

## 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
<b>San Diego, CA</b>	<b>H+</b>	<b>H+</b>	<b>H+</b>	<b>F+</b>	<b>F+</b>
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+
San Antonio, TX	0	0	L	F	S
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 Diego, CA

<b>Inventory Measures</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>	<b>2001</b>	<b>2000</b>
<b>Urban Area Information</b>						
Population (1000s)	2,905	2,875	2,870	2,825	2,780	2,740
Rank	15	15	15	14	14	14
Urban Area (square miles)	800	775	770	765	760	755
Popn Density (persons/sq mile)	3,631	3,710	3,727	3,693	3,658	3,629
Peak Travelers (1000s)	1,604	1,578	1,567	1,520	1,471	1,428
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	39,395	38,805	36,195	35,000	34,590	33,745
Lane Miles	1,965	1,930	1,860	1,830	1,795	1,795
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	22,155	22,125	21,245	22,605	21,520	20,065
Lane Miles	3,400	3,375	3,340	3,300	3,220	3,140
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	539	513	509	509	560	553
Annual Unlinked Psgr Trips (millions)	90	89	93	97	103	103
<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)	2.62	2.28	1.78	1.66	1.93	1.72
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	85	85	80	82	82	79
<b>Congested System</b> (% of lane-miles)	67	67	65	64	65	62
<b>Congested Time</b> (number of "Rush Hours")	8.0	8.0	8.0	8.0	8.0	7.8
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	147	190	168	172	141	121
Transit Riders or Carpoolers (millions)	58	76	65	67	55	46
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	71,124	72,365	60,519	61,460	54,556	48,998
Rank	11	11	12	12	12	12
Fuel per Peak Traveler (gallons)	44	46	39	40	37	34
Rank	3	2	5	4	7	7
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	90,711	92,736	78,538	80,959	71,769	63,659
Rank	13	12	13	12	12	14
Delay per Peak Traveler (person-hrs)	57	59	50	53	49	45
Rank	6	4	9	7	9	11
Delay due to Incidents (percent)	48	48	48	48	49	47
<b>Travel Time Index</b>						
Rank	4	3	6	4	7	9
<b>Congestion Cost</b>						
Total Cost (\$ millions)	1,708	1,669	1,353	1,366	1,214	1,038
Rank	13	12	13	13	13	14
Cost per Peak Traveler (\$)	1,065	1,057	864	899	825	727
Rank	5	3	8	6	8	11

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 Diego, CA, 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)	2,700	2,660	2,620	2,565	2,555	2,550
Rank	13	13	13	13	12	12
Urban Area (square miles)	755	750	750	745	745	740
Popn Density (persons/sq mile)	3,576	3,547	3,493	3,443	3,430	3,446
Peak Travelers (1000s)	1,382	1,341	1,300	1,252	1,226	1,206
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	31,775	30,000	29,515	29,150	28,490	28,000
Lane Miles	1,780	1,760	1,760	1,750	1,710	1,690
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	19,345	18,985	19,340	19,695	19,190	18,520
Lane Miles	2,990	2,955	2,915	2,885	2,850	2,825
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	515	500	445	415	337	327
Annual Unlinked Psgr Trips (millions)	98	95	84	77	71	69
<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)	1.59	1.27	1.40	1.21	1.27	1.16
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	78	72	72	72	70	69
<b>Congested System</b> (% of lane-miles)	62	57	58	58	54	54
<b>Congested Time</b> (number of "Rush Hours")	7.6	7.6	7.6	7.6	7.6	7.4
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	91	72	67	88	55	50
Transit Riders or Carpoolers (millions)	34	26	24	32	20	18
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	47,208	39,237	36,218	35,179	32,399	31,107
Rank	13	14	14	14	14	14
Fuel per Peak Traveler (gallons)	34	29	28	28	26	26
Rank	9	11	11	10	10	10
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	62,485	53,108	49,263	47,615	43,270	41,588
Rank	14	14	14	14	14	14
Delay per Peak Traveler (person-hrs)	45	40	38	38	35	34
Rank	12	14	18	15	15	16
Delay due to Incidents (percent)	48	48	48	48	48	48
<b>Travel Time Index</b>						
Rank	1.31	1.26	1.24	1.23	1.22	1.21
Rank	9	14	17	16	16	15
<b>Congestion Cost</b>						
Total Cost (\$ millions)	978	803	742	695	620	575
Rank	14	14	14	14	14	14
Cost per Peak Traveler (\$)	707	599	571	555	505	476
Rank	10	15	17	17	16	14

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 Diego, CA, 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)	2,530	2,480	2,445	2,295	2,230	2,150
Rank	12	12	12	12	12	12
Urban Area (square miles)	735	730	710	710	705	695
Popn Density (persons/sq mile)	3,442	3,397	3,444	3,232	3,163	3,094
Peak Travelers (1000s)	1,176	1,136	1,100	1,017	981	937
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	27,470	27,510	27,150	27,390	26,760	25,055
Lane Miles	1,670	1,630	1,610	1,610	1,610	1,600
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	17,965	17,985	17,290	17,515	17,290	16,805
Lane Miles	2,790	2,770	2,735	2,705	2,665	2,610
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	376	389	398	380	323	270
Annual Unlinked Psgr Trips (millions)	73	74	73	68	58	49
<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)	1.23	1.28	1.11	1.14	1.14	1.05
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	71	72	70	68	63	57
<b>Congested System</b> (% of lane-miles)	57	54	51	48	43	38
<b>Congested Time</b> (number of "Rush Hours")	7.4	7.6	7.4	7.6	7.4	7.2
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	74	143	191	279	323	331
Transit Riders or Carpoolers (millions)	26	52	68	101	116	114
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	31,770	32,598	29,812	30,612	27,820	21,833
Rank	12	11	10	10	12	14
Fuel per Peak Traveler (gallons)	27	29	27	30	28	23
Rank	10	9	9	5	6	9
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	42,965	44,326	39,810	40,260	36,543	29,269
Rank	14	14	14	12	13	15
Delay per Peak Traveler (person-hrs)	37	39	36	40	37	31
Rank	11	9	11	10	11	15
Delay due to Incidents (percent)	48	48	48	48	47	48
<b>Travel Time Index</b>						
Rank	1.22	1.23	1.21	1.22	1.20	1.16
Rank	11	11	11	13	13	17
<b>Congestion Cost</b>						
Total Cost (\$ millions)	580	586	509	501	423	320
Rank	14	13	14	12	13	16
Cost per Peak Traveler (\$)	493	516	462	493	431	342
Rank	12	10	11	9	11	13

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 Diego, CA, 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)	2,070	2,000	1,890	1,830	1,800	1,780
Rank	13	13	14	14	14	15
Urban Area (square miles)	680	665	650	640	625	610
Popn Density (persons/sq mile)	3,044	3,008	2,908	2,859	2,880	2,918
Peak Travelers (1000s)	896	858	805	774	756	739
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	23,170	21,500	19,650	18,480	16,675	15,070
Lane Miles	1,570	1,570	1,560	1,540	1,485	1,365
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	15,570	14,340	13,200	12,125	11,995	11,905
Lane Miles	2,590	2,550	2,515	2,480	2,440	2,405
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	230	217	260	246	246	246
Annual Unlinked Psgr Trips (millions)	47	40	45	43	43	43
<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)	1.05	1.03	1.35	1.36	1.39	1.46
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	52	45	40	34	30	27
<b>Congested System</b> (% of lane-miles)	36	35	33	28	28	25
<b>Congested Time</b> (number of "Rush Hours")	7.0	6.2	5.4	4.8	4.2	4.2
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	312	--	--	--	--	--
Transit Riders or Carpoolers (millions)	101	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	16,986	12,590	10,599	8,569	6,631	5,996
Rank	15	16	16	18	17	17
Fuel per Peak Traveler (gallons)	19	15	13	11	9	8
Rank	11	13	14	19	26	27
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	23,513	17,642	15,234	12,732	9,926	9,123
Rank	16	17	17	19	18	17
Delay per Peak Traveler (person-hrs)	26	21	19	16	13	12
Rank	15	22	23	24	30	29
Delay due to Incidents (percent)	49	49	49	50	51	51
<b>Travel Time Index</b>						
Rank	1.14	1.11	1.10	1.08	1.07	1.07
Rank	17	24	27	32	34	34
<b>Congestion Cost</b>						
Total Cost (\$ millions)	249	180	155	126	95	85
Rank	16	18	17	19	18	18
Cost per Peak Traveler (\$)	278	210	193	162	125	115
Rank	13	22	21	24	30	29

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

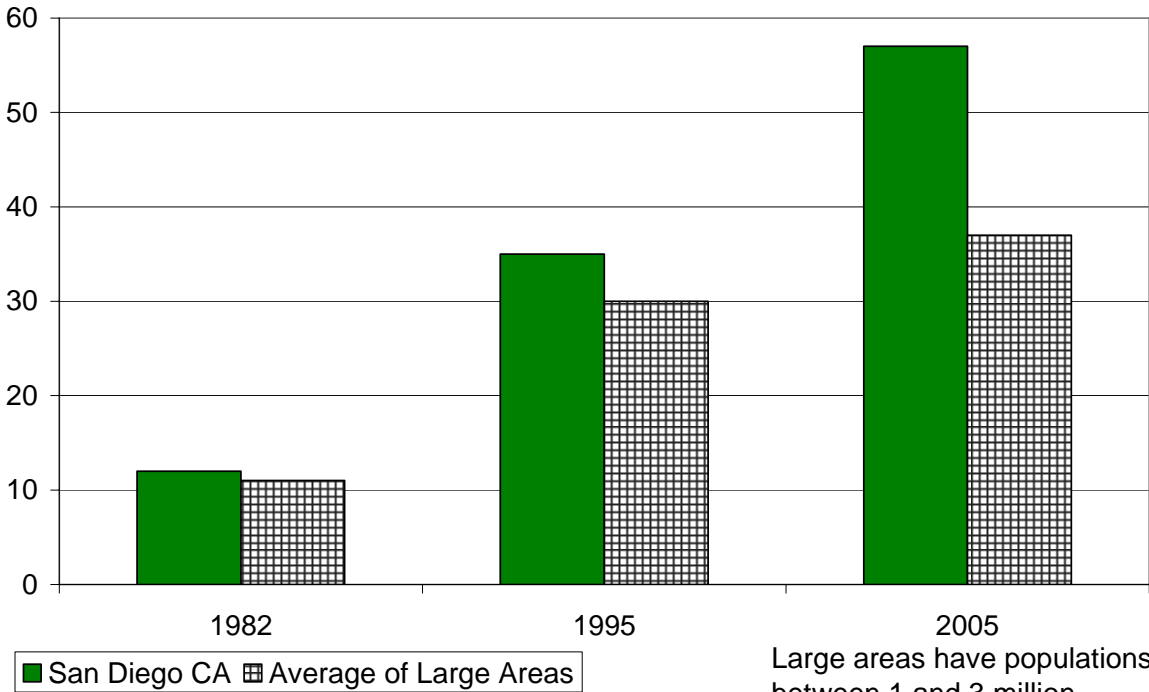
Note: Zeroes in the table reflect values less than 0.5.

**Benefits From Public Transportation Service and Operations Strategies for San Diego, CA**

<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	85	87	90	90	87	85
Annual Delay Reduction (1000 hours)	3,463	3,680	2,396	1,982	1,829	1,731
<b>Freeway Incident Management</b>						
<b>Cameras</b>						
Percent of Roadway Miles	13	13	10	10	10	11
<b>Service Patrols</b>						
Percent of Roadway Miles	80	82	85	87	87	87
Annual Delay Reduction (1000 hours)	2,546	2,652	2,138	2,052	1,639	1,210
<b>Arterial Signal Coordination</b>						
Percent of Roadway Miles	90	90	90	91	93	92
Annual Delay Reduction (1000 hours)	327	330	370	469	404	356
<b>Arterial Access Management</b>						
Percent of Roadway Miles	53	53	54	52	53	50
Annual Delay Reduction (1000 hours)	1,613	1,626	1,496	1,339	1,256	970
<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)	7,949	8,287	6,400	5,842	5,128	4,267
Annual Delay Saved per Peak Traveler (hours)	5	5	4	4	3	3
Annual Congestion Cost Savings (\$million)	146.4	145.8	108.3	97.1	85.5	68.8
Travel Time Index with Strategies	1.396	1.409	1.356	1.361	1.326	1.302
Travel Time Index (Base)	1.430	1.444	1.384	1.387	1.349	1.323
<b>Public Transportation Service</b>						
<b>Existing Service</b>						
Annual Passenger-miles of Travel (million)	539	513	509	509	560	553
Unlinked Passenger Trips (million)	90	89	93	97	103	103
Travel Time Index (combined road and transit)	1.381	1.394	1.342	1.347	1.311	1.288
<b>Condition if Public Transportation Service were Discontinued</b>						
Travel Time Index	1.460	1.474	1.417	1.419	1.379	1.354
Annual Delay Increase (1000 hours)	8,922	8,374	8,566	8,389	8,025	7,747
Annual Delay Increase per Peak Traveler (hours)	6	5	5	6	5	5
Annual Congestion Cost Increase (\$million)	164.6	147.6	145.0	139.4	133.4	124.5

### Growth in Delay per Peak Traveler

Hours of Delay



### Growth in Total Delay

Annual Hours of Delay (million)

