Rank	33	41	45	48	55	58
Delay due to Incidents (percent)	52	51	51	51	51	52
<b>Travel Time Index</b>						
Rank	37	44	48	48	54	60
<b>Congestion Cost</b>						
Total Cost (\$ millions)	313	249	210	183	148	110
Rank	30	32	35	36	40	41
Cost per Peak Traveler (\$)	493	400	343	306	252	192
Rank	35	42	46	50	56	58

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

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

**The Mobility Data for San Antonio, TX, Continued**

<b>Inventory Measures</b>	<b>1993</b>	<b>1992</b>	<b>1991</b>	<b>1990</b>	<b>1989</b>	<b>1988</b>
<b>Urban Area Information</b>						
Population (1000s)	1,195	1,185	1,180	1,170	1,165	1,165
Rank	31	31	29	28	27	27
Urban Area (square miles)	480	425	470	470	465	460
Popn Density (persons/sq mile)	2,490	2,788	2,511	2,489	2,505	2,533
Peak Travelers (1000s)	556	543	531	518	513	508
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	11,340	10,500	9,700	9,280	8,575	8,900
Lane Miles	1,055	1,000	950	900	840	810
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	8,720	8,570	8,385	7,935	7,720	7,510
Lane Miles	2,085	2,075	2,060	2,050	1,975	1,920
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	156	162	168	187	154	141
Annual Unlinked Psgr Trips (millions)	45	46	44	42	39	38
<b>Cost Components</b>						
Value of Time (\$/hour)	10.75	10.50	10.25	10.00	9.25	8.80
Commercial Cost (\$/hour)	57.05	55.40	53.80	51.60	48.95	46.70
Fuel Cost (\$/gallon)	1.10	1.09	1.12	1.04	1.07	0.99
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	23	22	19	20	20	22
<b>Congested System</b> (% of lane-miles)	25	25	20	22	21	21
<b>Congested Time</b> (number of "Rush Hours")	3.6	3.4	3.0	3.0	3.0	3.6
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	128	107	76	76	75	107
Transit Riders or Carpoolers (millions)	29	23	16	16	15	22
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	4,896	4,715	3,944	3,867	3,562	3,724
Rank	41	40	42	41	39	36
Fuel per Peak Traveler (gallons)	9	9	7	7	7	7
Rank	58	57	57	54	54	51
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	7,729	7,524	6,437	6,223	5,699	5,724
Rank	40	39	40	40	37	35
Delay per Peak Traveler (person-hrs)	14	14	12	12	11	11
Rank	60	57	58	57	56	53
Delay due to Incidents (percent)	51	51	51	51	51	52
<b>Travel Time Index</b>						
Rank	59	56	53	53	53	51
<b>Congestion Cost</b>						
Total Cost (\$ millions)	99	94	79	74	63	61
Rank	41	38	42	39	40	36
Cost per Peak Traveler (\$)	178	174	148	143	124	119
Rank	60	57	57	57	57	53

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

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

**The Mobility Data for San Antonio, TX, Continued**

<b>Inventory Measures</b>	<b>1987</b>	<b>1986</b>	<b>1985</b>	<b>1984</b>	<b>1983</b>	<b>1982</b>
<b>Urban Area Information</b>						
Population (1000s)	1,050	1,035	1,005	980	980	960
Rank	30	31	32	32	32	32
Urban Area (square miles)	460	455	450	440	440	430
Popn Density (persons/sq mile)	2,283	2,275	2,233	2,227	2,227	2,233
Peak Travelers (1000s)	455	444	428	415	412	398
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	8,770	8,710	8,420	7,780	7,150	6,835
Lane Miles	780	775	755	740	740	715
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	7,300	7,255	6,725	6,505	6,385	6,155
Lane Miles	1,880	1,865	1,850	1,835	1,820	1,800
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	146	140	136	131	131	131
Annual Unlinked Psgr Trips (millions)	38	37	35	34	34	34
<b>Cost Components</b>						
Value of Time (\$/hour)	8.50	8.20	8.00	7.75	7.45	7.20
Commercial Cost (\$/hour)	44.85	43.30	42.50	41.05	39.35	38.10
Fuel Cost (\$/gallon)	0.99	0.97	1.27	1.28	1.31	1.37
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	21	21	20	16	14	11
<b>Congested System</b> (% of lane-miles)	20	21	18	16	15	14
<b>Congested Time</b> (number of "Rush Hours")	3.8	3.8	3.6	3.0	2.9	2.8
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	116	--	--	--	--	--
Transit Riders or Carpoolers (millions)	24	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	3,826	3,990	3,398	2,370	2,234	1,678
Rank	35	30	31	38	35	36
Fuel per Peak Traveler (gallons)	8	9	8	6	5	4
Rank	42	37	38	47	43	50
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	6,067	6,349	5,398	3,764	3,592	2,568
Rank	34	31	31	36	35	37
Delay per Peak Traveler (person-hrs)	13	14	13	9	9	6
Rank	43	39	41	50	47	53
Delay due to Incidents (percent)	51	51	51	52	52	52
<b>Travel Time Index</b>						
Rank	46	41	42	49	46	51
<b>Congestion Cost</b>						
Total Cost (\$ millions)	62	62	53	36	33	23
Rank	34	31	33	36	35	37
Cost per Peak Traveler (\$)	136	141	124	87	80	58
Rank	44	41	41	49	47	52

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

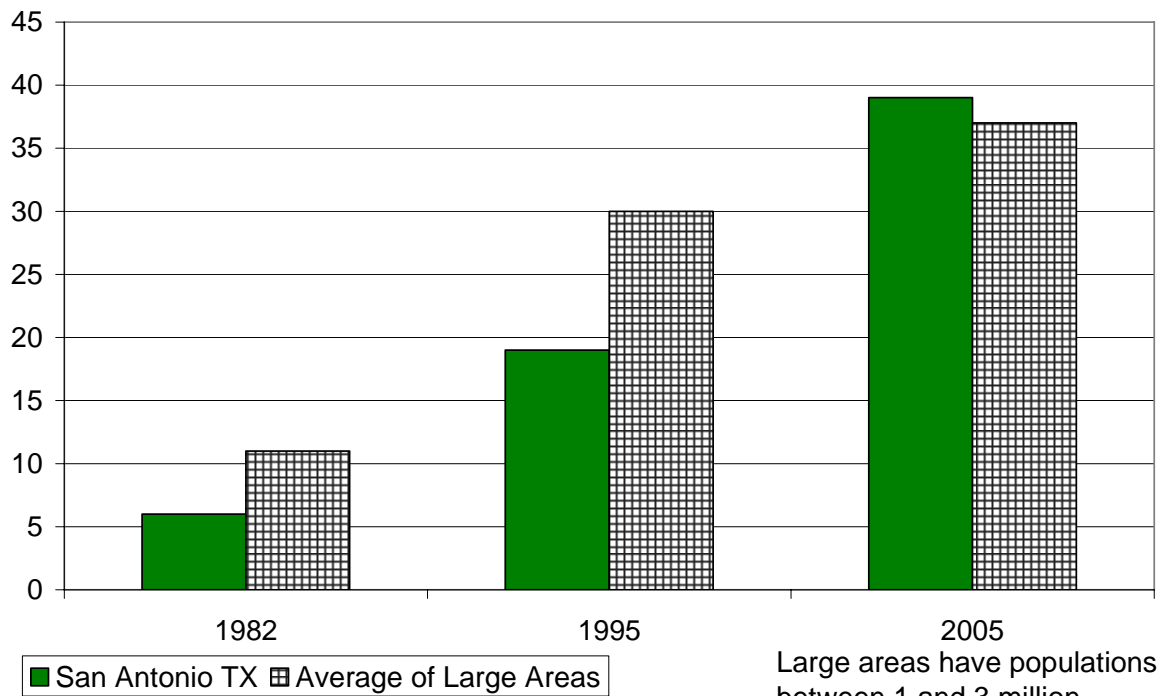
Note: Zeroes in the table reflect values less than 0.5.

**Benefits From Public Transportation Service and Operations Strategies for San Antonio, TX**

<b>Operations Strategies</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>	<b>2001</b>	<b>2000</b>
<b>Freeway Ramp Metering</b>						
Percent of Roadway Miles	--	--	--	--	--	--
Annual Delay Reduction (1000 hours)	--	--	--	--	--	--
<b>Freeway Incident Management</b>						
<b>Cameras</b>						
Percent of Roadway Miles	52	53	53	53	44	35
<b>Service Patrols</b>						
Percent of Roadway Miles	92	93	93	94	--	--
Annual Delay Reduction (1000 hours)	977	992	887	895	54	54
<b>Arterial Signal Coordination</b>						
Percent of Roadway Miles	66	64	56	47	44	45
Annual Delay Reduction (1000 hours)	163	159	85	97	77	94
<b>Arterial Access Management</b>						
Percent of Roadway Miles	6	6	6	6	6	6
Annual Delay Reduction (1000 hours)	73	112	57	90	110	53
<b>HOV Lanes</b>						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
<b>Total Effect of Operations Treatments</b>						
Annual Delay Reduction (1000 hours)	1,213	1,263	1,028	1,082	242	201
Annual Delay Saved per Peak Traveler (hours)	2	2	1	2	0	0
Annual Congestion Cost Savings (\$million)	21.9	21.7	17.0	17.2	3.8	3.1
Travel Time Index with Strategies	1.233	1.233	1.203	1.198	1.195	1.208
Travel Time Index (Base)	1.242	1.242	1.211	1.206	1.197	1.210
<b>Public Transportation Service</b>						
<b>Existing Service</b>						
Annual Passenger-miles of Travel (million)	181	164	162	191	187	183
Unlinked Passenger Trips (million)	41	43	40	45	47	45
Travel Time Index (combined road and transit)	1.227	1.227	1.198	1.192	1.190	1.203
<b>Condition if Public Transportation Service were Discontinued</b>						
Travel Time Index	1.253	1.252	1.222	1.221	1.210	1.225
Annual Delay Increase (1000 hours)	1,774	1,585	1,661	2,325	2,039	2,095
Annual Delay Increase per Peak Traveler (hours)	2	2	2	3	3	3
Annual Congestion Cost Increase (\$million)	32.2	27.4	27.6	37.2	32.2	32.4

### Growth in Delay per Peak Traveler

Hours of Delay



Annual Hours of Delay (million)

### Growth in Total Delay

