

## APPENDIX A: POTENTIAL EFFECTIVENESS OF TRANSPORTATION MEASURES

**Table 7-1. Potential Effectiveness Of Transportation Control Measures**

<u>Control Measure</u>	<u>Emission Reduction Potential</u>	<u>Rate of Reduction</u>
<u>Land Use Management</u>		
Job/Housing Balance	Low	Slow
Densification	Medium	Slow
Mixed Use	High	Slow
Growth Controls	High	Slow
Pedestrian Improvements	Low	Slow
<u>Traffic Flow Improvements</u>		
Traffic Signal Improvements	Low – Medium	Fast
Capacity Increases	Low	Slow
<u>Transit Improvements</u>		
Service Increases	Low	Fast
Employee Transit Pass Subsidy	Low	Fast
Park-and-Ride Lots	Low	Fast
High Occupancy Vehicle Lanes	Low	Slow
<u>Bicycle Improvements</u>		
Bicycle Improvements	Low	Fast / Slow
<u>Demand Management</u>		
Trip Reduction Ordinances	High	Fast
Ridesharing	Medium	Fast
Parking Management	Medium	Fast
Telecommuting	High	Slow
<u>Alternative Work Schedules</u>		
Flexible Work Hours	Low	Fast
Staggered Work Hours	Low	Fast
Compressed Work Week	Low	Fast
<u>Pricing</u>		
Gas Tax	High	Fast
VMT Tax	High	Fast
<u>Freeway Management</u>		
Motorist Information	Low	Fast
Incident Management & Response	Low	Fast
<u>Goods Movement</u>		
Delivery Timing	Low	Fast
Loading Facility Improvements	Low	Fast

## APPENDIX B: TDM SOLUTIONS

**Table 2. TDM Solutions**

Strategy	Area Suitability	SOV Reduction	Peak Trip Reduction	VMT Reduction	Transit Impact	Employee Cost	Employer Cost	Public Capital Cost	Employee	Employer	Municipal	Political	Ease of Implementation Index
Alternate Work Schedules													
Staggered	U , S	none	high	none	none	same	higher	none	high	low	high	high	3
Flex -time	U , S	negative	high	negative	negative	same	higher	none	high	low	high	high	4
4 Day week	U , S	medium	medium	high	high-neg	lower	unknown	none	medium	low	high	medium	3
Telecommuting	U , S	positive	positive	positive	high-neg	lower	unknown	none	unknown	unknown	high	medium	unknown
Carpools	S	high	medium	medium	negative	lower	varies	none	low	medium	high	high	3
Vanpools	S	medium	low	low	negative	lower	higher	none	low	low	high	high	2
Subscription Buses	S	low	low	low	positive	lower	higher	none	low	low	high	medium	2
Parking Management													
Preferential parking	S	low	low	low	none	same	higher	none	low	low	high	high	2
Parking pricing	U , S	medium	medium	medium	low	higher	same	none	negative	low	negative	negative	1
Parking ratios	U / S	medium	medium	medium	positive	same	lower	none	negative	unknown	negative	negative	2
Park - riders	U , S	medium	medium	medium	positive	varies	n/a	higher	medium	medium	varies	varies	4
Preferential HOV Lanes	U , S	medium	medium	medium	positive	same	n/a	higher	varies	varies	high	varies	4
Congestion Pricing	U , S	medium	high	medium	positive	varies	n/a	lower	low	low	unknown	negative	unknown
Transit													
Transachek	U , S	medium	medium	medium	medium	lower	same	none	high	medium	high	high	5
Employer sponsored	U , S	low	low	low	low	varies	higher	none	medium	low	high	high	4
Employer subsidized	U , S	low	low	low	low	varies	higher	none	medium	low	high	high	5
Land Use - Zoning													
Higher densities	S	medium	medium	high	high	n/a	varies	lower	n/a	n/a	negative	negative	2
Transit-friendly design	S	medium	medium	medium	medium	same	same	lower	medium	low	varies	positive	4
Mixed use development	S	unknown	unknown	medium	unknown	lower	unknown	lower	unknown	unknown	varies	positive	4
Growth Management	S	unknown	unknown	unknown	unknown	same	unknown	lower	unknown	unknown	varies	varies	3
Trip Reduction Ordinances	S	high	high	high	low/med	varies	higher	n/a	low	negative	varies	varies	4
Transp. Mangmnt. Assoc.	U , S	varies	varies	varies	unknown	same	higher	n/a	n/a	varies	n/a	positive	n/a

Suitability Index: U – urban areas; S – suburban areas; n/a – not applicable

Ease of Implementation Index: 1 (difficult) to 5 (easy); n/a – not applicable

## APPENDIX E: ASSESSMENT OF TRAVEL REDUCTION OPTIONS

**Table 1. Assessment of Travel Reduction Options**

Options	<i>Effectiveness in Reducing</i>							Implementation Problems and Requirements
	<i>1 Vehicle miles</i>	<i>2 Energy conser- vation</i>	<i>3 Environ- mental impacts</i>	<i>4 Parking regula- tions</i>	<i>5 User Costs</i>	<i>6 Overall Costs</i>	<i>Potential Applica- bility</i>	
Rides haring								
Carpooling	M	M	L	M	L	L	H	Promotion & matching program desirable
Vanpooling	H	H	M	H	L	L	M	Government or employer information & incentives
Susbidization	M	M	M	M	L	L	L	Program funding more difficult than preferential treatment
Trip Chaining								
Chaining shopping trips	M	M	L	L	M	H	M	Education, land use planning, activity scheduling
Combining shopping / other trips	M	M	L	L	M	H	M	Education, land use planning, activity scheduling
Public Transportation								
Fixed route service (bus, rail, etc)	H	H	M	H	L	L	H	Adequate route density & frequency require substantial subsidies
Taxi	L	L	L	H	L	M	M	Reduced barriers to entry in taxi business
Subscription services	H	H	M	H	L	M	M	Transit management practices
Dial-a-ride	M	M	L	M	L	L	M	Employer initiatives, good management, adequate demand density, vehicle operating cost
Car rental	L	L	L	L	L	L	L	Vehicle redistribution, vandalism
Activities Scheduling								
Staggered work hours	L	L	L	L	M	M	M	Possible government intervention
Flexible work hours	L	L	L	L	M	L	M	May sometimes reduce ridesharing
More part-time jobs	L	L	L	L	L	L	L	More management
Extended workdays for service firms	L	L	L	M	M	M	M	Cost of overtime or extra shifts
Restricting peak period freight deliveries	L	L	M	L	L	L	L	Cost of overtime or night pay
Home deliveries & pick-ups	H	M	L	H	H	M	M	Demand density, willingness to pay extra cost based on trip savings
Parking Controls								
Higher parking prices	M	M	L	M	L	M	H	Easier for private sector
Restricted supply of parking	M	M	L	M	L	L	M	Political difficulty, risk to downtown stores
Reduced accessibility of parking	M	M	L	M	L	L	M	Political difficulty, risk to downtown stores
Park & ride facilities at transit Station	M	M	L	L	M	M	M	Shift parking requirements to outlying areas
Fringe parking & transit shuttles	M	H	L	M	L	M	M	Find parking lots & fund transit services

Table 1, cont'd

Options	<i>Effectiveness in Reducing</i>						<i>Potential Applica- bility</i>	Implementation Problems and Requirements
	<i>1 Vehicle miles</i>	<i>2 Energy conser- vation</i>	<i>3 Environ- mental impacts</i>	<i>4 Parking regula- tions</i>	<i>5 User Costs</i>	<i>6 Overall Costs</i>		
Parking Controls, cont'd								
Rate and/or accessibility differential for:								
a) long & short-term parking	L	L	L	M	L	M	M	Enforcement
b) peak, off peak, & night periods	M	M	L	L	L	M	M	Inflexible street meters
c) higher occupancy vehicles	M	M	L	M	L	L	M	Larger lots, enforcement
d) smaller vehicles	L	M	L	L	L	L	M	Larger lots, enforcement
Roadspace Allocation								
Exclusive lanes for buses	M	M	L	H	L	L	L	Corridor with sufficient bus demand
Exclusive lanes for HOVs	L	L	L	M	L	M	M	Enforcement, sufficient HOV demand
Contraflow lanes for buses	M	M	L	H	L	L	L	Directional imbalance in volumes
Contraflow lanes for HOVs	L	L	L	M	M	L	L	Safety problems for cars
Reversible lanes for mixed traffic	L	L	L	L	M	M	H	Doubtful reduction in vehicle miles traveled
Bicycle lanes (on existing roads)	M	M	M	M	L	L	M	Weather, safety, and user acceptance problems
Wider sidewalks (on existing roads)	M	M	H	M	L	L	M	Doubtful net benefits
Pedestrian malls	L	L	M	L	L	L	L	Vehicles & impacts shifted elsewhere
On-street parking restrictions	L	L	L	L	L	L	M	Depend largely on volumes & other local conditions
On-street truck loading restrictions	L	L	L	L	L	L	L	Enforcement problems, higher costs to shippers
Auto-free zones	M	M	H	M	L	L	M	Limited experience
Barriers on local streets	L	L	M	L	L	L	M	Doubtful net benefits, political antagonism
Preferential Treatment for HOVs								
Bypass lanes at metered ramps	L	L	L	L	M	M	L	Cost & availability of extra lanes
Signal pre-emption by buses	L	L	L	L	M	M	L	Difficulty in coordinating signal systems
Auto Disincentives								
Road tolls	M	M	L	M	H	H	M	Toll collection technology
Fuel taxes	M	M	L	M	M	M	H	Political acceptability
Registration & excise taxes	L	L	L	L	L	L	H	Current levels are insignificant
Speed limits	L	M	L	L	M	L	H	Doubtful net benefits
Land-Use Planning to Achieve More Compact Cities								
Mix commercial, office, & residential use	M	M	M	L	H	M	M	Difficult even in long term for transportation professionals; not a short term option

Table 1, cont'd

Options	<i>Effectiveness in Reducing</i>						<i>Potential Applica- bility</i>	Implementation Problems and Requirements
	<i>1 Vehicle miles</i>	<i>2 Energy conser- vation</i>	<i>3 Environ- mental impacts</i>	<i>4 Parking regula- tions</i>	<i>5 User Costs</i>	<i>6 Overall Costs</i>		
Land-Use Planning...cont'd								
Encourage bicycle and walk trips	H	H	M	H	L	L	M	May require unpopular decisions on roadspace allocation, parking restriction
Improved Telecommunications								
Shopping from home	H	H	L	H	H	H	H	Potential increases with advances in technology
Teleconferencing	H	H	M	M	H	H	M	Potential increases with advances in technology
Decentralization of major employees	H	H	M	H	M	M	M	Potential increases with advances in technology
More work at home	H	H	M	H	H	M	L	Conceivable for many desk workers but productivity may suffer
Diversified education services on Cable TV	H	H	M	H	H	H	M	Potential increases with advances in technology



## APPENDIX F: IMPACTS OF TCMS ON VMT AND EMISSIONS

**Table 1. (A). Impacts of Selected Individual Transportation Control Measures on Vehicle Kilometers of Travel and Emissions**

Control Measure	Percentage Reduction			Reference
	Vehicle Kilometers of Travel <sup>a</sup>	Emissions	Area	
<b>Inspection &amp; Maintenance</b>		8.1 – HC <sup>b</sup>	Washington	5
		4.7 – HC <sup>b</sup>	Baltimore	6
		6.4 – 8-h CO		
		6 – CO	Urban area in New York	7
		1 – HC		
<b>Improved transit service</b>				
10 percent increase in bus service	0.02		Albany	7
10 percent (\$0.05) decrease in fares	0.22		Albany	7
\$0.10 decrease in fares	0.70 <sup>b</sup>	0.3 – HC <sup>b</sup>	Baltimore	5
Increased frequency of service to CBD	0.1		Washington	8
Express bus service to CBD combined with increased frequency	0.3		Washington	8
Increased frequency of service and extended coverage	1.1-2.2		San Diego	9
<b>HOV preferential lanes</b>	2.5 <sup>c</sup>		Albany	7
HOV lane on freeway	0.2 <sup>b</sup>	0.1 – HC <sup>b</sup>	Baltimore	6
	0.6		Washington	8
<b>Carpool or Vanpool</b>				
Major employer-based carpool or vanpool program	1.5	1.3 – HC	>500,000 population.	4
		1.3 – CO		
Carpool matching and promotion	0.4		Washington	8
Carpool cost subsidy				
\$0.016/passenger kilometer	0.3		Washington	8
\$0.031/passenger kilometer	0.7			
Vanpooling	1.2		Washington	8
Carpool locator	0.4 <sup>b</sup>	0.2 – HC <sup>b</sup>	Baltimore	6
Major employer matching	1.0		Chicago	10
Meet and ride program	1.0		Chicago	11
Major employer matching	1.2		Numerous areas	11, 12
Area wide programs	0.12		Numerous areas	11, 12
<b>Automobile-restricted zones</b>				
Automobile-restricted zone	0.4		Washington	8
One-day -a-week driving ban	8.8		Washington	8
<b>Parking management</b>				
\$1.00 parking surcharge	0.8 <sup>b</sup>	0.3 – 8-h CO	Baltimore	6
		0.3 – HC <sup>b</sup>		
\$2.00 parking surcharge	1.5 <sup>b</sup>	0.7 – 8-h CO	Baltimore	6
		0.8 – HC <sup>b</sup>		
Outlying parking cost	4.8 <sup>b</sup>	1.5 – 8-h CO	Baltimore	6
		2.7 – HC <sup>b</sup>		
Preferential parking for carpools	0.6		Washington	8
Areawide parking cost increase				
\$1.00	0.8		Washington	8
\$2.00	1.7		Washington	8
\$3.00	2.5		Washington	8
CBD parking cost increase				
\$1.00	0.3		Washington	8
\$2.00	0.6		Washington	8
\$3.00	0.9		Washington	8
Reduced parking supply in CBD	0.5		Washington	8

**Table 1, (B). Impacts of Selected Individual Transportation Control Measures  
on Vehicle Kilometers of Travel and Emissions**

Control Measure	Percentage Reduction			Reference
	Vehicle Kilometers of Travel <sup>a</sup>	Emissions	Area	
<b>Parking management, cont'd</b>				
Increased parking costs in seven high-density areas				
Commercial rates	14-subareas		Washington	13
Commercial rates, \$1.00	29-subareas		Washington	13
Commercial rates, \$2.00	30-subareas		Washington	13
<b>Park and ride lots, and fringe parking</b>				
Six park-and-ride lots	0.8 <sup>c</sup>		Syracuse	7
Six peripheral park-and-ride lots	0.5 <sup>c</sup>		Syracuse	7
Pedestrian malls	0.3 – region <sup>c</sup> + 1.9 – CBD <sup>c</sup>		Syracuse Syracuse	7 7
<b>Staggered work hours</b>				
Flexible working hours	3.7 <sup>b</sup> 4.0 <sup>b</sup>	2.0 – HC <sup>b</sup>	Baltimore Washington	6 5
<b>Pricing strategies</b>				
Increase gasoline prices \$0.05 / L	1.5 <sup>b</sup>		Baltimore	6
Double gasoline prices	5.1		Washington	8
Triple gasoline prices	9.7			
Quadruple gasoline prices	13.6			
Tolls for single-occupancy automobiles to CBD				
\$0.50	0.2		Washington	8
\$1.00	0.4			
Vehicle ownership tax				
\$100 / vehicle	0.1		Washington	8
\$200 / vehicle	0.2			
\$400 / vehicle	0.4			
Carpool tax rebates				
\$250 / year	0.05		Washington	8
\$500 / year	0.1			
<b>Idling controls</b>				
		3.4 – CO 1.5 – HC	Upstate New York	7
<b>Traffic flow improvements</b>				
Preferential traffic control	0.1	1 – HC <sup>b</sup>	Washington	8
Progressive signalization to increase speeds by 1 percent		1 – 8-h CO	Washington	5
<b>Retrofits</b>				
Light-duty vehicle		9.3 – 8-h CO 3.2 – HC <sup>b</sup>	Baltimore	6
Light-duty trucks		0.3 – 8-h CO 0.2 – 8-h HC		
Heavy-duty gasoline-powered trucks		6.3 – 8-h CO 1.6 – HC <sup>b</sup>		

Notes: 1 km = 0.62 mile; 1 L = 0.26 gal.

<sup>a</sup> Percentages apply to weekday areawide vehicle kilometers of travel, except where noted.

<sup>b</sup> Peak period.

<sup>c</sup> Peak hour.



**Table 2. Summary of Estimated Impacts of the Localized Prototype Scenarios**

Prototype Scenario	Impact on Morning Peak-Hour Corridor Vehicle Volume <sup>a</sup>		Impact on Morning Peak-Hour CO Concentration at Reference Receptor, from Affected Facility Emissions ( $\mu\text{g}/\text{m}^3$ ) <sup>b</sup>				Program Costs <sup>c</sup> (\$000s)	
	Base Peak-Hour Volume	Change %	Typical, Good Dispersion <sup>d</sup>		Typical, Poor Dispersion <sup>d</sup>		Capital (One-time Implementation) <sup>e</sup>	Operating per Year <sup>f</sup>
			Base Value	Change %	Base Value	Change %		
1. Expanded express bus service in mixed freeway traffic; favorable impacts	19 667	-1.47	5756	- 2.4	8210	- 2.5	3168-4788	1447
2. Freeway lane reserved for buses and carpools, favorable impacts	19 667	- 6.30	5756	- 11.4	8210	- 9.3	3720-5350	1839
3. Ramp metering and bus bypass lanes; favorable impacts	19 667	- 3.06	5756	- 6.7	8210	- 6.5	5224-6844	1703
4. Reserved bus and pool lane, ramp metering, and bus bypass lanes; modest impacts	19 667	- 3.97 <sup>c</sup>	5756	- 9	8210	- 9	4862-6482	1751
5. Reserved bus and pool lane, ramp metering, and bus bypass lanes; favorable impacts	19 667	- 6.98	5756	- 8.7	8210	- 10.1	6248-7868	2266
6. Contraflow freeway lane reserved for buses; favorable impacts	14 750	- 1.69	4798	+ 4.7	6759	+ 3.4	962	541
7. Contraflow bus lane, expanded express bus service, and park-and-ride lots; favorable impacts	14 750	- 3.72	4798	+ 2.3	6759	+ 1.5	3668-5288	1818
8. Contraflow bus lane, expanded express bus service, and lots, assuming 70% -80% directional split; favorable impacts	13 500	- 4.07	4066		5748	-2.7	3668-5288	1818
9. Reserved arterial median lane for express buses; favorable impacts	3 750	- 15.47	4964	-15.7	6485	- 15.3	3594-4134	1130
10. Contraflow curb lane for local buses on pair of one-way arterials; favorable impacts	5 000	- 4.40	3992 <sup>h</sup>	- 13.3 <sup>h</sup>	4992 <sup>h</sup>	- 13.7 <sup>h</sup>	468	123
			3349 <sup>i</sup>	+ 10.9 <sup>i</sup>	4793 <sup>i</sup>	+ 9.9 <sup>i</sup>		

Note: 1  $\mu\text{g}/\text{m}^3$  CO = 870 ppm

<sup>a</sup>. Volume is for freeway or arterial segments approximately 0.6 km (1 mile) out from the CBD (adjacent to the CBD in the case of scenario 10).

<sup>b</sup>. CO concentration 15 m (50 ft) from downwind edge of primary corridor facility, based on vehicular emissions from affected facilities only. Uninterrupted traffic flow conditions are also assumed.

<sup>c</sup>. Costs are in 1976 dollars.

<sup>d</sup>. This value includes the vehicles originally using the corridor freeway, but estimated as being unable to pass through during peak hour because of flow breakdown caused by congestion.

<sup>e</sup>. The two capital cost entries represent the range in costs depending on whether existing parking facilities (e.g., shopping center) or newly constructed facilities are required for park-and-ride lots.

<sup>f</sup>. Represents incremental operating costs.

<sup>g</sup>. CO concentration impacts for scenario 4 could not be reliably estimated.

<sup>h</sup>. Inbound arterial

<sup>i</sup>. Outbound arterial

**Table 3. Summary of Estimated Impacts of the Regional Prototype Scenarios**

Prototype Scenario <sup>a</sup>	Change to Regional Weekday Vehicle Kilometers of Travel	Change to Regional Weekday Highway Emissions	Change to Annual Highway Fuel Consumption	Program Costs <sup>b</sup> ( \$ 000,000s )			
	Percentage of Total	Percentage of Work Trip	HC (%)	CO (%)	( L000 000's )	Capital (One-time Implementation)	Incremental Operating per Year
11. Carpool or vanpool program, medium-sized city, favorable impacts	- 1.5	- 5.0	- 1.2	- 1.3	- 9.8	-	76
12. Carpool or vanpool program, large-sized city, favorable impacts	- 1.5	- 5.0	- 1.4	- 1.3	- 43.9	-	404
13. Reserved bus and pool lanes, ramp metering, and bus bypass lanes on all appropriate freeways; modest impacts	- 0.25	- 0.8	- 0.1	+ 0.1	+ 5.7	14,586-19,446	5253
14. Reserved bus and pool lane, ramp metering, and bus bypass lanes on all appropriate freeways; favorable impacts	- 0.44	- 1.5	- 0.4	- 0.4	- 10.2	18,744-23,604	6798
15. Reserved median lane for express buses on appropriate arterials; modest impacts	- 0.23	- 0.8	+ 0.4	+ 0.8	- 6.1	18,868-21,704	5984
16. Reserved median lane for express buses on appropriate arterials; favorable impacts	- 0.38	- 1.3	- 0.1	+ 0.2	- 11.0	18,868-21,704	5984
17. Carpool or vanpool program and freeway reserved lanes; modest impacts	- 1.0	- 3.3	- 0.4	- 0.6	- 27.3	9,804-14,664	5408
18. Carpool or vanpool program and freeway reserved lanes; favorable impacts	- 1.9	- 6.3	- 1.8	- 1.7	- 53.4	11,190-16,050	5921
19. Carpool or vanpool program and freeway reserved lanes, ramp metering, and bus bypass lanes; modest impacts	- 1.0	- 3.3	- 0.8	- 0.6	- 27.6	14,586-19,446	5957
20. Carpool or vanpool program and freeway reserved lanes, ramp metering, and bus bypass lanes; favorable impacts	- 1.9	- 6.5	- 0.8	- 1.8	- 53.8	18,744-23,604	7202

Note: 1 L = 0.26 gal.

<sup>a</sup>. All scenarios except 11 are for a large-sized city 1 000 000 + standard metropolitan statistical area (SMSA) population. Scenario 11 is set in a medium-sized city (500 000 – 1 000 000 SMSA population).

<sup>b</sup>. Costs are in 1976 dollars.

## APPENDIX I: CHARACTERISTICS OF EMPLOYER TDM PROGRAMS

**Table 3.2-3. Characteristics of Employer TDM Programs**

Program	Vehicle Trip Reduction	Travel Base	Type Area <sup>1</sup>	Employer Support Level			Employee Modal Split <sup>2</sup>			
				<i>Transit</i>	<i>Carpool</i>	<i>Vanpool</i>	<i>SOV</i>	<i>Transit</i>	<i>Carpool</i>	<i>Vanpool</i>
Travelers	47.9%	10,000	CBD	Hugh	High	High	33%	36%	19%	8%
US West	47.1	1,150	SBD	Low	High	None	26	13	60	--
NRC	41.6	1,400	ISI	Medium	Medium	None	42	28	27	--
GEICO	38.6	2,500	SBD	High	High	High	40	31	20	8
CH <sub>2</sub> M Hill	31.2	400	SBD	High	High	None	54	17	12	--
State Farm	30.4	980	SBP	None	High	Medium	66	--	31	2
Pacific Bell	27.8	6,900	SBP	High	High	Medium	63	2	22	11
Hartford Steam Boiler	26.5	1,100	CBD	High	High	High	40	36	21	1
Swedish Hospital	26.1	2,500	ISI	High	Medium	Medium	33	44	23	--
Bellevue City Hall	25.8	600	ISI	Medium	High	Medium	52	7	29	4
San Diego Trust & Savings	22.7	500	CBD	High	Medium	None	44	37	14	--
Pasadena City Hall	21.0	350	SBD	High	High	High	58	7	27	2
TransAmerica	20.0	2,700	CBD	Medium	Medium	High	45	14	21	19
ARCO	19.1	2,000	CBD	Medium	High	High	46	20	20	14
Varian	17.7	3,200	SBP	Medium	Low	Low	62	8	21	3
AT&T	13.4	3,890	SBP	Low	Medium	Medium	71	2	22	3
Ventura County	13.0	1,850	OSI	Medium	Medium	None	69	2	23	--
COMSIS	10.5	250	SBD	Medium	Medium	None	54	18	25	--
3M	9.7	12,700	OSI	Low	Low	High	83	2	14	8
Allergan	7.0	1,250	SBP	Medium	Medium	High	76	1	14	7
UCLA	5.5	18,000	ISI	High	Low	High	74	6	10	5
Chevron	3.7	2,300	SBP	High	Medium	High	82	1	11	5

<sup>1</sup> Key: CBD = Central Business District  
OSI = Outer Suburb, Isolated

SBD = Suburban Business District  
SBP = Suburban Business Park

ISI = Inner Suburb, Isolated

<sup>2</sup> May not sum to 100% because of walk, bike, or other.

Table 3.2-3, cont'd

Program	Vehicle Trip Reduction	Preferential Reserved Parking	Restricted Parking	Parking Charges	Employer Support Level			Legal Requirement
					<i>Transit</i>	<u>Carpool</u>	<i>Vanpool</i>	
Travelers	47.9%	Yes	Yes	Yes	Yes	Yes	Yes	No
US West	47.1	Yes	Yes	Yes	No	Yes	Yes	Yes
NRC	41.6	Yes	Yes	Yes	Yes	No	No	Yes
GEICO	38.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CH <sub>2</sub> M Hill	31.2	No	Yes	Yes	Yes	Yes	Yes	Yes
State Farm	30.4	No	No	No	No	Yes	Yes	Yes
Pacific Bell	27.8	Yes	Yes	No	No	No	No	Yes
Hartford Steam Boiler	26.5	No	Yes	Yes	Yes	Yes	Yes	No
Swedish Hospital	26.1	No	Yes	Yes	Yes	Yes	Yes	Yes
Bellevue City Hall	25.8	Yes	Yes	Yes	Yes	Yes	Yes	No
San Diego Trust & Savings	22.7	No	Yes	Yes	Yes	Yes	Yes	Yes
Pasadena City Hall	21.0	No	Yes	Yes	Yes	Yes	Yes	Yes
TransAmerica	20.0	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ARCO	19.1	No	Yes	Yes	Yes	Yes	Yes	Yes
Varian	17.7	No	Yes	No	Yes	Yes	Yes	Yes
AT&T	13.4	Yes	Yes	No	No	No	No	Yes
Ventura County	13.0	No	No	No	Yes	Yes	Yes	Yes
COMSIS	10.5	No	Yes	Yes	Yes	Yes	Yes	Yes
3M	9.7	No	No	No	No	No	No	No
Allergan	7.0	Yes	No	No	Yes	No	No	Yes
UCLA	5.5	No	Yes	Yes	No	No	No	Yes
Chevron	3.7	Yes	No	No	No	No	No	Yes

## APPENDIX J: POTENTIAL IMPACTS OF CONGESTION MANAGEMENT MEASURES

**Table II.3. Potential Impacts (Objective) of Demand-side Congestion Management Measures**

Types	Strategy Class	Measures	Impacts							
			<i>Reduce Need to Make Trip</i>	<i>Reduce Length of Trip</i>	<i>Promote Non- motorized Transport</i>	<i>Promote Public Transport</i>	<i>Promote Carpooling</i>	<i>Shift Peak Hour Travel</i>	<i>Shift Trips Away from Congested Locations</i>	<i>Reduce Traffic Traveler Delays</i>
D E M A N D  -  S I D E	Land Use & Zoning	Land Use & Zoning Policy	X	XX	XX	XX	X	X	X	X
		Site Amenities & Design	XX	XX	XX	XX	XX	X		X
	Tele- Communications Substitutes	Telecommuting	XX	XX	X	X			X	X
		Tele-conferencing	XX	XX						
		Tele-shopping	XX	X						
	Traveler Info Services	Pre-trip Travel Info	X	X	X	XX	XX	XX	XX	X
		Regional Rideshare Matching	XX			XX	XX	X	X	X
	Economic Measures	Congestion Pricing	X	X	X	XX	XX	XX	XX	XX
		Parking Pricing	X	X	X	XX	XX	XX	XX	X
		Transportation Allowances			X	XX	XX	X		X
		Transit & Rideshare Financial Incentives				XX	XX	X		X
		Public Transport Pass Program				XX		X		X
		Innovative Financing				XX	XX			X
	Administrative Measures	Transportation Partnerships			X	XX	XX	X	X	X
		Trip Reduction Ordinances / Regulations	XX		X	XX	XX	X	X	XX
		Alternative Work Schedules	X			XX	XX	XX		X
		Auto Restricted Zone	XX		XX	XX			XX	
		Parking Management	X		X	XX	XX	X	X	X

Note: XX – Significant Impact

X – Some Impact

(Blank) – No Impact

Table II.3, cont'd

Types	Strategy Class	Measures	Impacts							
			<i>Reduce Need to Make Trip</i>	<i>Reduce Length of Trip</i>	<i>Promote Non- motorized Transport</i>	<i>Promote Public Transport</i>	<i>Promote Carpooling</i>	<i>Shift Peak Hour Travel</i>	<i>Shift Trips Away from Congested Locations</i>	<i>Reduce Traffic Traveler Delays</i>
S U P P L Y  -  S I D E	Road Traffic Operations	Entrance Ramp Controls				XX	XX	X	XX	XX
		Traveler Info Systems		X		X	X	XX	XX	XX
		Traffic Signalization Improvements				X			X	XX
		Motorway Traffic Management		X		X	X	X	X	XX
		Incident Management							XX	XX
		Traffic Control at Construction Sites				X	X	X	XX	XX
	Preferential Treatment	Bus Lanes				XX		X	X	X
		Carpool Lanes				X	XX	X	X	X
		Bicycle & Pedestrian Facilities			XX					
		Traffic Signal Pre-emption				XX				X
	Public Transport Operations	Express Bus Services				XX				X
		Park & Ride Facilities				XX	XX		X	X
		Service Improvements				XX				X
		Public Transport Image				XX				X
		High Capacity Public Transport Vehicles				XX				X
	Freight Movements	Urban Goods Movement						X	X	XX
		Inner-city Goods Movement	X					X	X	XX

Note: XX – Significant Impact      X – Some Impact      (Blank) – No Impact

## APPENDIX K: COST-EFFECTIVENESS OF TDM MEASURES

**Table 2. Results of Cost Effectiveness Analysis: Alternative 1A**

TDM Measure	Average Daily Cost per Daily Trip Reduced	Ranking	Average Daily Cost per Peak Period Trip Reduced	Ranking
Commute Information Program	\$0.42	7	\$0.53	7
Ridematching Services In-house	-\$0.23	4	-\$0.28	3
Transit Pass Subsidies	\$4.63	13	\$5.79	13
Employee Transportation Coordinator	\$5.15	14	\$6.44	14
Home-based Telecommuting	\$100.87	15	\$126.09	15
Compressed Work Hours	-\$0.59	3	-\$0.01	5
Reduction of Employer-subsidized Parking	-\$6.48	1	-\$8.10	1
Preferential Parking	\$0.15	6	\$0.18	6
Bicycle Lockers and Showers	\$4.40	12	\$5.50	12
Guaranteed Ride Home	-\$0.14	5	-\$0.18	4
Shuttle to Transit Stations	\$3.84	9	\$4.80	9
Vanpool Program	\$4.04	11	\$5.06	11
Reduction of Parking Supply	-\$0.87	2	-\$1.09	2
Direct Monetary Incentives	\$4.02	10	\$5.02	10
Transportation Allowance	\$1.01	8	\$1.26	8

*Note: Ranking among measures with a negative cost per trip reduced may be misleading and should all be considered highly cost-effective.*

## APPENDIX L: COST AND EFFECTIVENESS OF TCMS

**Table 2. Travel Impact Estimates: Range Of Daily Regional Reductions**  
(in percent)<sup>a</sup> (Based on literature review)<sup>b</sup>

TCM <sup>c</sup>	VTM	Trips
Employer trip reduction	0.2% - 3.3%	0.1% - 4.1%
Area-wide ridesharing	0.1 - 2.0	0.5 - 1.1
Transit improvements	0.0 - 2.6	0.6 - 2.5
HOV lanes	0.2 - 1.4	0.5 - 0.6
Park-and-ride lots	0.0 - 0.5	0.0
Bicycle/pedestrian facilities	d	d
Parking pricing:		
work	0.5 - 4.0	0.4 - 4.0
non-work	3.1 - 4.2	3.9 - 5.4
Congestion pricing	0.2 - 5.7	0.4 - 4.2
Compressed work week <sup>e</sup>	0.0 - 0.6	0.0 - 0.5
Telecommuting <sup>e</sup>	0.0 - 3.4	0.0 - 2.8
Land use planning <sup>e</sup>	0.0 - 5.2	0.0 - 5.2
Signal timing	( d )	( d )
Incident management	(0.1) - 0.0	(0.1) - 0.0
Emissions/VTM Tax	0.2 - 0.6	0.1 - 0.9
Buy-backs of older cars	N/A	N/A

- Notes:
- (a) Numbers in parentheses represent increases in VMT or trips.
  - (b) Numerical estimates have been converted from the literature into common units and rounded to the nearest tenth of a percent. The estimates reflect the specific parameters for the case studied or the assumptions in any predictive model -- all from existing literature. Actual impacts in specific regions will depend on the level of implementation and local circumstances.
  - (c) See text for discussion of TCMS, including assumptions made in the literature. Appendix II provides a detailed summary of the TCM travel impact estimates in the literature.
  - (d) Impact is less than 0.1 percent.
  - (e) No literature reported impact as low as 0; literature indicated that the potential impact of this measure is highly speculative, and we have therefore reported a range starting at 0. (Conversely, the upper end of the range may exceed that reported here.)



**Table 3. Travel And Emissions Effectiveness:  
Estimated Potential Regional Daily Reductions**  
(in percent)<sup>a</sup> (Based on literature review)<sup>b</sup>

TCM <sup>c</sup>	<u>VT</u>	Trips	Emissions (Mobile-source HC)
Employer trip reduction	1.0%	0.8%	0.9%
Area-wide ridesharing	0.4	0.3	0.4
Transit improvements	1.0	0.8	0.9
HOV lanes	1.4	0.5	1.1
Park-and-ride lots	0.5	0	0.3
Bicycle/pedestrian facilities	d	d	d
Parking pricing:			
work	3.0	2.5	2.8
non-work	4.2	5.4	4.6
Congestion pricing	5.0	3.8	8.2 <sup>e</sup>
Compressed work week	0.8	0.7	0.7
Telecommuting	1.1	1.0	1.0
Land use planning	f	f	f
Signal timing	( d )	( d )	0.4 <sup>e</sup>
Incident management	(0.1)	(0.1)	0.8 <sup>e</sup>
Emissions/VT Tax	0.4	0.7	4.1 <sup>e</sup>
Buy-backs of older cars	N/A	N/A	0.4 <sup>e</sup>

- Notes: (a) Maximum reasonable potential based on current information; some of these estimates do not reflect actual experience, and all depend on the level of implementation and specific local assumptions (congestion pricing, for example, assumes a 15 cents per mile charge). Estimates are percentage changes from baseline travel and emissions. Estimates are rounded to the nearest tenth of a percent. Numbers in parentheses represent increases in VT or trips.
- (b) Estimates should be treated separately: in some cases, TCM impacts may be additive; in others, the impacts are likely redundant; and for some combinations, there may be synergy among TCMs. This analysis simply reports individual impacts from the literature review.
- (c) See text for discussion of TCMs, including assumptions made in the literature. (d) Impact is less than 0.1 percent.
- (e) Estimates not interpolated --but drawn directly from literature.
- (f) The best available study on land-use planning (the LUTRAQ report) reports a long-term impact of 5.2 percent trip reduction (achieved by the year 2010) as the impact of land-use planning and parking pricing (plus free work-trip transit). Material in the report indicates that the pricing measure accounts for a large proportion of the total impact, but does not allow for a clean separation of the effects. For that reason, no estimate is shown in this table.

**Table 4. Travel Cost-Effectiveness Estimates:  
Cost Per Vehicle Round-Trip A Voided**  
(in dollars) (Based on literature review)

<b>TCM <sup>c</sup></b>	<b><u>Cost-Effectiveness</u></b>
Employer trip reduction	\$10.30
Area-wide ridesharing	0.60
Transit improvements	10.00
HOV lanes	4.00
Park-and-ride lots	b
Bicycle/pedestrian facilities	10.60
Parking pricing:	
work	1.70
non-work	c
Congestion pricing	2.40 <sup>d</sup>
Compressed work week	c
Telecommuting	c
Land use planning	c
Signal timing	e
Incident management	e
Emissions/VMT Tax	f
Buy-backs of older cars	e

- Notes:(a) Based on current information; some of these estimates do not reflect actual experience, and all depend on the level of implementation and specific local assumptions (congestion pricing, for example, assumes a 15 cents per mile charge). Estimates are rounded to the nearest ten cents (except for park-and-ride). Appendix V provides an explanation of these estimates.
- (b) Measure does not reduce trips; it does reduce VMT at cost of \$0.17 per VMT avoided.
- (c) No information available on which to base a cost-effectiveness estimate; however, TCM is potentially highly cost-effective (see text for explanation).
- (d) The general consensus in the literature is that in a benefit-cost context, the traffic-flow benefits of such measures (not counting emissions effects) exceed the societal costs.
- (e) Measure does not reduce trips.
- (f) Cost-effectiveness not calculated; only part of effect is in travel reduction -- balance is in scrappage of high-emitting vehicles. Since costs are very low, measure would be highly cost-effective.

**Table 5. Emissions Cost-Effectiveness Estimates:  
Cost Per Ton Of Hydrocarbon (Hc) Reduced**  
(in dollars)<sup>a</sup> (Based on literature review)<sup>b</sup>

<b>TCM<sup>c</sup></b>	<b><u>1990</u></b>	<b>1994</b>	<b>1997</b>
Employer trip reduction	\$227,000	\$281,000	\$365,000
Area-wide ridesharing	13,000	16,000	20,000
Transit improvements	220,000	272,000	353,000
HOV lanes	88,000	109,000	141,000
Park-and-ride lots	118,000	146,000	188,000
Bicycle/pedestrian facilities	233,000	289,000	376,000
Parking pricing <sup>d</sup> :			
work	38,000	47,000	61,000
non-work	c	c	c
Congestion pricing	53,000	66,000	85,000
Compressed work week	c	c	c
Telecommuting	c	c	c
Land use planning	c	c	c
Signal timing			23,000 <sup>e</sup>
Incident management			83,000 <sup>e</sup>
Emissions/VMT Tax	near 0	near 0	near 0
Buy-backs of older cars	3,000 <sup>e</sup>		

- Notes: (a) Based on current cost information; some of these estimates do not reflect actual experience, and all depend on the level of implementation and specific local assumptions (congestion pricing, for example, assumes a 15 cents per mile charge). Estimates are rounded to nearest thousands of dollars; 1994 and 1997 are not adjusted for inflation.
- (b) Appendix IV provides an explanation of these estimates.
- (c) No information available on which to base a cost-effectiveness estimate; however, TCM is potentially highly cost-effective (see text for explanation).
- (d) The general consensus in the literature is that in a benefit-cost context, the traffic-flow benefits of such measures (not counting emissions effects) exceed the societal costs.
- (e) Estimates drawn directly from the literature.

## APPENDIX N: EMISSION IMPACTS OF ITS

**Table 2-1. IVHS technology bundles for an emission analysis**

<i>Traffic and Incident Management Systems</i> Traffic Signalization Systems (ATMS) Freeway and Corridor Control Systems (ATMS) Real Time Changeable Message Road Sign Display Systems (ATIS) Incident Detection Systems (ATMS) Emergency Mayday Systems (ATIS) Hazardous Material Information Systems (CVO)	<i>Vehicle Control Systems</i> Radar Braking Systems (AYCS) Vehicle Speed Control Systems (AYCS) Automatic Headway Control Systems (AYCS) Automatic Steering Control Systems (AYCS) Automated Highway Systems (AYCS)
<i>Route Guidance Systems</i> Electronic Route Planning and Information Systems (ATIS) Radio Data Systems (ATIS) On-Board Navigation Systems (ATIS) Externally Linked Route Guidance Systems (ATIS)	<i>Commercial Vehicle Inspection Systems</i> Automatic Credentials Checking (CYO) Electronic Permitting and Payment (CYO) Electronic Recordkeeping (CYO) Weigh-in-Motion (CYO) Automated Safety Inspections (CYO) Automated Driver Data Processing (CYO) Traffic Data Collection Systems (CYO)
<i>Accident Reduction Systems</i> SmartRamp Designs (CVO) Site Specific Highway Warning Systems for Trucks (CVO) Antilock Braking Systems (AVCS) Intersection Hazard Warning Systems (AVCS) Collision Avoidance Systems (AVCS)	<i>Trip Guidance and Public Transportation Systems</i> Ridesharing Information Systems (ATIS) Traveler Information and Service Systems (APTS) Traffic Management Systems (APTS) Transit and Fleet Management Systems (APTS)
<u>Enabling Technologies for Travel Fees</u> Automatic Vehicle Identification Automatic Vehicle Location Automatic Vehicle Classification Electronic Toll Collection (A TMS) Smart Cards (APTS)	<u>Emission Control Enabling Technologies</u> Remote Sensing Devices Vehicle Condition Warning Systems (ATIS)

*The functional area from which a specific system originates is presented in parenthesis. ATMS corresponds to advanced traffic management systems. ATIS corresponds to advanced traveler information systems. CVO corresponds to commercial vehicle operations. AVCS corresponds to advanced vehicle control systems. APTS corresponds to advanced public transportation systems. Appendix A provides detailed definitions of each specific system, or systems, included in a particular technology bundle.*

**Table E-1. Potential short-term, corridor-level impacts of IVHS technology bundles.**

	Traffic Flow	Vehicle Trips	Trip Distance	Mode Shifts	Hydrocarbon Emissions	Carbon Monoxide Emissions	Oxides of Nitrogen Emissions
Traffic and Incident Management Systems	Positive	Insignificant	Insignificant	Insignificant	Uncertain	Uncertain	Uncertain
Route Guidance Systems	Positive	Insignificant	Insignificant	Insignificant	Positive	Positive	Uncertain
Accident Reduction Systems	Positive	Insignificant	Insignificant	Insignificant	Positive	Positive	Negative
Vehicle Control Systems	Positive	Insignificant	Insignificant	Insignificant	Positive	Positive	Negative
Commercial Vehicle Inspection Systems	Positive	Insignificant	Insignificant	Insignificant	Positive	Positive	Positive
Trip Guidance and Public Transportation Systems	Positive	Positive	Insignificant	Positive	Positive	Positive	Uncertain
Enabling Technologies for Travel Fees	Positive	Positive	Insignificant	Positive	Positive	Positive	Uncertain
Emission Control Enabling Technologies	Insignificant	Insignificant	Insignificant	Insignificant	Positive	Positive	Positive

- The short term is defined in this study to be from 2000 to 2010.
- Positive impacts reflect improvements in traffic flow, reductions in vehicle trips or trip distance, or mode shifts from single occupancy vehicles to high-occupancy vehicles.
- Negative impacts reflect increases in congestion, vehicle trips, and those impacts that reflect mode shifts from high-occupancy vehicles to single occupancy vehicles.
- Insignificant impacts reflect no changes (or very small changes) in traffic flow, the number of vehicle trips, trip distance, or mode shifts.
- Uncertain impacts are those for which changes in traffic flow, tripmaking, trip distance, or mode cannot be even qualitatively assessed given the current state of knowledge.

**Table E-2. Potential short-term, regional-level impacts of IVHS technology bundles.**

	Traffic Flow	Vehicle Trips	Trip Distance	Mode Shifts	Hydrocarbon Emissions	Carbon Monoxide Emissions	Oxides of Nitrogen Emissions
Traffic and Incident Management Systems	Positive	Insignificant	Insignificant	Insignificant	Positive	Positive	Negative
Route Guidance Systems	Positive	Positive	Uncertain	Insignificant	Positive	Positive	Uncertain
Accident Reduction Systems	Positive	Insignificant	Insignificant	Insignificant	Positive	Positive	Negative
Vehicle Control Systems	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant
Commercial Vehicle Inspection Systems	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant
Trip Guidance and Public Transportation Systems	Positive	Positive	Insignificant	Positive	Positive	Positive	Uncertain
Enabling Technologies for Travel Fees	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain
Emission Control Enabling Technologies	Insignificant	Insignificant	Insignificant	Insignificant	Positive	Positive	Positive

- The short term is defined in this study to be from 2000 to 2010.
- Positive impacts reflect improvements in traffic flow, reductions in vehicle trips or trip distance, or mode shifts from single occupancy vehicles to high-occupancy vehicles.
- Negative impacts reflect increases in congestion, vehicle trips, and those impacts that reflect mode shifts from high-occupancy vehicles to single occupancy vehicles.
- Insignificant impacts reflect no changes (or very small changes) in traffic flow, the number of vehicle trips, trip distance, or mode shifts.
- Uncertain impacts are those for which changes in traffic flow, tripmaking, trip distance, or mode cannot be even qualitatively assessed given the current state of knowledge.

**Table E-3. Potential long-term, corridor-level impacts of IVHS technology bundles.**

	Traffic Flow	Vehicle Trips	Trip Distance	Mode Shifts	Hydrocarbon Emissions	Carbon Monoxide Emissions	Oxides of Nitrogen Emissions
Traffic and Incident Management Systems	Positive	Insignificant	Insignificant	Insignificant	Uncertain	Uncertain	Uncertain
Route Guidance Systems	Positive	Insignificant	Insignificant	Insignificant	Positive	Positive	Uncertain
Accident Reduction Systems	Positive	Insignificant	Insignificant	Insignificant	Positive	Positive	Negative
Vehicle Control Systems	Positive	Insignificant	Negative	Insignificant	Uncertain	Uncertain	Uncertain
Commercial Vehicle Inspection Systems	Positive	Insignificant	Insignificant	Insignificant	Insignificant	Positive	Positive
Trip Guidance and Public Transportation Systems	Positive	Positive	Insignificant	Positive	Positive	Positive	Uncertain
Enabling Technologies for Travel Fees	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Emission Control Enabling Technologies	Insignificant	Insignificant	Insignificant	Insignificant	Positive	Positive	Positive

- The short term is defined in this study to be from 2000 to 2010.
- Positive impacts reflect improvements in traffic flow, reductions in vehicle trips or trip distance, or mode shifts from single occupancy vehicles to high-occupancy vehicles.
- Negative impacts reflect increases in congestion, vehicle trips, and those impacts that reflect mode shifts from high-occupancy vehicles to single occupancy vehicles.
- Insignificant impacts reflect no changes (or very small changes) in traffic flow, the number of vehicle trips, trip distance, or mode shifts.
- Uncertain impacts are those for which changes in traffic flow, tripmaking, trip distance, or mode cannot be even qualitatively assessed given the current state of knowledge.

**Table E-4. Potential long-term, regional-level impacts of IVHS technology bundles.**

	Traffic Flow	Vehicle Trips	Trip Distance	Mode Shifts	Hydrocarbon Emissions	Carbon Monoxide Emissions	Oxides of Nitrogen Emissions
Traffic and Incident Management Systems	Positive	Insignificant	Insignificant	Insignificant	Positive	Positive	Negative
Route Guidance Systems	Positive	Positive	Uncertain	Insignificant	Positive	Positive	Uncertain
Accident Reduction Systems	Positive	Insignificant	Insignificant	Insignificant	Positive	Positive	Negative
Vehicle Control Systems	Positive	Uncertain	Negative	Insignificant	Uncertain	Uncertain	Uncertain
Commercial Vehicle Inspection Systems	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant
Trip Guidance and Public Transportation Systems	Positive	Positive	Insignificant	Positive	Positive	Positive	Uncertain
Enabling Technologies for Travel Fees	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Emission Control Enabling Technologies	Insignificant	Insignificant	Insignificant	Insignificant	Positive	Positive	Positive

- The short term is defined in this study to be from 2000 to 2010.
- Positive impacts reflect improvements in traffic flow, reductions in vehicle trips or trip distance, or mode shifts from single occupancy vehicles to high-occupancy vehicles.
- Negative impacts reflect increases in congestion, vehicle trips, and those impacts that reflect mode shifts from high-occupancy vehicles to single occupancy vehicles.
- Insignificant impacts reflect no changes (or very small changes) in traffic flow, the number of vehicle trips, trip distance, or mode shifts.
- Uncertain impacts are those for which changes in traffic flow, tripmaking, trip distance, or mode cannot be even qualitatively assessed given the current state of knowledge.



## APPENDIX O: PACKAGING CONSIDERATIONS AMONG SELECTED TCMS

	Area-wide Ridesharing	Bicycling	Employer Programs	HOV Lanes	Park and Ride	Parking Management	Road Pricing	Traffic Flow Improvements	Transit Improvements	Trip-reduction Ordinances	Voluntary No-drive Days	Work Schedule Changes
Area-wide Ridesharing		0	+	+	+	+	+	-	-	+	+	?
Bicycling	0		+	0	0	0	0	0	0	+	0	+
Employer-based Transportation Management	+	+		+	+	+	+	-	+	+	+	+
HOV Lanes	+	0	+		+	+	+	-	+	+	+	?
Park and Ride	+	0	+	+		+	+	-	+	+	+	+
Parking Management	+	0	+	+	+		+	0	+	+	+	0
Road Pricing	+	0	+	+	+	+		-	+	+	+	0
Traffic Flow Improvements	-	0	-	-	-	0	-		-	-	-	0
Transit Improvements	-	0	+	+	+	+	+	-		+	+	?
Trip-reduction Ordinances	+	+	+	+	+	+	+	-	+		+	+
Voluntary No-drive Days	+	0	+	+	+	+	+	-	+	+		+
Work Schedule Changes	?	+	+	?	+	0	0	0	?	+	+	

  

Key			
+	Mutually supportive	0	Limited or no interaction
-	Conflicting measures	?	Will vary with situation

**Figure 2-1. Example packaging considerations among selected TCMS**  
(note these associations are general; individual cases may vary).\*

\* For further examples and discussion, see Rosenbloom. 1978; Wilbur Smith & Associates, 1981; Horowitz. 1977.

Basic Package	Supplementary Package							
	Work-hour wages	Pricing techniques	Restricting access	Changing land use	Prearranged ridesharing	Communications substitutes	Traffic engineering	Transit treatments
Work-hour changes		+	0	0	-	+	-	+
Pricing techniques	+		0	+	-	0	-	+
Restricting access	0	0		+	-	0	+	+
Changing land use	0	+	+		0	+	-	-
Prearranged ridesharing	-	0	0	0		0	-	-
Communications substitutes	0	+	0	+	-		-	-
Traffic engineering	+	0	-	+	-	0		-
Transit treatments	+	+	+	0	-	0	-	

<b>Key:</b>	<b>+</b> Supportive	<b>0</b> Neutral	<b>-</b> Conflicting
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**Figure 2-2. Packaging opportunities for eight measures proposed by Rosenbloom (1978).**

	Major Problem Areas			Special Problem Areas	
	CBDs of Large Cities	CBDs of Small Cities	Urban Freeways & Aterials	Roadways with Strong One-directional flow	Roadways with Limited Options for Alternative Routes
Work-hour changes	5	7	5	5	5
Pricing techniques	2	1	8	7	1
Access restriction	4	2	6	8	6
Land use changes	3	5	3	4	3
Prearranged ridesharing	6	6	4	3	4
Communications substitutes for travel	8	8	7	6	8
Traffic engineering techniques	7	3	2	1	7
Transit treatments	1	4	1	2	2

<b>Key:</b>	1 = Most effective	8 = Least effective
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**Figure 2-3. Ranking of the proposed packages' applicability to five traffic congestion locations.**

Source: Rosenbloom, 1978.



## APPENDIX P: EFFECTS OF COMBINING TCMS

**Table 7-2. Effects Of Combining Measures**

Transportation Control Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 Jobs/Housing Balance	X																								
2 Densification	A	X																							
3 Mixed Use	A	A	X																						
4 Growth Controls	A	A	A	X																					
5 Pedestrian Improvements	A	A	A	A	X																				
6 Traffic Signal Improvements	A	A	A	A	D	X																			
7 Capacity Increases	A	A	A	A	D	S	X																		
8 Transit Service Increases	A	A	A	A	S	C	C	X																	
9 Employee Transit Pass Subsidy	A	A	A	A	S	C	C	S	X																
10 Park-and-Ride Lots	A	A	A	A	S	C	C	S	A	X															
11 HOV Lanes	A	A	A	A	S	A	A	A	A	S	X														
12 Bicycle Improvements	A	A	A	A	A	A	A	A	A	A	A	X													
13 TROs	A	A	A	A	S	C	C	S	S	S	S	A	X												
14 Ridesharing	A	A	A	A	S	C	C	A	S	S	S	A	S	X											
15 Parking Management	A	A	A	A	S	A	A	S	S	A	A	A	S	S	X										
16 Telecommuting	A	A	A	A	D	D	D	A	A	A	A	A	A	A	A	X									
17 Flexible Work Hours	A	A	A	A	A	D	D	A	A	C	C	A	C	C	C	A	X								
18 Staggered Work Hours	A	A	A	A	A	D	D	A	A	C	C	A	C	C	C	A	A	X							
19 Compressed Work Week	A	A	A	A	A	D	D	A	A	C	C	A	C	C	C	A	A	A	X						
20 Gas Tax/Cost Increase	A	A	A	A	S	D	D	S	S	S	S	S	S	S	S	S	D	D	D	X					
21 VMT Tax	A	A	A	A	S	D	D	S	S	S	S	S	S	S	S	S	D	D	D	D	X				
22 Motorist Information	A	A	A	A	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	X			
23 Incident Management	A	A	A	A	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	X		
24 Delivery Timing	A	A	A	A	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	X	
25 Loading Facility	A	A	A	A	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	X

Legend:

A - Sequentially Additive  
 C - Conflicting  
 D - Directly Additive  
 S - Synergistic