Performance Measure Summary – Cincinnati, 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 Cincinnati OH-KY-IN

Inventory Measures	2007	2006	2005	2004	2003	2002
Urban Area Information						
Population (1000s)	1,670	1,645	1,620	1,610	1,605	1,570
Rank	27	27	27	27	27	26
Urban Area (square miles)	890	890	885	885	880	850
Population Density (persons/sq mile)	1,876	1,848	1,831	1,819	1,824	1,847
Peak Travelers (1000s)	949	933	914	905	899	864
Freeway						
Daily Vehicle-Miles of Travel (1000s)	18,990	18,820	18,560	17,790	17,635	16,900
Lane-Miles	1,235	1,235	1,200	1,185	1,160	1,100
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	12,175	12,080	12,030	12,270	12,200	11,200
Lane-Miles	2,800	2,745	2,745	2,730	2,600	2,525
Public Transportation						
Annual Psgr-Miles of Travel (millions)	148	152	163	156	152	160
Annual Unlinked Psgr Trips (millions)	30	29	30	27	28	29
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 ($/gallon)	2.88	2.58	2.24	1.81	1.52	1.38
System Performance	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
Congested Travel (% of peak VMT)	51	50	51	51	52	52
Congested System (% of lane-miles)	36	36	36	40	40	40
Congested Time (number of "Rush Hours")	6.6	6.6	6.8	6.4	6.6	6.6
Annual Increase Needed to Maintain Constant Congestion Level:						
Lane-miles	85	103	109	122	129	99
Transit Riders or Carpoolers (millions)	23	28	29	32	36	27
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	17,307	17,280	17,437	17,333	17,714	16,538
Rank	28	28	28	28	28	30
Fuel per Peak Traveler (gallons)	18	19	19	19	20	19
Rank	42	42	42	42	40	42
Annual Delay						
Total Delay (1000s of person-hours)	23,832	24,077	24,362	24,397	25,075	23,548
Rank	30	30	30	30	30	30
Delay per Peak Traveler (person-hours)	25	26	27	27	28	27
Rank	51	48	46	47	44	44
Delay due to Incidents (percent)	55	55	55	54	53	53
Travel Time Index	1.18	1.18	1.18	1.18	1.19	1.19
Rank	39	38	39	39	35	34
Congestion Cost						
Total Cost ($ millions)	514	496	479	450	444	405
Rank	30	30	30	29	29	29
Cost per Peak Traveler ($)	542	532	524	497	494	469
Rank	48	45	45	46	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 Cincinnati OH-KY-IN, Continued

Inventory Measures	2001	2000	1999	1998	1997
Urban Area Information					
Population (1000s)	1,540	1,500	1,470	1,425	1,390
Rank	26	26	27	27	27
Urban Area (square miles)	820	790	760	730	710
Population Density (persons/sq mile)	1,878	1,899	1,934	1,952	1,958
Peak Travelers (1000s)	833	798	769	732	702
Freeway					
Daily Vehicle-Miles of Travel (1000s)	16,200	16,000	15,500	15,195	14,930
Lane-Miles	1,080	1,030	1,000	975	960
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	11,000	10,700	10,300	10,000	9,640
Lane-Miles	2,450	2,400	2,350	2,300	2,245
Public Transportation					
Annual Psgr-Miles of Travel (millions)	176	170	161	171	154
Annual Unlinked Psgr Trips (millions)	30	30	30	33	30
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 ($/gallon)	1.30	1.55	1.14	1.11	1.13
System Performance	**2001**	**2000**	**1999**	**1998**	**1997**
Congested Travel (% of peak VMT)	51	53	53	53	50
Congested System (% of lane-miles)	40	40	39	39	38
Congested Time (number of "Rush Hours")	6.4	6.8	6.8	6.8	6.8
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	124	137	127	154	183
Transit Riders or Carpoolers (millions)	33	37	34	41	49
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	15,834	16,117	14,787	14,915	14,368
Rank	28	28	28	27	27
Fuel per Peak Traveler (gallons)	19	20	19	20	20
Rank	41	34	38	32	32
Annual Delay					
Total Delay (1000s of person-hours)	22,497	22,872	21,000	21,126	20,585
Rank	30	29	30	28	27
Delay per Peak Traveler (person-hours)	27	29	27	29	29
Rank	45	41	44	36	35
Delay due to Incidents (percent)	54	54	54	54	54
Travel Time Index	1.18	1.19	1.18	1.19	1.18
Rank	34	34	37	27	29
Congestion Cost					
Total Cost ($ millions)	381	384	329	323	313
Rank	30	28	29	28	27
Cost per Peak Traveler ($)	458	481	427	441	445
Rank	45	41	43	38	36

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 Cincinnati OH-KY-IN, Continued

Inventory Measures	1996	1995	1994	1993	1992
Urban Area Information					
Population (1000s)	1,350	1,300	1,255	1,250	1,220
Rank	27	28	28	28	28
Urban Area (square miles)	695	675	655	640	630
Population Density (persons/sq mile)	1,942	1,926	1,916	1,953	1,937
Peak Travelers (1000s)	671	634	602	590	566
Freeway					
Daily Vehicle-Miles of Travel (1000s)	13,870	13,425	13,415	12,560	11,610
Lane-Miles	945	945	945	935	910
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	9,020	8,510	7,990	7,485	7,015
Lane-Miles	2,205	2,150	2,110	2,050	1,990
Public Transportation					
Annual Psgr-Miles of Travel (millions)	139	144	133	148	162
Annual Unlinked Psgr Trips (millions)	30	28	29	30	32
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 ($/gallon)	1.28	1.12	1.08	1.09	1.11
System Performance	**1996**	**1995**	**1994**	**1993**	**1992**
Congested Travel (% of peak VMT)	47	46	46	43	40
Congested System (% of lane-miles)	38	42	42	42	42
Congested Time (number of "Rush Hours")	6.2	5.8	5.8	5.2	4.8
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	160	151	171	188	165
Transit Riders or Carpoolers (millions)	40	37	42	44	37
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	12,134	11,285	11,010	9,157	7,798
Rank	28	27	27	27	28
Fuel per Peak Traveler (gallons)	18	18	18	16	14
Rank	35	31	31	30	34
Annual Delay					
Total Delay (1000s of person-hours)	17,395	16,126	15,887	12,812	10,951
Rank	29	29	26	29	31
Delay per Peak Traveler (person-hours)	26	25	26	22	19
Rank	38	40	31	40	41
Delay due to Incidents (percent)	54	54	54	54	53
Travel Time Index	1.17	1.16	1.16	1.14	1.13
Rank	32	31	27	32	34
Congestion Cost					
Total Cost ($ millions)	261	232	222	174	145
Rank	28	28	26	28	32
Cost per Peak Traveler ($)	388	366	369	296	256
Rank	39	40	33	40	41

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 Cincinnati OH-KY-IN, Continued

Inventory Measures	1991	1990	1989	1988	1987
Urban Area Information					
Population (1000s)	1,200	1,140	1,140	1,130	1,130
Rank	28	30	30	29	28
Urban Area (square miles)	590	570	565	560	560
Population Density (persons/sq mile)	2,034	2,000	2,018	2,018	2,018
Peak Travelers (1000s)	547	511	506	497	493
Freeway					
Daily Vehicle-Miles of Travel (1000s)	11,360	11,260	10,800	9,750	9,415
Lane-Miles	890	870	860	840	835
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	6,525	6,025	5,490	5,010	4,700
Lane-Miles	1,945	1,895	1,850	1,810	1,755
Public Transportation					
Annual Psgr-Miles of Travel (millions)	150	170	144	135	151
Annual Unlinked Psgr Trips (millions)	33	35	31	28	33
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 ($/gallon)	1.13	1.06	1.08	1.00	1.00
System Performance	**1991**	**1990**	**1989**	**1988**	**1987**
Congested Travel (% of peak VMT)	38	37	32	26	23
Congested System (% of lane-miles)	38	37	32	30	30
Congested Time (number of "Rush Hours")	4.8	4.8	4.4	3.6	3.2
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	168	144	143	91	114
Transit Riders or Carpoolers (millions)	37	31	30	18	21
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	6,698	6,214	4,836	3,482	2,974
Rank	30	30	33	37	37
Fuel per Peak Traveler (gallons)	12	12	10	7	6
Rank	40	38	42	54	53
Annual Delay					
Total Delay (1000s of person-hours)	9,351	8,721	6,736	4,887	4,241
Rank	33	32	35	38	39
Delay per Peak Traveler (person-hours)	17	17	13	10	9
Rank	46	44	52	61	61
Delay due to Incidents (percent)	53	53	53	53	53
Travel Time Index	1.12	1.11	1.09	1.07	1.06
Rank	35	36	41	46	51
Congestion Cost					
Total Cost ($ millions)	121	108	79	55	46
Rank	32	32	35	38	38
Cost per Peak Traveler ($)	221	212	157	110	93
Rank	47	45	52	63	63

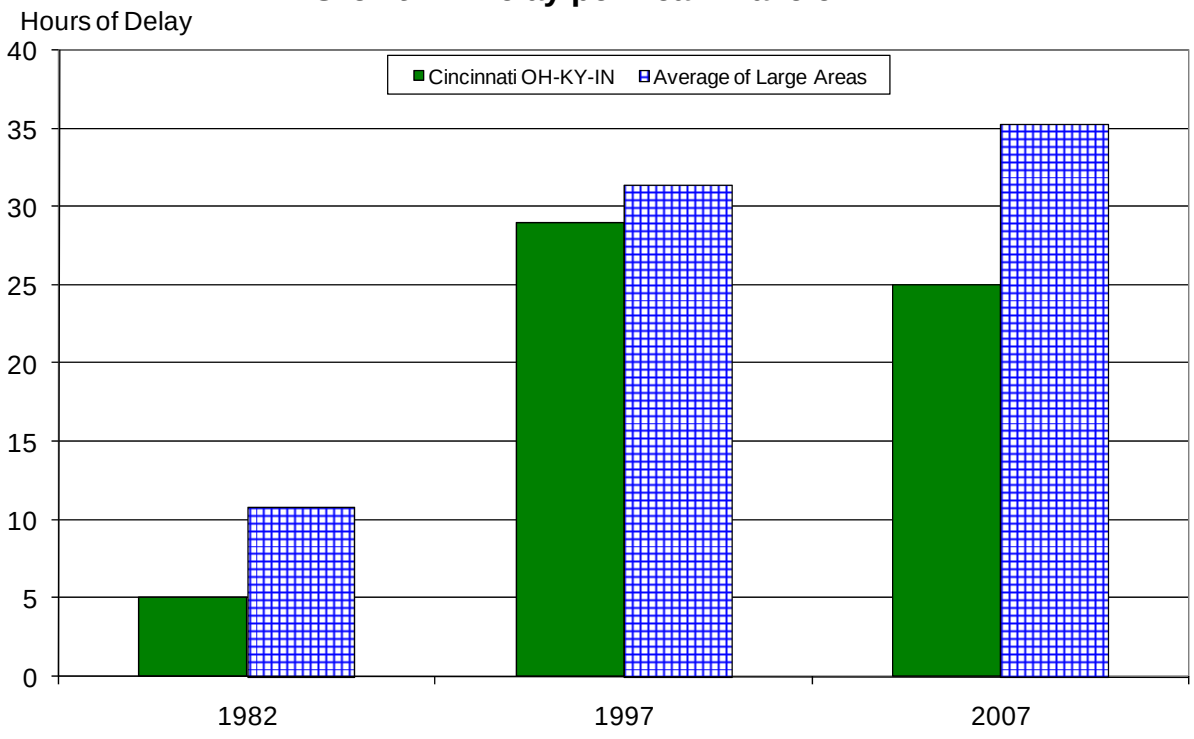
Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.
Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Cincinnati OH-KY-IN, Continued

Inventory Measures	1986	1985	1984	1983	1982
Urban Area Information					
Population (1000s)	1,130	1,130	1,130	1,130	1,130
Rank	28	27	27	25	25
Urban Area (square miles)	560	560	560	560	560
Population Density (persons/sq mile)	2,018	2,018	2,018	2,018	2,018
Peak Travelers (1000s)	488	484	479	475	471
Freeway					
Daily Vehicle-Miles of Travel (1000s)	8,775	8,840	8,255	8,310	7,460
Lane-Miles	815	815	815	810	780
Arterial Streets					
Daily Vehicle-Miles of Travel (1000s)	4,650	4,565	4,345	4,150	3,930
Lane-Miles	1,700	1,650	1,600	1,550	1,500
Public Transportation					
Annual Psgr-Miles of Travel (millions)	143	126	22	22	22
Annual Unlinked Psgr Trips (millions)	33	33	7	7	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 ($/gallon)	0.98	1.28	1.29	1.32	1.38
System Performance	**1986**	**1985**	**1984**	**1983**	**1982**
Congested Travel (% of peak VMT)	19	19	18	18	15
Congested System (% of lane-miles)	25	25	25	25	23
Congested Time (number of "Rush Hours")	3.0	3.0	2.9	2.9	2.7
Annual Increase Needed to Maintain Constant Congestion Level:					
Lane-miles	- -	- -	- -	- -	- -
Transit Riders or Carpoolers (millions)	- -	- -	- -	- -	- -
Annual Excess Fuel Consumed					
Total Fuel (1000 gallons)	2,330	2,472	2,072	1,916	1,431
Rank	40	38	39	38	38
Fuel per Peak Traveler (gallons)	5	5	4	4	3
Rank	61	57	58	55	58
Annual Delay					
Total Delay (1000s of person-hours)	3,386	3,583	3,031	2,790	2,189
Rank	42	40	40	39	39
Delay per Peak Traveler (person-hours)	7	7	6	6	5
Rank	64	61	63	59	62
Delay due to Incidents (percent)	52	52	52	52	52
Travel Time Index	1.05	1.06	1.05	1.05	1.04
Rank	55	46	47	44	50
Congestion Cost					
Total Cost ($ millions)	35	38	31	27	21
Rank	42	39	39	37	38
Cost per Peak Traveler ($)	72	78	65	58	44
Rank	66	60	64	62	67

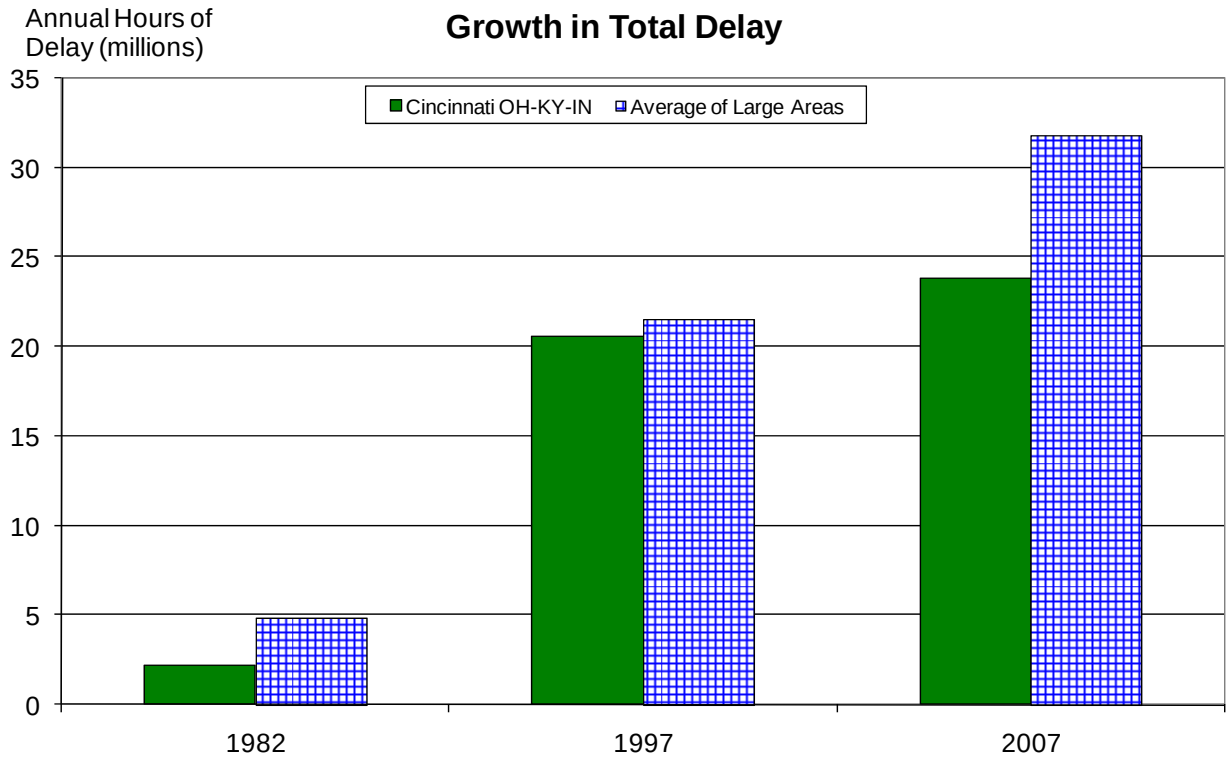
Note: System Performance statistics for 2000 through 2007 data reflect the effects of operational treatments.
Note: Zeroes in the table reflect values less than 0.5.

Growth in Delay per Peak Traveler



Note: Large areas have populations between 1 and 3 million

Growth in Total Delay



Note: Large areas have populations between 1 and 3 million

Benefits from Public Transportation Service and Operations Strategies in Cincinnati OH-KY-IN

Operations Strategies	2007	2006	2005	2004
Freeway Ramp Metering				
Percent of Roadway Miles	2	2	2	2
Annual Delay Reduction (1000 hours)	17	17	17	14
Freeway Incident Management				
Cameras				
Percent of Roadway Miles	48	48	50	51
Service Patrols				
Percent of Roadway Miles	42	42	44	44
Annual Delay Reduction (1000 hours)	568	579	609	555
Arterial Signal Coordination				
Percent of Roadway Miles	52	52	51	48
Annual Delay Reduction (1000 hours)	109	115	108	111
Arterial Access Management				
Percent of Roadway Miles	7	7	7	7
Annual Delay Reduction (1000 hours)	99	83	72	37
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	793	794	806	716
Annual Delay Saved per Peak Traveler (hours)	1	1	1	1
Annual Congestion Cost Savings ($million)	17.1	16.4	15.9	13.4
Travel Time Index with Strategies	1.176	1.177	1.181	1.183
Travel Time Index (Base)	1.181	1.182	1.186	1.188
Public Transportation Service	**2007**	**2006**	**2005**	**2004**
Existing Service				
Annual Passenger-miles of travel (million)	148	152	163	156
Unlinked Passenger Trips (million)	30	29	30	27
Travel Time Index (combined road and transit)	1.179	1.180	1.183	1.185
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.188	1.188	1.195	1.195
Annual Increase				
Delay (1000 hours)	1,328	1,244	1,619	1,354
Delay per Peak Traveler (hours)	1	1	2	1
Congestion Cost ($million)	28.4	25.4	31.6	24.9

Benefits from Public Transportation Service and Operations Strategies in Cincinnati OH-KY-IN, 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	46	49	50	52
Service Patrols				
Percent of Roadway Miles	45	48	49	51
Annual Delay Reduction (1000 hours)	545	547	552	567
Arterial Signal Coordination				
Percent of Roadway Miles	38	36	34	35
Annual Delay Reduction (1000 hours)	99	126	95	121
Arterial Access Management				
Percent of Roadway Miles	7	8	8	8
Annual Delay Reduction (1000 hours)	50	41	44	67
HOV Lanes				
Daily Passenger-miles of travel (1000s)	--	--	--	--
HOV User Delay Savings	--	--	--	--
Total Effect of Operations Treatments				
Annual Delay Reduction (1000 hours)	694	714	691	755
Annual Delay Saved per Peak Traveler (hours)	1	1	1	1
Annual Congestion Cost Savings ($million)	12.4	12.4	11.8	12.7
Travel Time Index with Strategies	1.189	1.187	1.185	1.192
Travel Time Index (Base)	1.193	1.192	1.190	1.198
Public Transportation Service	**2003**	**2002**	**2001**	**2000**
Existing Service				
Annual Passenger-miles of travel (million)	152	160	176	170
Unlinked Passenger Trips (million)	28	29	29	30
Travel Time Index (combined road and transit)	1.191	1.189	1.186	1.194
Condition if Public Transportation Service were Discontinued				
Travel Time Index	1.200	1.199	1.200	1.208
Annual Increase				
Delay (1000 hours)	1,407	1,454	1,773	1,779
Delay per Peak Traveler (hours)	2	2	2	2
Congestion Cost ($million)	24.9	25.0	30.0	29.7

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 2007	
				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+	0	F+
St. Louis, MO-IL	L-	L-	0	S-	S
Denver-Aurora, CO	H+	H+	H+	F	F+
Riverside-San Bernardino, CA	H+	H+	H+	F+	F+
Sacramento, CA	H	H+	H	0	F+
Pittsburgh, PA	L-	L-	L-	S-	S-
Portland, OR-WA	0	H	0	0	F
Cleveland, OH	L-	L-	L-	S-	S-
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-
San Antonio, TX	H	0	0	F+	F
Las Vegas, NV	H+	H	0	F+	F+
Orlando, FL	H+	H	H	F+	F+
Providence, RI-MA	L	L	L	0	S-
Columbus, OH	L	L	L	0	S-
Buffalo, NY	L-	L-	L-	S-	S-
New Orleans, LA	L-	L	L-	S-	S-
Charlotte, NC-SC	H	0	L	F	S-
Indianapolis, IN	H	0	L	S	S-
Jacksonville, FL	H	0	L	0	S-
Austin, TX	H	H	L	F	S-
Memphis, TN-MS-AR	L-	L-	L-	S	S-
Raleigh-Durham, NC	0	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

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