Appendix J

Summary of Benefit Cost/Calculations

Twin Cities Ramp Meter Study

Benefit Estimation

	Daily Change		Value		Daily Benefit	Annual Change		Annual Benefit
Travel Time								
Change in Freeway Travel Time (person hours)	30,550	$	9.85	$	300,922	7,545,965	$	74,327,759
Change in Ramp Travel Time (person hours)	(30,449)	$	9.85	$	(299,920)	(7,520,844)	$	(74,080,315)
Subtotal	*101.7*			*$*	*1,002*	*25,121.2*	*$*	*247,443*
Travel Time Reliability								
Change in Freeway Travel Time Reliability (person hours)	33,089	$	9.85	$	325,923	8,172,895	$	80,503,016
Change in Ramp Travel Time Reliability (person hours)	(22,628)	$	9.85	$	(222,889)	(5,589,201)	$	(55,053,626)
Subtotal	*10,460.3*			*$*	*103,034*	*2,583,694.5*	*$*	*25,449,390*
Safety								
Fatality Crashes	0.0228	$	1,176,584.23	$	26,834	5.6333	$	6,628,064
Injury Crashes								
Severe	0.1210	$	57,287.50	$	6,930	29.8777	$	1,711,617
Moderate	0.4888	$	21,711.76	$	10,612	120.7214	$	2,621,075
Minor	0.7423	$	13,471.42	$	10,000	183.3433	$	2,469,895
Property Damage Crashes	2.8424	$	6,789.87	$	19,300	702.0742	$	4,766,992
Subtotal	*4.2172*			*$*	*73,675*	*1041.6499*	*$*	*18,197,643*
Emissions								
Hydrocarbon (tons)	0.43	$	1,774.00	$	754	104.99	$	186,247
Carbon Monoxide (tons)	4.91	$	3,731.00	$	18,329	1213.41	$	4,527,229
Nitrous Oxide (tons)	(0.64)	$	3,889.00	$	(2,480)	(157.48)	$	(612,442)
Subtotal	*4.70*			*$*	*16,603*	*1160.92*	*$*	*4,101,034*
Energy								
Fuel Use (gallons)	(22,246.3)	$	1.45	$	(32,257)	(5,494,829)	$	(7,967,502)
Subtotal				*$*	*(32,257)*	*(5,494,829)*	*$*	*(7,967,502)*
DAILY TOTAL				$	162,057			
Number of Metering Days Per Year					247			
TOTAL ANNUAL BENEFIT								**40,028,008**

Mn/DOT Ramp Metering Study

Cost Estimation

Capital Costs

Congestion Management Subsystems	# of System Components	System Capital Cost	Annual Captial Cost	% Attributable to Metering	Annual Metering Cost
Ramp Meters	431	$ 4,183,019	$ 356,597	100%	**$ 356,597**
System Detection	3500	$ 13,072,500	$ 1,762,417	15%	**$ 264,363**
CCTV Surveillance	229	$ 21,073,015	$ 1,669,764	0%	**$ -**
Traffic Management Center	1	$ 24,943,438	$ 1,247,172	10%	**$ 124,717**
Subtotal		*$ 63,271,972*	*$ 5,035,950*		***$ 745,677***
HOV Bypass Ramps*	73	$ 21,900,000	$ 730,000	100%	**$ 730,000**
TOTAL			**$ 5,765,950**		**$ 1,475,677**

* HOV bypass ramps are a transit initiative and are not generally considered part of the congestion management system.

Total Costs

	Cost Item	All Congestion Management Capabilities	Amount Related to Ramp Metering
	CMS Operation Costs	$ 893,836	$ 431,879
	CMS Maintenance Costs	$ 967,489	$ 464,395
	Additional Research	$ 250,000	$ 250,000
	Subtotal	***$ 2,111,325***	***$ 1,146,274***
+	Annual Capital Costs	$ 5,765,950	$ 1,475,677
	TOTAL	**$ 7,877,275**	**$ 2,621,950**

Twin Cities Ramp Meter Study

Benefit/Cost Comparison

Benefit/Cost Comparison

	All Congestion Management Costs	Ramp Metering Only Costs
Cost Item		
Annual Capital Cost	$ 5,765,950	$ 1,475,677
Annual O&M Costs	$ 2,111,325	$ 1,146,274
TOTAL ANNUAL COST	*$ 7,877,275*	*$ 2,621,950*
TOTAL ANNUAL BENEFIT	*$ 40,028,008*	*$ 40,028,008*
Comparison		
Net Annual Benefit	**$ 32,150,734**	**$ 37,406,058**
Benefit/Cost Ratio	**5.1**	**15.3**