2017 Congestion Management Program

Appendices B – I

Appendix B	CMP System Roadways	1
Appendix C	CMP System Transit Network	4
Appendix D	Level Of Service Descriptions	6
Appendix E	Summary Of Air Quality Elements In Congestion Management Program Law	9
Appendix F	Federal And State Transportation Control Measures	11
Appendix G	Other Sources Of TDM Funding	18
Appendix H	California Government Codes Relevant To The Congestion Management Program	20
Appendix I	CMP Multimodal Performance Measures	32

APPENDIX B | CMP SYSTEM ROADWAYS

TABLE B.1 | CMP SYSTEM NETWORK: HIGHWAYS

Highway	Length (in miles)
State Route 82	26.4
U.S. 101	52.6
Interstate 280	20.6
Interstate 680	9.9
State Route 237	11.1
State Route 17	13.9
Interstate 880	10.5
State Route 87	9.2
State Route 85	23.8
State Route 9	11.4
State Route 35	17.1
State Route 152	35.2
State Route 156	0.6
State Route 25	2.5
State Route 130	22.5
Total	**267.4**

TABLE B.2 | CMP SYSTEM NETWORK: EXPRESSWAYS

Expressway	Length (in miles)
Almaden Expressway	8.9
Capitol Expressway	8.7
Central Expressway	9.8
Foothill Expressway	7.1
Lawrence Expressway	5.9
Oregon - Page Mill Expressway	4.6
San Tomas – Montague Expressway	13.7
Total	**58.7**

TABLE B.3 | CMP SYSTEM NETWORK: PRINCIPAL ARTERIALS

Roadway Segment	Length (in miles)
Calaveras Boulevard between SR 237 and I-680	1.8
Alum Rock Road (SR 130) between US 101 and Mount Hamilton Road	3.6
Bascom Avenue between I-280 and SR 85	4.6
Bernal Road between Santa Teresa Boulevard and US 101	1.3
Berryessa Road between US 101 and I-680	2.0
Blossom Hill Road (SR 82) between Almaden Expressway and US 101	4.5
Brokaw Road between US 101 and Old Oakland Road	0.5
Camden Avenue between SR 17 and SR 85	2.6
Campbell Avenue between Hamilton Avenue and Saratoga Avenue	0.2
Caribbean Drive at Mathilda Avenue/SR 237 to Blazingwood Drive	3.9
Coleman Avenue from De La Cruz to I-880	1.4
Curtner Avenue between SR 87 and Monterey Highway	0.9
De Anza Boulevard between Bollinger Road and I-280	1.5
De La Cruz Boulevard between US 101 and Coleman Avenue	1.3
El Camino Real (SR 82) from Palo Alto city limits to the Alameda	16.0
Great America Parkway between SR 237 and US 101	2.1
Hamilton Avenue between Campbell Avenue and Bascom Avenue	3.3
Central Coast Highway (SR 9) between Santa Clara County line and Saratoga-Sunnyvale Road	7.2
Hillsdale Avenue between Camden Avenue and Almaden Expressway	2.5
Hostetter Road to I-680	0.9
Lark Avenue between Los Gatos Boulevard and SR 17	0.2
Los Gatos Boulevard between SR 85 and Lark Avenue	0.5
Mathilda Avenue between El Camino Real (SR 82) and Caribbean Drive	2.4
Monterey Road between San Carlos Street and Blossom Hill Road	7.0
Montgomery Avenue between Santa Clara Street and San Carlos Street	0.5
Murphy Avenue between Old Oakland Road and Hostetter Road	0.6
Prospect Avenue between Saratoga Avenue and Lawrence Expressway	0.3
San Antonio Boulevard between US 101 and El Camino Real (SR 82)	2.1
San Carlos Street between Montgomery and Monterey Highway	0.9
Santa Teresa Boulevard between SR 85 and Bernal Road	5.8
Saratoga Avenue between San Tomas Expressway and SR 85	4.2
Saratoga-Los Gatos Road between Saratoga-Sunnyvale Road and SR 17	3.9
Saratoga-Sunnyvale Road between Central Coast Highway (SR 9) and Bollinger Road	3.7

Stevens Creek Boulevard between SR 85 and I-880	6.0
Sunnyvale-Saratoga Road between I-280 and El Camino Real (SR 82)	2.5
The Alameda from El Camino Real (SR 82) to Montgomery Avenue	2.1
Trimble Road between US 101 and Montague Expressway	1.7
Tully Road between Capitol Expressway and US 101	1.4
Wolfe Road between Stevens Creek Boulevard and I-280	0.5
Total	**108.4**

APPENDIX C | CMP SYSTEM TRANSIT NETWORK

TABLE C.1 | CMP TRANSIT NETWORK: RAIL LINES

Transit Service	Area Served
Caltrain	Gilroy to San Francisco
VTA Light Rail Line 900	Almaden Station to Ohlone/Chynoweth Station
VTA Light Rail Line 901	Santa Teresa Station to Alum Rock Station
VTA Light Rail Line 902	Mountain View Station to Winchester Station

TABLE C.2 | CMP TRANSIT NETWORK: GRID BUS ROUTES

Bus Route	Area Served
Route 22	Palo Alto Transit Center to Eastridge Transit Center via El Camino
Route 23	De Anza College to Alum Rock Transit Center via Stevens Creek
Route 25	De Anza College to Alum Rock Transit Center via Valley Medical Center
Route 26	Sunnyvale/Lockheed Martin Transit Center to Eastridge Transit Center
Route 27	Good Samaritan Hospital to Kaiser San Jose
Route 54	De Anza College to Sunnyvale/Lockheed Martin Transit Center
Route 57	West Valley College to Great America
Route 58	West Valley College to Alviso
Route 60	Winchester Transit Center to Great America
Route 62	Good Samaritan Hospital to Sierra & Piedmont via Union
Route 64	Almaden LRT Station to McKee & White via Downtown San Jose
Route 66	Kaiser San Jose to Milpitas/Dixon Road via Downtown San Jose
Route 68	Gilroy Transit Center to San Jose Diridon Transit Center
Route 70	Capitol LRT Station to Great Mall/Main Transit Center
Route 323	Downtown San Jose to De Anza College
Route 522	Palo Alto Transit Center to Eastridge Transit Center

TABLE C.3 | CMP TRANSIT NETWORK: REGIONAL BUS ROUTES

Bus Route	Area Served
Route 180	Great Mall/Main Transit Center/Aborn & White to Fremont BART
Route 181	Fremont BART Station to San Jose Diridon Transit Center
Hwy 17 Express	Downtown San Jose to Santa Cruz
Dumbarton Bridge Express	Palo Alto to Union City BART Station

APPENDIX D | LEVEL OF SERVICE DESCRIPTOINS

TABLE D.1 | LEVEL OF SERVICE DESCRIPTIONS: SIGNALIZED INTERSECTIONS

Level of Service	Description
LOS A	At LOS A, delays at the intersection are less than or equal to 10.0 seconds per vehicle. Progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.
LOS B	At LOS B, intersection delays range from great than 10.0 to less than or equal to 20.0 seconds per vehicle. Good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher average delays.
LOS C	At LOS C intersection delays range from greater than 20.0 to less than or equal to 35.0 seconds per vehicle. Higher delays result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many vehicles still pass through the intersection without stopping.
LOS D	At LOS D, intersection delays range from greater than 35.0 and less than or equal to 55.0 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume to capacity (V/C) ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
LOS E	At LOS E, intersection delays range from greater than 55.0 and less than or equal to 80.0 seconds per vehicle. This is considered to be the limit of capacity delay. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.
LOS F	At LOS F intersection delays exceed 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition occurs with over-saturation (i.e. when arrival flow rates exceed the capacity of at an intersection). Poor progression and long cycle lengths may also be major contributing causes to such delay levels.
Source: Based on *Highway Capacity Manual 2000*, Transportation Research Board	

TABLE D.2 | LEVEL OF SERVICE DESCRIPTIONS: FREEWAYS

LOS	Description
LOS A	LOS A describes free flow conditions. Average density is no greater than 11 passenger cars per mile per lane. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. The effects of incidents or point breakdowns are easily absorbed at this level of service.
LOS B	LOS B represents free-flow speeds. Average density is greater than 11 but less than or equal to 18 passenger cars per mile per lane. The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. The effects of minor incidents and breakdown points are still easily absorbed at this level of service.
LOS C	LOS C provides for stable traffic flow; however, flows are approaching the range where small increases in traffic flows will cause substantial deterioration in traffic service. Average density is greater than 18 but less than or equal to 26 passenger cars per mile per lane. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver. Minor incidents may still be absorbed, but the local deterioration in traffic service will be substantial. Queues may be expected to form behind any significant blockage.
LOS D	LOS D provides for unstable flows; traffic is at the level where a small increase in traffic flows causes substantial deterioration in traffic service. Average density is greater than 26 but less than or equal to 46 passenger cars per mile per lane. Freedom to maneuver within the traffic stream is severely limited, and the driver experiences reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing, because the traffic stream has little space to absorb disruptions.
LOS E	LOS E describes traffic conditions operating at capacity. The average density is greater than 46 but less than or equal to 58 passenger cars per mile per lane. Operations at this level are extremely unstable because there are virtually no usable gaps in the traffic stream. Any incident on the highway can be expected to produce serious breakdown in traffic with extensive queuing.
LOS F	LOS F describes breakdowns in vehicular flow. Average density is greater than 58 passenger cars per mile per lane. Such conditions generally exist within queues forming behind breakdown points. Breakdowns occur for a number of reasons: a temporary reduction in capacity caused by a traffic incident, or a recurring point of congestion caused by a merge, a weave segment, or lane drop.
Source: Based on *Highway Capacity Manual 2000*, Transportation Research Board, with Santa Clara County-specific densities for LOS D, E and F per CMP *Traffic Level of Service Analysis Guidelines*, adopted June 2003.	

TABLE D.3 | LEVEL OF SERVICE DESCRIPTIONS: RURAL HIGHWAYS

LOS	Description
LOS A	LOS A allows motorists to travel at their desired speed of 55 mph or more on a Class I two-lane highway. Drivers spend 35 or less of their time following other vehicles. The passing frequency requited to maintain these speeds has not reached a demanding level, so that passing demand is well below passing capacity, and platoons of three or more vehicles are rare.
LOS B	LOS B characterizes traffic flow with speeds of greater than 50 mph or slightly higher on a Class I level-terrain highway. Drivers spend more than 35 to 50 percent of their time following other vehicles. The demand for passing to maintain desired speeds becomes significant and approximates the passing capacity at the lower boundary of LOS B. Drivers are delayed in platoons up to 50 percent of the time.
LOS C	LOS C describes situations when the average speed still exceeds 45 mph on a Class I level-terrain highway, even though unrestricted passing demand exceeds passing capacity. Drivers spend more than 50 to 65 percent of their time following other vehicles. Further increases in traffic flow exist, resulting in noticeable increases in platoon formation, platoon size, and frequency of passing impediments. Unresitricted passing demand exceeds passing capacity. At higher volumes, the chaining of platoons and significant reductions in passing capacity occur. Although traffic flow is stable, it is susceptible to congestion due to turning traffic and slow-moving vehicles.
LOS D	LOS D describes unstable traffic flow. The average travel speed remains at or slightly above 40 miles per hour. Drivers spend more than 65 to 80 percent of their time following other vehicles. The two opposing traffic streams begin to operate separately at higher volume levels, and passing becomes extremely difficult. Passing demand is high, but passing capacity approaches zero. Mean platoon sizes of 5 to 10 vehicles are common.
LOS E	LOS E represents traffic conditions where speeds drop below 40 mph (under base conditions, and may be as low as 25 mph with less than ideal roadway conditions such as steep grades). Drivers spend more than 80 percent of their time following other vehicles, making it virtually impossible to pass other vehicles. Traffic platoons become intense, as slower vehicles or other interruptions are encountered.
LOS F	LOS F represents heavily congested flow conditions, where traffic demand exceeds capacity. Average traffic speeds are highly variable and there are no opportunities available to pass other vehicles.
Source: Based on *Highway Capacity Manual 2000*, Transportation Research Board, for Class I two-lane highways	

APPENDIX E | SUMMARY OF AIR QUALITY ELEMENTS IN CONGESTION MANAGEMENT PROGRAM LAW

• The CMP is to be developed in consultation with the air quality management district.
Government Code Section 65089 (a)

• The CMP must contain a "trip reduction and travel demand element that promotes alternative transportation methods including, but not limited to carpools, vanpools, transit, bicycles, and park-and-ride lots; improvements in the balance between jobs and housing; and other strategies, including but not limited to flexible work hours, telecommuting and parking management programs."
Government Code Section 65089 (b)(3)(A)

• The performance measures shall support air quality.
Government Code Section 65089 (b)(2)

• The air quality management district shall coordinate the development of trip reduction responsibilities and avoid duplication of responsibilities among agencies. Multiple site employers may comply with a district employer trip reduction rule and report directly to the air quality management district. A multiple site employer that exercises this option shall be exempt from any employer-based trip reduction requirement imposed in the trip reduction and travel demand element of the CMP.
Government Code Section 65089 (b)(3)(B)

• With the exception of requirements on multiple site employers (see above paragraph), a local jurisdiction may adopt transportation demand management measures that include or exceed the requirements established in the CMP or by the air quality management district.
Government Code Section 65089 (b)(3)(C)

• The capital improvement program (CIP) must conform to "transportation-related vehicle emission air quality mitigation measures."
Government Code Section 65089 (b)(5)

• A deficiency plan must include a list of improvements, programs, or actions, and estimates of costs that will measurably improve multimodal performance and contribute to significant improvements in air quality. The air quality management district shall establish and periodically revise a list of approved improvements, programs, and actions that meet the scope of this paragraph.
Government Code Section 65089.4 (c)(3)

• Any congestion management agency that is located in the Bay Area Air Quality Management District and receives funds pursuant to Section 44241 of the Health and Safety Code for the purpose of implementing paragraph (3) of subdivision (b) of Section 65089 shall ensure that those funds are expended as part of an overall program for improving air quality and for the purposes of this chapter.
Government Code Section 65089.10

APPENDIX F | FEDERAL AND STATION TRANSPORTATION CONTROL MEASURES

Table F.1 | Federal Transportation Control Measures (Source: Transportation Air Quality Conformity Analysis for Plan Bay Area and the 2017 Transportation Improvement Plan, September 28, 2016: https://mtc.ca.gov/sites/default/files/A-04_RES-4274_adopt_AQ_Conformity.pdf)

Number	Federal TCMs	Description
Bay Area Air Quality Plan		
TCM 1	Reaffirm commitment to 28 percent transit ridership increase between 1978 and 1983.	Increase transit ridership according to the transit operator's five-year plans.
TCM 2	Support post-1983 improvements identified in the operator's five-year plans, and after consultation with the operators, adopt ridership target for the period 1983 through 1987.	A target for this TCM was to increase ridership by 15 percent between 1982/83 and 1987/88.
TCM 3	Seek to expand and improve public transit beyond committed levels.	This TCM was to upgrade and expand transit service between the years 1982/83 and 1987/88. The target was to increase the combined fleet size by 15 percent during this period.
TCM 4	Continue to support development of High Occupancy Vehicle (HOV) lanes.	Implement HOV lanes, where justified on a case-by-case basis; also includes highway ramp meters with HOV bypass lanes.
TCM 5	Continues to support efforts made by Bay Area non-profit -RIDES.	Support for RIDES efforts in region wide commuter matching services, vanpooling and employer services designed to encourage employees to participate in ridesharing activities.
TCM 6	TCM DELETED - Continue efforts to obtain funding to support long-range transit improvements.	Covers the funding and implementation of the Guadalupe light-rail transit line in Santa Clara County and BART extensions to North Concord and Warm Springs in Fremont.

TCM 7	Reaffirm commitment to preferential parking program.	Support the development of park-and-ride lots, where commuters can leave their cars and complete trips by other travel modes.
TCM 8	Encourage transit operators to work with Caltrans to identify underutilized parking lots along major transit lines that could be used as park-and-ride lots.	Applies to Caltrans' joint use park-and-ride program to establish lots in existing private parking areas.
TCM 9	Expand Commute Alternatives Program.	Encourages employers to promote alternatives to commuting in the single-occupant vehicle. Includes funding to conduct employer transportation coordinator training classes, market ridesharing to employers, and outreach programs to employers.
TCM 10	Develop Information Program for Local Governments	This TCM consists of providing information detailing the responsibility of local governments in addressing commute options and providing technical assistance.
TCM 11	TCM DELETED - Gasoline Conservation and Awareness Program (GasCAP)	The Gas CAP program was funded by the California Energy Commission, sponsored by Caltrans, and administered by the West Valley College. It entailed a training program, oriented towards large vehicle fleets, to teach proper driving techniques, vehicle maintenance, and trip planning. It was discontinued in 1984. The California Energy Commission is continuing a Gas CAP type program by training large public agency fleet managers on methods to reduce fuel consumption.
TCM 12	TCM DELETED - Santa Clara Commuter Transportation Program	This TCM consists of the commuter program adopted by Santa Clara County in 1982. It consists of a ridesharing program, express bus service, park-and-ride lots, upgraded Southern Pacific (CalTrain) service and HOV lanes.
Contingency Plan TCM's Adopted by MTC 1990 (MTC Resolution 2131)		
TCM 13	Increase bridge tolls to $1.00 on all bridges.	Would raise tolls to $1.00 on the Antioch, Bay, Benicia, and Carquinez bridges.
TCM 14	Bay Bridge surcharge of $1.00	Increase Bay Bridge toll to $2.00 to discourage single occupant automobile use and improve transit ridership.

TCM 15	Increase state gas tax by 9 cents	Raise State gasoline taxes from 9 cents to 18 cents per gallon. This measure takes credit for emission reductions due to a full 9cent tax increase phased in by 1995.
TCM 16	TCM DELETED - Implement MTC Resolution No. 1876, Revised—New Rail Starts Agreement	Complete the $3.5 billion, 6-rail extension program by securing State and Federal funds. Only take credit for emission reduction from a future BART extension to Colma.
TCM 17	Continue post-earthquake transit service	Continuation of ferry service initiated after the October 1989 earthquake and the expanded BART peak period service.
TCM 18	Sacramento-Bay Area Amtrak service	Implement near-term improvements recommended in ACR 132 Rail Study. Assumes three trains in each direction between Sacramento and the Bay Area.
TCM 19	Upgrade CalTrain service	Increase rail service frequency to 66 trains per day. Extend service to Gilroy.
TCM 20	Regional High Occupancy Vehicle (HOV) Lane System Plan	Expand and improve HOV concept first proposed in TCM 4 by developing and implementing the HOV Lane Master Plan. Includes 221 directional miles of HOV lanes.
TCM 21	Regional Transit Coordination	Coordinate multiple fare and service plans for the region.
TCM 22	Expand Regional Transit Connection (RTC) ticket distribution	Expand on-going MTC program to provide a regional clearinghouse for sale of transit tickets to employers; encourage employers to subsidize tickets.
TCM 23	Employer audits	Develop a program to review the TSM programs of selected employers in the region and to suggest actions to enhance programs. Will target specific large or mid-size employers and small employers for improved commute alternatives program.
TCM 24	Expand signal timing program to new cities	Establish a program to provide technical assistance to cities in the form of traffic monitoring, design of signal timing plans, and hardware improvements.
TCM 25	Maintain existing signal timing programs for local streets	Involves the provision of technical assistance to cities for periodic traffic signal program adjustments and coordination with adjacent cities.
TCM 26	Incident management on Bay Area freeways	Incident management is part of Caltrans' Traffic Operations Systems (TOS). This program assumes

		emission reductions on the approaches to the Bay Bridge due to the initial phases of TOS.
TCM 27	Update MTC guidance on development of local TSM programs	The existing MTC report 'Key Considerations for Developing Local Government TSM Programs' (December 1988) contains guidance on developing TSM programs.
TCM 28	Local Transportation Systems Management (TSM) initiatives	This TCM accounts for effects of new initiatives, such as Golden Triangle Task Force and Contra Costa County Growth Management Program.
2001 Ozone Attainment Plan		
TCM A	Regional Express Bus Program	Program includes purchase of approximately 90 low emission buses to operate new or enhanced express bus services. Buses will meet all applicable ARB standards, and will include particulate traps or filters. MTC will approve $40 million in funding to various transit operators for bus acquisition. Program assumes transit operators can sustain service for a five year period. Actual emission reductions will be determined based on routes selected by MTC.
TCM B	Bike/Ped Program	Fund high priority projects in countywide plans consistent with TDA funding availability. MTC would fund only projects that are exempt from CEQA, have no significant environmental impacts, or adequately mitigate any adverse environmental impacts. Actual emission reductions will be determined based on the projects funded.
TCM C	Transportation for Livable Communities	Program provides planning grants, technical assistance, and capital grants to help cities and nonprofit agencies link transportation projects with community plans. MTC would fund only projects that are exempt from CEQA, have no significant environmental impacts, or adequately mitigate any adverse environmental impacts. Actual emission reductions will be based on the projects funded.
TCM D	Expansion of Freeway Service Patrol	Operation of 55 lane miles of new roving tow truck patrols beyond routes which existed in 2000. TCM commitment would be satisfied by any combination for routes adding 55 miles. Tow trucks used in service are new vehicles meeting all applicable ARB standards.
TCM E	Transit Access to Airports	Take credit for emission reductions from air passengers who use BART to SFO, as these reductions are not included in the baseline.

Table F.2 | State Transportation Control Measures (Source: Bay Area 2017 Clean Air Plan)
http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx

Number	State TCM	Description
TR1	Clean Air Teleworking Initiative	Develop teleworking best practices for employers and develop additional strategies to promote telecommuting. Promote teleworking on Spare the Air Days.
TR2	Trip Reduction Programs	Implement the regional Commuter Benefits Program (Rule 14-1) that requires employers with 50 or more Bay Area employees to provide commuter benefits. Encourage trip reduction policies and programs in local plans, e.g., general and specific plans while providing grants to support trip reduction efforts. Encourage local governments to require mitigation of vehicle travel as part of new development approval, to adopt transit benefits ordinances in order to reduce transit costs to employees, and to develop innovative ways to encourage rideshare, transit, cycling, and walking for work trips. Fund various employer-based trip reduction programs.
TR3	Local and Regional Bus Service	Fund local and regional bus projects, including operations and maintenance.
TR4	Local and Regional Rail Service	Fund local and regional rail service projects, including operations and maintenance.
TR5	Transit Efficiency and Use	Improve transit efficiency and make transit more convenient for riders through continued operation of 511 Transit, full implementation of Clipper® fare payment system and the Transit Hub Signage Program.
TR6	Freeway and Arterial Operations	Improve the performance and efficiency of freeway and arterial systems through operational improvements, such as implementing the Freeway Performance Initiative, the Freeway Service Patrol and the Arterial Management Program.
TR7	Safe Routes to Schools and Safe Routes to Transit	Provide funds for the regional Safe Routes to School and Safe Routes to Transit Programs.
TR8	Ridesharing, Last-Mile Connection	Promote carpooling and vanpooling by providing funding to continue regional and local ridesharing programs, and support the expansion of carsharing programs. Provide

		incentive funding for pilot projects to evaluate the feasibility and cost-effectiveness of innovative ridesharing and other last-mile solution trip reduction strategies. Encourage employers to promote ridesharing and carsharing to their employees.
TR9	Bicycle and Pedestrian Access and Facilities	Encourage planning for bicycle and pedestrian facilities in local plans, e.g., general and specific plans, fund bike lanes, routes, paths and bicycle parking facilities.
TR10	Land Use Strategies	Support implementation of Plan Bay Area, maintain and disseminate information on current climate action plans and other local best practices, and collaborate with regional partners to identify innovative funding mechanisms to help local governments address air quality and climate change in their general plans.
TR11	Value Pricing	Implement and/or consider various value pricing strategies.
TR12	Smart Driving	Implement smart driving programs with businesses, public agencies and possibly schools and fund smart driving projects.
TR13	Parking Policies	Encourage parking policies and programs in local plans, e.g., reduce minimum parking requirements; limit the supply of off-street parking in transit-oriented areas; unbundle the price of parking spaces; support implementation of demand-based pricing (such as "SF Park") in high-traffic areas.
TR14	Cars and Light Trucks	Commit regional clean air funds toward qualifying vehicle purchases and infrastructure development. Partner with private, local, state and federal programs to promote the purchase and lease of battery-electric and plug-in hybrid electric vehicles.
TR15	Public Outreach and Education	Implement the Spare the Air Every Day Campaign including Spare the Air alerts, employer program, and community resource teams, a PEV Outreach campaign and the Spare the Air Youth Program.
TR16	Indirect Source Review	Consider a rule that sets air quality performance standards for new and modified development projects.
TR17	Planes	Work with the appropriate partners to increase the use of cleaner burning jet fuel and low-NOX engines in commercial jets arriving and departing the Bay Area.
TR18	Goods Movement	Continue participation in the preparation and implementation of the Regional Goods Movement Plan. Participate in the Goods Movement Collaborative, led by the Alameda County Transportation Commission, and assist MTC in development of the Freight Emissions Action Plan.

TR19	Medium and Heavy Duty Trucks	Directly provide, and encourage other organizations to provide, incentives for the purchase of 1) new trucks with engines that exceed ARB's 2010 NOX emission standards for heavy-duty engines, 2) new hybrid trucks, and 3) new zero-emission trucks. The Air District will work with truck owners, industry, ARB, the California Energy Commission, and others to demonstrate additional battery-electric and hydrogen fuel cell zero-emission trucks.
TR20	Ocean Going Vessels	Replicate the Green Ship Program that has been implemented at the ports of Los Angeles and Long Beach. Financial incentives for cleaner Tier 2 and Tier 3 oceangoing vessels to call at the ports serve as the basis of the Program. The Program was initiated as part of the San Pedro Bay Ports Clean Air Action Plan. This measure also recognizes the need to monitor progress under such programs and augment them as necessary to ensure sufficient results.
TR21	Commercial Harbor Craft	Focus on assisting fleets to achieve early compliance with the CARB harbor craft air toxic control measure and supporting research efforts to develop and deploy more efficient engines and cleaner, renewable fuels for harbor craft.
TR22	Construction, Freight and Farming Equipment	Provide incentives for the early deployment of electric, Tier 3 and 4 off-road engines used in construction, freight and farming equipment. Support field demonstrations of advanced technology for off-road engines and hybrid drive trains.
TR23	Lawn and Garden Equipment	Seek additional funding to expand the Commercial Lawn and Garden Equipment Replacement Program into all nine Bay Area counties. Explore options to expand Lawn and Garden Equipment Program to cover shredders, stump grinders and commercial turf equipment.

APPENDIX G | OTHER SOURCES OF TRANSPORTATION DEMAND MANAGEMENT (TDM) FUNDING

Benefit Assessment Districts — A benefit assessment is a charge levied against a property owner in order to pay for local improvements, which directly benefit the property with assessments. The jurisdiction can issue bonds that are paid for the beneficiaries over a specific time. The beneficiary's charge remains the same throughout the time of the assessment.

Bicycle Lane Account — This program is funded by gasoline taxes whose expenditure must be justified through improved capacity or safety on an existing local street or highway. The funding available for these projects is five million dollars for the entire state.

Developers — Local agencies can require developers to contribute fees that address the transportation impacts of new development, which may be in part directed to TDM programs. These fees may fall within the context of a Deficiency Plan prepared by the local agency, or they may be tied to a separate transportation impact fee. In addition, developers may include facilities or infrastructure that supports TDM efforts (such as bike lockers or racks, or alternative transportation information kiosks) as part of a development project.

Mello-Roos Communities Facilities District — The Mello-Roos Act allows for the formation of a Community Facilities District (CFD) that is contained within legally defined boundaries. Within the CFD, eligible voters can, with two-thirds approval, authorize a government entity to issue bonds and collect taxes for construction and operation of public improvements. Tax formulas for the CFD are developed on a general benefit basis and a maximum tax rate is approved annually by City Council resolution. The tax may vary each year but distributions cannot exceed the maximum tax rate.

Redevelopment Areas — In the past, local jurisdictions have had the ability to designate redevelopment areas and collect tax increment funds to pay for projects within redevelopment boundaries. Changes in California redevelopment law in 2011 have cast doubt on the future of Redevelopment Agencies in the state, but these changes are still uncertain until pending lawsuits are decided.

Vehicle License Fee — Increasing the vehicle license fee by a flat rate is another way to acquire funds to support transportation related improvements on the road network. In 2004, Santa Clara County voted on a bill that would increase the existing vehicle license tabs $5.00 annually in an effort to fund projects that help manage traffic congestion. Some of the transportation improvement projects will incorporate TDM related improvements. In November 2010, Santa Clara County voters approved an additional increase to the vehicle license fee under authority granted by Senate Bill 83, but these funds were specifically designated for local streets and

roads projects and will not be used for TDM programs. VTA is continually looking at other methods in order to generate revenue for TDM elements.

Express Lane Revenue – Revenue from Express Lane implementation could also potentially fund some TDM-related elements. The fee charged for using the lanes will first be used for operations and maintenance of the express lane infrastructure, and could also be used to pay for all or a portion of the cost of the additional lane(s) or the lane conversions. Any additional revenue could be used to pay for transit services serving the corridor or other alternative transportation improvements in the corridor.

Transportation Impact Fee – Another method of funding these TDM programs could be fees resulting from the collection of fees related to traffic impacts. Various cities within Santa Clara County have implemented impact fee programs to collect money for road improvements. Although legislation states that an impact fee program must include a project list, a TDM – related element may be included.

APPENDIX H | CALIFORNIA GOVERNMENT CODES RELEVANT TO THE CONGESTION MANAGEMENT PROGRAM

65088. The Legislature finds and declares all of the following:

(a) Although California's economy is critically dependent upon transportation, its current transportation system relies primarily upon a street and highway system designed to accommodate far fewer vehicles than are currently using the system.

(b) California's transportation system is characterized by fragmented planning, both among jurisdictions involved and among the means of available transport.

(c) The lack of an integrated system and the increase in the number of vehicles are causing traffic congestion that each day results in 400,000 hours lost in traffic, 200 tons of pollutants released into the air we breathe, and three million one hundred thousand dollars ($3,100,000) added costs to the motoring public.

(d) To keep California moving, all methods and means of transport between major destinations must be coordinated to connect our vital economic and population centers.

(e) In order to develop the California economy to its full potential, it is intended that federal, state, and local agencies join with transit districts, business, private and environmental interests to develop and implement comprehensive strategies needed to develop appropriate responses to transportation needs.

(f) In addition to solving California's traffic congestion crisis, rebuilding California's cities and suburbs, particularly with affordable housing and more walkable neighborhoods, is an important part of accommodating future increases in the state's population because homeownership is only now available to most Californians who are on the fringes of metropolitan areas and far from employment centers.

(g) The Legislature intends to do everything within its power to remove regulatory barriers around the development of infill housing, transit-oriented development, and mixed use commercial development in order to reduce regional traffic congestion and provide more housing choices for all Californians.

(h) The removal of regulatory barriers to promote infill housing, transit-oriented development, or mixed use commercial development does not preclude a city or county from holding a public hearing nor finding that an individual infill project would be adversely impacted by the surrounding environment or transportation patterns.

65088.1. As used in this chapter the following terms have the following meanings:

(a) Unless the context requires otherwise, “agency” means the agency responsible for the preparation and adoption of the congestion management program.

(b) “Bus rapid transit corridor” means a bus service that includes at least four of the following attributes:

(1) Coordination with land use planning.

(2) Exclusive right-of-way.

(3) Improved passenger boarding facilities.

(4) Limited stops.

(5) Passenger boarding at the same height as the bus.

(6) Prepaid fares.

(7) Real-time passenger information.

(8) Traffic priority at intersections.

(9) Signal priority.

(10) Unique vehicles.

(c) “Commission” means the California Transportation Commission.

(d) “Department” means the Department of Transportation.

(e) “Infill opportunity zone” means a specific area designated by a city or county, pursuant to subdivision (c) of Section 65088.4, that is within one-half mile of a major transit stop or high-quality transit corridor included in a regional transportation plan. A major transit stop is as defined in Section 21064.3 of the Public Resources Code, except that, for purposes of this section, it also includes major transit stops that are included in the applicable regional transportation plan. For purposes of this section, a high-quality transit corridor means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours.

(f) “Interregional travel” means any trips that originate outside the boundary of the agency. A “trip” means a one-direction vehicle movement. The origin of any trip is the starting point of that trip. A roundtrip consists of two individual trips.

(g) “Level of service standard” is a threshold that defines a deficiency on the congestion management program highway and roadway system which requires the preparation of a deficiency plan. It is the intent of the Legislature that the agency shall use all elements of the program to implement strategies and actions that avoid the creation of deficiencies and to improve multimodal mobility.

(h) “Local jurisdiction” means a city, a county, or a city and county.

(i) “Multimodal” means the utilization of all available modes of travel that enhance the movement of people and goods, including, but not limited to, highway, transit, non-motorized, and demand management strategies including, but not limited to, telecommuting. The availability and practicality of specific multimodal systems, projects, and strategies may vary by county and region in accordance with the size and complexity of different urbanized areas.

(j) (1) “Parking cash-out program” means an employer-funded program under which an employer offers to provide a cash allowance to an employee equivalent to the parking subsidy that the employer would otherwise pay to provide the employee with a parking space. “Parking subsidy” means the difference between the out-of-pocket amount paid by an employer on a regular basis in order to secure the availability of an employee parking space not owned by the employer and the price, if any, charged to an employee for use of that space.

(2) A parking cash-out program may include a requirement that employee participants certify that they will comply with guidelines established by the employer designed to avoid neighborhood parking problems, with a provision that employees not complying with the guidelines will no longer be eligible for the parking cash-out program.

(k) “Performance measure” is an analytical planning tool that is used to quantitatively evaluate transportation improvements and to assist in determining effective implementation actions, considering all modes and strategies. Use of a performance measure as part of the program does not trigger the requirement for the preparation of deficiency plans.

(l) “Urbanized area” has the same meaning as is defined in the 1990 federal census for urbanized areas of more than 50,000 population.

(m) Unless the context requires otherwise, “regional agency” means the agency responsible for preparation of the regional transportation improvement program.

65088.3. This chapter does not apply in a county in which a majority of local governments, collectively comprised of the city councils and the county board of supervisors, which in total also represent a majority of the population in the county, each adopt resolutions electing to be exempt from the congestion management program.

65088.4. (a) It is the intent of the Legislature to balance the need for level of service standards for traffic with the need to build infill housing and mixed use commercial developments within walking distance of mass transit facilities, downtowns, and town centers and to provide greater flexibility to local governments to balance these sometimes competing needs.

(b) Notwithstanding any other provision of law, level of service standards described in Section 65089 shall not apply to the streets and highways within an infill opportunity zone.

(c) The city or county may designate an infill opportunity zone by adopting a resolution after determining that the infill opportunity zone is consistent with the general plan and any

applicable specific plan, and is a transit priority area within a sustainable communities strategy or alternative planning strategy adopted by the applicable metropolitan planning organization.

65088.5. Congestion management programs, if prepared by county transportation commissions and transportation authorities created pursuant to Division 12 (commencing with Section 130000) of the Public Utilities Code, shall be used by the regional transportation planning agency to meet federal requirements for a congestion management system, and shall be incorporated into the congestion management system.

65089.

(a) A congestion management program shall be developed, adopted, and updated biennially, consistent with the schedule for adopting and updating the regional transportation improvement program, for every county that includes an urbanized area, and shall include every city and the county. The program shall be adopted at a noticed public hearing of the agency. The program shall be developed in consultation with, and with the cooperation of, the transportation planning agency, regional transportation providers, local governments, the department, and the air pollution control district or the air quality management district, either by the county transportation commission, or by another public agency, as designated by resolutions adopted by the county board of supervisors and the city councils of a majority of the cities representing a majority of the population in the incorporated area of the county.

(b) The program shall contain all of the following elements:

(1) (A) Traffic level of service standards established for a system of highways and roadways designated by the agency. The highway and roadway system shall include at a minimum all state highways and principal arterials. No highway or roadway designated as a part of the system shall be removed from the system. All new state highways and principal arterials shall be designated as part of the system, except when it is within an infill opportunity zone. Level of service (LOS) shall be measured by Circular 212, by the most recent version of the Highway Capacity Manual, or by a uniform methodology adopted by the agency that is consistent with the Highway Capacity Manual. The determination as to whether an alternative method is consistent with the Highway Capacity Manual shall be made by the regional agency, except that the department instead shall make this determination if either (i) the regional agency is also the agency, as those terms are defined in Section 65088.1, or (ii) the department is responsible for preparing the regional transportation improvement plan for the county.

(B) In no case shall the LOS standards established be below the level of service E or the current level, whichever is farthest from level of service A except when the area is in an infill opportunity zone. When the level of service on a segment or at an intersection fails to attain the established level of service standard outside an infill opportunity zone, a deficiency plan shall be adopted pursuant to Section 65089.4.

(2) A performance element that includes performance measures to evaluate current and future multimodal system performance for the movement of people and goods. At a minimum, these performance measures shall incorporate highway and roadway system performance, and measures established for the frequency and routing of public transit, and for the coordination of transit service provided by separate operators. These performance measures shall support mobility, air quality, land use, and economic objectives, and shall be used in the development of the capital improvement program required pursuant to paragraph (5), deficiency plans required pursuant to Section 65089.4, and the land use analysis program required pursuant to paragraph (4).

(3) A travel demand element that promotes alternative transportation methods, including, but not limited to, carpools, vanpools, transit, bicycles, and park-and-ride lots; improvements in the balance between jobs and housing; and other strategies, including, but not limited to, flexible work hours, telecommuting, and parking management programs. The agency shall consider parking cash-out programs during the development and update of the travel demand element.

(4) A program to analyze the impacts of land use decisions made by local jurisdictions on regional transportation systems, including an estimate of the costs associated with mitigating those impacts. This program shall measure, to the extent possible, the impact to the transportation system using the performance measures described in paragraph (2). In no case shall the program include an estimate of the costs of mitigating the impacts of interregional travel. The program shall provide credit for local public and private contributions to improvements to regional transportation systems. However, in the case of toll road facilities, credit shall only be allowed for local public and private contributions which are unreimbursed from toll revenues or other state or federal sources. The agency shall calculate the amount of the credit to be provided. The program defined under this section may require implementation through the requirements and analysis of the California Environmental Quality Act, in order to avoid duplication.

(5) A seven-year capital improvement program, developed using the performance measures described in paragraph (2) to determine effective projects that maintain or improve the performance of the multimodal system for the movement of people and goods, to mitigate regional transportation impacts identified pursuant to paragraph (4). The program shall conform to transportation-related vehicle emission air quality mitigation measures, and include any project that will increase the capacity of the multimodal system. It is the intent of the Legislature that, when roadway projects are identified in the program, consideration be given for maintaining bicycle access and safety at a level comparable to that which existed prior to the improvement or alteration. The capital improvement program may also include safety, maintenance, and rehabilitation projects that do not enhance the capacity of the system but are necessary to preserve the investment in existing facilities.

(c) The agency, in consultation with the regional agency, cities, and the county, shall develop a uniform data base on traffic impacts for use in a countywide transportation computer model

and shall approve transportation computer models of specific areas within the county that will be used by local jurisdictions to determine the quantitative impacts of development on the circulation system that are based on the countywide model and standardized modeling assumptions and conventions. The computer models shall be consistent with the modeling methodology adopted by the regional planning agency. The data bases used in the models shall be consistent with the data bases used by the regional planning agency. Where the regional agency has jurisdiction over two or more counties, the data bases used by the agency shall be consistent with the data bases used by the regional agency.

(d) (1) The city or county in which a commercial development will implement a parking cash-out program that is included in a congestion management program pursuant to subdivision (b), or in a deficiency plan pursuant to Section 65089.4, shall grant to that development an appropriate reduction in the parking requirements otherwise in effect for new commercial development.

(2) At the request of an existing commercial development that has implemented a parking cash-out program, the city or county shall grant an appropriate reduction in the parking requirements otherwise applicable based on the demonstrated reduced need for parking, and the space no longer needed for parking purposes may be used for other appropriate purposes.

(e) Pursuant to the federal Intermodal Surface Transportation Efficiency Act of 1991 and regulations adopted pursuant to the act, the department shall submit a request to the Federal Highway Administration Division Administrator to accept the congestion management program in lieu of development of a new congestion management system otherwise required by the act.

65089.1. (a) For purposes of this section, "plan" means a trip reduction plan or a related or similar proposal submitted by an employer to a local public agency for adoption or approval that is designed to facilitate employee ridesharing, the use of public transit, and other means of travel that do not employ a single-occupant vehicle.

(b) An agency may require an employer to provide rideshare data bases; an emergency ride program; a preferential parking program; a transportation information program; a parking cash-out program, as defined in subdivision (f) of Section 65088.1; a public transit subsidy in an amount to be determined by the employer; bicycle parking areas; and other noncash value programs which encourage or facilitate the use of alternatives to driving alone. An employer may offer, but no agency shall require an employer to offer, cash, prizes, or items with cash value to employees to encourage participation in a trip reduction program as a condition of approving a plan.

(c) Employers shall provide employees reasonable notice of the content of a proposed plan and shall provide the employees an opportunity to comment prior to submittal of the plan to the agency for adoption.

(d) Each agency shall modify existing programs to conform to this section not later than June 30, 1995. Any plan adopted by an agency prior to January 1, 1994, shall remain in effect until adoption by the agency of a modified plan pursuant to this section.

(e) Employers may include disincentives in their plans that do not create a widespread and substantial disproportionate impact on ethnic or racial minorities, women, or low-income or disabled employees.

(f) This section shall not be interpreted to relieve any employer of the responsibility to prepare a plan that conforms with trip reduction goals specified in Division 26 (commencing with Section 39000) of the Health and Safety Code, or the Clean Air Act (42 U.S.C. Sec. 7401 et seq.).

(g) This section only applies to agencies and employers within the South Coast Air Quality Management District.

65089.2. (a) Congestion management programs shall be submitted to the regional agency. The regional agency shall evaluate the consistency between the program and the regional transportation plans required pursuant to Section 65080. In the case of a multicounty regional transportation planning agency, that agency shall evaluate the consistency and compatibility of the programs within the region.

(b) The regional agency, upon finding that the program is consistent, shall incorporate the program into the regional transportation improvement program as provided for in Section 65082. If the regional agency finds the program is inconsistent, it may exclude any project in the congestion management program from inclusion in the regional transportation improvement program.

(c) (1) The regional agency shall not program any surface transportation program funds and congestion mitigation and air quality funds pursuant to Section 182.6 and 182.7 of the Streets and Highways Code in a county unless a congestion management program has been adopted by December 31, 1992, as required pursuant to Section 65089. No surface transportation program funds or congestion mitigation and air quality funds shall be programmed for a project in a local jurisdiction that has been found to be in nonconformance with a congestion management program pursuant to Section 65089.5 unless the agency finds that the project is of regional significance.

(2) Notwithstanding any other provision of law, upon the designation of an urbanized area, pursuant to the 1990 federal census or a subsequent federal census, within a county which previously did not include an urbanized area, a congestion management program as required pursuant to Section 65089 shall be adopted within a period of 18 months after designation by the Governor.

(d) (1) It is the intent of the Legislature that the regional agency, when its boundaries include areas in more than one county, should resolve inconsistencies and mediate disputes which arise between agencies related to congestion management programs adopted for those areas.

(2) It is the further intent of the Legislature that disputes which may arise between regional agencies, or agencies which are not within the boundaries of a multicounty regional transportation planning agency, should be mediated and resolved by the Secretary of Business, Housing and Transportation Agency, or an employee of that agency designated by the secretary, in consultation with the air pollution control district or air quality management district within whose boundaries the regional agency or agencies are located.

(e) At the request of the agency, a local jurisdiction that owns, or is responsible for operation of, a trip-generating facility in another county shall participate in the congestion management program of the county where the facility is located. If a dispute arises involving a local jurisdiction, the agency may request the regional agency to mediate the dispute through procedures pursuant to subdivision (d) of Section 65089.2. Failure to resolve the dispute does not invalidate the congestion management program.

65089.3. The agency shall monitor the implementation of all elements of the congestion management program. The department is responsible for data collection and analysis on state highways, unless the agency designates that responsibility to another entity. The agency may also assign data collection and analysis responsibilities to other owners and operators of facilities or services if the responsibilities are specified in its adopted program. The agency shall consult with the department and other affected owners and operators in developing data collection and analysis procedures and schedules prior to program adoption. At least biennially, the agency shall determine if the county and cities are conforming to the congestion management program, including, but not limited to, all of the following:

(a) Consistency with levels of service standards, except as provided in Section 65089.4.

(b) Adoption and implementation of a program to analyze the impacts of land use decisions, including the estimate of the costs associated with mitigating these impacts.

(c) Adoption and implementation of a deficiency plan pursuant to Section 65089.4 when highway and roadway level of service standards are not maintained on portions of the designated system.

65089.4. (a) A local jurisdiction shall prepare a deficiency plan when highway or roadway level of service standards are not maintained on segments or intersections of the designated system. The deficiency plan shall be adopted by the city or county at a noticed public hearing.

(b) The agency shall calculate the impacts subject to exclusion pursuant to subdivision (f) of this section, after consultation with the regional agency, the department, and the local air quality management district or air pollution control district. If the calculated traffic level of

service following exclusion of these impacts is consistent with the level of service standard, the agency shall make a finding at a publicly noticed meeting that no deficiency plan is required and so notify the affected local jurisdiction.

(c) The agency shall be responsible for preparing and adopting procedures for local deficiency plan development and implementation responsibilities, consistent with the requirements of this section. The deficiency plan shall include all of the following:

(1) An analysis of the cause of the deficiency. This analysis shall include the following:

(A) Identification of the cause of the deficiency.

(B) Identification of the impacts of those local jurisdictions within the jurisdiction of the agency that contribute to the deficiency. These impacts shall be identified only if the calculated traffic level of service following exclusion of impacts pursuant to subdivision (f) indicates that the level of service standard has not been maintained, and shall be limited to impacts not subject to exclusion.

(2) A list of improvements necessary for the deficient segment or intersection to maintain the minimum level of service otherwise required and the estimated costs of the improvements.

(3) A list of improvements, programs, or actions, and estimates of costs, that will (A) measurably improve multimodal performance, using measures defined in paragraphs (1) and (2) of subdivision (b) of Section 65089, and (B) contribute to significant improvements in air quality, such as improved public transit service and facilities, improved non-motorized transportation facilities, high occupancy vehicle facilities, parking cash-out programs, and transportation control measures. The air quality management district or the air pollution control district shall establish and periodically revise a list of approved improvements, programs, and actions that meet the scope of this paragraph. If an improvement, program, or action on the approved list has not been fully implemented, it shall be deemed to contribute to significant improvements in air quality. If an improvement, program, or action is not on the approved list, it shall not be implemented unless approved by the local air quality management district or air pollution control district.

(4) An action plan, consistent with the provisions of Chapter 5 (commencing with Section 66000), that shall be implemented, consisting of improvements identified in paragraph (2), or improvements, programs, or actions identified in paragraph (3), that are found by the agency to be in the interest of the public health, safety, and welfare. The action plan shall include a specific implementation schedule. The action plan shall include implementation strategies for those jurisdictions that have contributed to the cause of the deficiency in accordance with the agency's deficiency plan procedures. The action plan need not mitigate the impacts of any exclusions identified in subdivision (f). Action plan strategies shall identify the most effective implementation strategies for improving current and future system performance.

(d) A local jurisdiction shall forward its adopted deficiency plan to the agency within 12 months of the identification of a deficiency. The agency shall hold a noticed public hearing within 60 days of receiving the deficiency plan. Following that hearing, the agency shall either accept or reject the deficiency plan in its entirety, but the agency may not modify the deficiency plan. If the agency rejects the plan, it shall notify the local jurisdiction of the reasons for that rejection, and the local jurisdiction shall submit a revised plan within 90 days addressing the agency's concerns. Failure of a local jurisdiction to comply with the schedule and requirements of this section shall be considered to be nonconformance for the purposes of Section 65089.5.

(e) The agency shall incorporate into its deficiency plan procedures, a methodology for determining if deficiency impacts are caused by more than one local jurisdiction within the boundaries of the agency.

(1) If, according to the agency's methodology, it is determined that more than one local jurisdiction is responsible for causing a deficient segment or intersection, all responsible local jurisdictions shall participate in the development of a deficiency plan to be adopted by all participating local jurisdictions.

(2) The local jurisdiction in which the deficiency occurs shall have lead responsibility for developing the deficiency plan and for coordinating with other impacting local jurisdictions. If a local jurisdiction responsible for participating in a multi-jurisdictional deficiency plan does not adopt the deficiency plan in accordance with the schedule and requirements of paragraph (a) of this section, that jurisdiction shall be considered in nonconformance with the program for purposes of Section 65089.5.

(3) The agency shall establish a conflict resolution process for addressing conflicts or disputes between local jurisdictions in meeting the multi-jurisdictional deficiency plan responsibilities of this section.

(f) The analysis of the cause of the deficiency prepared pursuant to paragraph (1) of subdivision (c) shall exclude the following:

(1) Interregional travel.

(2) Construction, rehabilitation, or maintenance of facilities that impact the system.

(3) Freeway ramp metering.

(4) Traffic signal coordination by the state or multi-jurisdictional agencies.

(5) Traffic generated by the provision of low-income and very low income housing.

(6) (A) Traffic generated by high-density residential development located within one-fourth mile of a fixed rail passenger station, and (B) Traffic generated by any mixed use development

located within one-fourth mile of a fixed rail passenger station, if more than half of the land area, or floor area, of the mixed use development is used for high density residential housing, as determined by the agency.

(g) For the purposes of this section, the following terms have the following meanings:

(1) "High density" means residential density development which contains a minimum of 24 dwelling units per acre and a minimum density per acre which is equal to or greater than 120 percent of the maximum residential density allowed under the local general plan and zoning ordinance. A project providing a minimum of 75 dwelling units per acre shall automatically be considered high density.

(2) "Mixed use development" means development which integrates compatible commercial or retail uses, or both, with residential uses, and which, due to the proximity of job locations, shopping opportunities, and residences, will discourage new trip generation.

65089.5. (a) If, pursuant to the monitoring provided for in Section 65089.3, the agency determines, following a noticed public hearing, that a city or county is not conforming with the requirements of the congestion management program, the agency shall notify the city or county in writing of the specific areas of nonconformance. If, within 90 days of the receipt of the written notice of nonconformance, the city or county has not come into conformance with the congestion management program, the governing body of the agency shall make a finding of nonconformance and shall submit the finding to the commission and to the Controller.

(b) (1) Upon receiving notice from the agency of nonconformance, the Controller shall withhold apportionments of funds required to be apportioned to that nonconforming city or county by Section 2105 of the Streets and Highways Code.

(2) If, within the 12-month period following the receipt of a notice of nonconformance, the Controller is notified by the agency that the city or county is in conformance, the Controller shall allocate the apportionments withheld pursuant to this section to the city or county.

(3) If the Controller is not notified by the agency that the city or county is in conformance pursuant to paragraph (2), the Controller shall allocate the apportionments withheld pursuant to this section to the agency.

(c) The agency shall use funds apportioned under this section for projects of regional significance which are included in the capital improvement program required by paragraph (5) of subdivision (b) of Section 65089, or in a deficiency plan which has been adopted by the agency. The agency shall not use these funds for administration or planning purposes.

65089.6. Failure to complete or implement a congestion management program shall not give rise to a cause of action against a city or county for failing to conform with its general plan,

unless the city or county incorporates the congestion management program into the circulation element of its general plan.

65089.7. A proposed development specified in a development agreement entered into prior to July 10, 1989, shall not be subject to any action taken to comply with this chapter, except actions required to be taken with respect to the trip reduction and travel demand element of a congestion management program pursuant to paragraph (3) of subdivision (b) of Section 65089.

65089.9. The study steering committee established pursuant to Section 6 of Chapter 444 of the Statutes of 1992 may designate at least two congestion management agencies to participate in a demonstration study comparing multimodal performance standards to highway level of service standards. The department shall make available, from existing resources, fifty thousand dollars ($50,000) from the Transportation Planning and Development Account in the State Transportation Fund to fund each of the demonstration projects. The designated agencies shall submit a report to the Legislature not later than June 30, 1997, regarding the findings of each demonstration project.

65089.10. Any congestion management agency that is located in the Bay Area Air Quality Management District and receives funds pursuant to Section 44241 of the Health and Safety Code for the purpose of implementing paragraph (3) of subdivision (b) of Section 65089 shall ensure that those funds are expended as part of an overall program for improving air quality and for the purposes of this chapter.

APPENDIX I | CMP MULTIMODAL PERFORMANCE MEASURES

INTRODUCTION

The following set of 12 CMP Multimodal Performance Measures are included in the 2017 Congestion Management Program (CMP):

- Auto LOS
- Vehicle Miles Traveled
- Modal Split
- Pedestrian and Bicycle Quality of Service
- Transit Vehicle Delay
- Transit Accessibility
- Air Quality
- Duration of Congestion
- Hours of Delay/Person Trip
- Travel Time Index
- Transit Sustainability Policy
- Travel Pattern (in Person Trips)

These measures can be used in a variety of analyses. Some may be used in the development of the countywide long-range transportation plan (VTP), some may be used in the CMP monitoring process, some may be used in analyses of the impacts and effects of specific development projects, and some may be used for more targeted efforts such as corridor studies, transit or roadway capital projects. The Development of the CMP Multimodal Performance Measures and further detail about each measure are provided in Chapter 4.

Throughout this document, reference is made to measurements that are to be made system-wide, for selected links, or travel markets. The travel markets to be used with multimodal performance measures may vary based on the measure or type of analysis. The travel markets consist of typical travel origins and destinations for the County, and can be developed from review of existing travel patterns and the expected future travel patterns.

VTA CMP PERFORMANCE MEASURES

This chapter provides further detail for ten of the twelve current VTA CMP multimodal performance measures. Each subsection is divided into four parts: 1) a general description of the measure; 2) a synopsis of how the measure can be implemented; 3) a summary of the measure's application to an evaluation of system performance; and 4) an example of the measure's results from the travel demand model, GIS, or other analytic tools or process.

AUTO LOS

Auto level of service (LOS) measures the interrelationship between travel demand (volume) and supply (capacity) of the roadway system. LOS is used to qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, maneuverability, and delay. LOS is categorized into six levels, A through F, with LOS A representing free-flow travel and LOS F representing congested flow.

IMPLEMENTATION

Appendix E shows the definitions and thresholds for auto Level of Service for Intersections, Freeways, and Rural Highways used in the VTA CMP. This section outlines specific auto LOS methodologies used in VTA's CMP. The Traffic LOS Analysis Guidelines of the CMP Technical Standards and Procedures include more technical information on auto LOS measurement.

Urban Arterials — The 2000 HCM intersection analysis operations methodology, which is based on Average Control Delay, is used to monitor LOS on urban arterials (this includes expressways and principal arterials).

Freeway Segments — Freeway segments are evaluated based on the procedures of the 2000 HCM. Beginning in June 2003, VTA adopted density as the standard for monitoring traffic conditions and traffic impacts due to new developments. Prior to 2003, the CMP used travel speed as the criteria for monitoring traffic conditions.

Rural Highways — Procedures described in Chapter 20 of the 2000 HCM are used to measure the percent time-spent following and average travel speed, with appropriate inputs for peak hour and peak 15 minute traffic volumes, the percentage split between the two directions of traffic, the percentage of trucks in the traffic flow, and the type of terrain.

APPLICATION

LOS is a good diagnostic indicating any imbalance between capacity and demand on the transportation system. It is a vehicle based performance measure. It can be affected by

changes in capacity (supply) and changes in volume (demand). Changes in capacity are realized by adding additional lanes, improving intersections, increasing transit infrastructure on parallel routes, and using ITS strategies such as signal synchronization. Changes in volume can be caused by mode shifts, time of day shifts, or changes in travel patterns, i.e. changing origins or destinations.

LOS is a widely accepted measure of roadway and intersection performance. LOS alone is a good indicator of trouble spots for congestion in the road network. Used in conjunction with other performance measures such as passenger throughput it becomes a strong performance measure for the overall transportation system. Nevertheless, LOS has significant shortcomings. Even significant increases in the capacity of a roadway, intersection, or interchange may not change LOS because the pent-up demand from drivers who have avoided traveling during peak periods will now move from the shoulders of the peak period and into the peak period, or travelers may alter other travel patterns to produce what is called "induced demand." Thus, other performance measures must be relied upon to assess the performance of the transportation system and the success of mitigation measures. Furthermore, LOS is usually insensitive to transit, bicycle, pedestrian or land use improvements. Finally, it is not applied currently to arterial roadway segments for forecasting purposes.

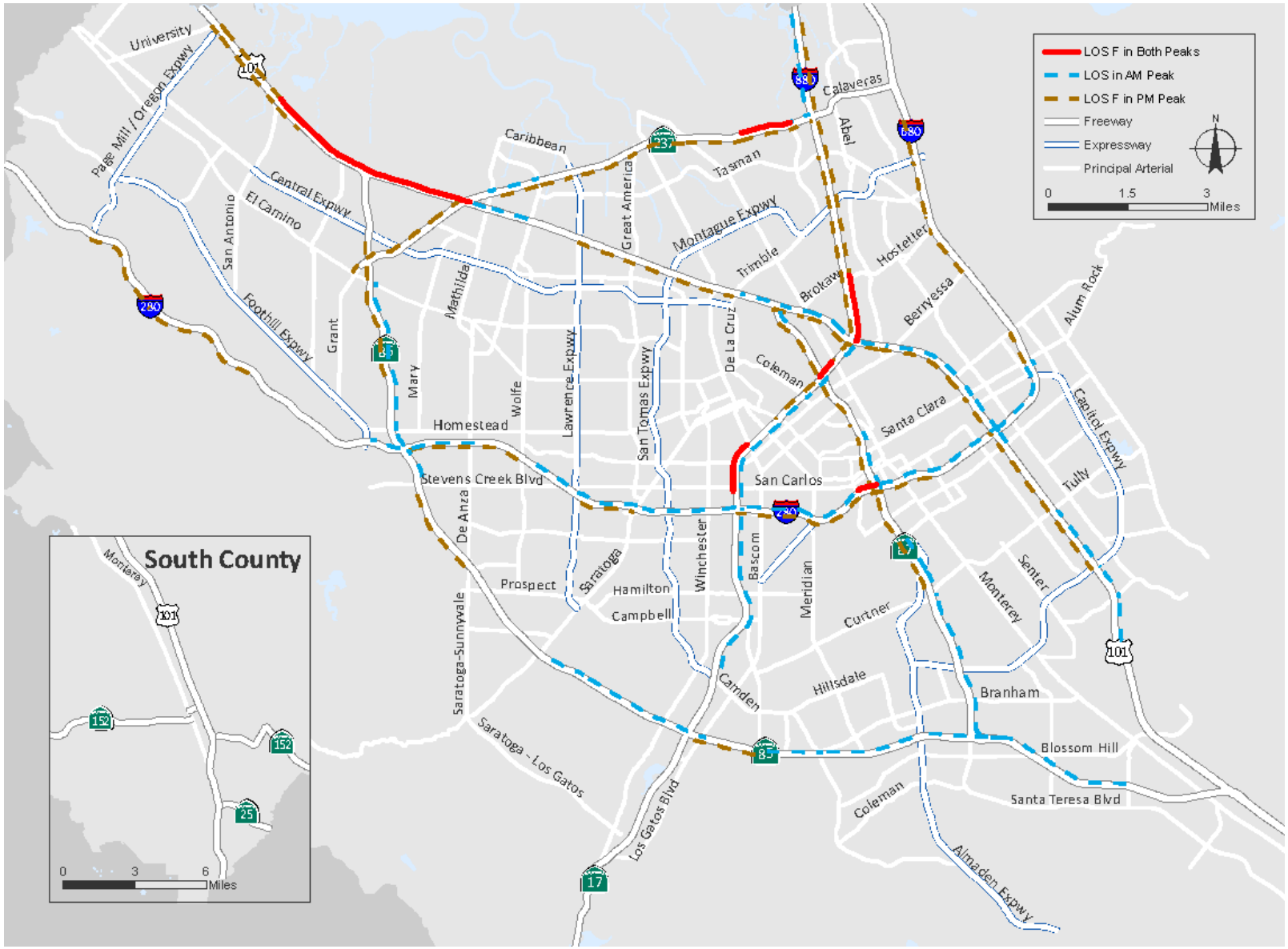
EXAMPLE OUTPUT

Figure I.1 illustrates how LOS can be presented in graphical format. Table I.1 shows the traffic level of service and miles of roadway at LOS F for a hypothetical 2020 base case and alternative.

TABLE I.1 | LEVELS OF SERVICE FOR THE MORNING PEAK HOUR

Roadway	From	To	Direction	Hypothetical Base Case 2020 LOS	Hypothetical Alternative 2020 LOS
I-680	County Line	Jacklin	SB	F	F
I-680	Berryessa	McKee	NB	F	
I-680	Capitol Expwy	U.S. Hwy 101	NB	F	F
I-880	County Line	Dixon Landing	SB		F
I-880	Montague Expwy	Brokaw	NB	F	
I-880	Montague Expwy	Brokaw	SB	F	
		Total LOS F (mi)		89.7	76.3

FIGURE I.1 EXAMPLE OF LOS F CONDITIONS IN MORNING AND EVENING PEAK PERIODS



VEHICLE MILES TRAVELED

DESCRIPTION

Vehicle Miles Traveled (VMT) is a measure of the total amount of vehicle travel on the roadway network. VMT is calculated by multiplying the total number of automobile trips by the average distance of each trip. VMT can be normalized to reflect travel efficiency, such as measuring VMT per capita, employee or person-trip. Normalization is an important step to understand the meaning of a given change in VMT. For example, an absolute increase in VMT could indicate a greater number of single-occupant vehicle trips; however, if the rise in VMT is slower than the rise in population (showing an overall decrease in VMT/capita), it would indicate that the usage of the transportation network is becoming more efficient over time.

During the development of the 1995 CMP, the CMA Board selected VMT per Person-Trip (VMT/P-T) as one of the CMP Multimodal Performance Measures. The remainder of this section will include a technical discussion of implementing and applying this specific measurement of VMT. VTA will be revisiting the VMT performance measure in the coming years in response to the implementation of Senate Bill 743 (see further discussion in Chapters 2 and 3) and will include additional details on VMT metrics in this Appendix in future updates of the CMP.

VMT/person trip (P-T) is the quotient of these two measures: a single number indicator that increases or decreases according to changes in VMT and/or person trips. It measures the intensity of the population's demand for vehicle travel. As the trend in population and job growth continues VMT will naturally increase. By using VMT/P-T, rather than VMT alone, the effect of population growth on the measure is normalized.

IMPLEMENTATION

VMT/P-T can be measured system-wide during the P.M. peak hour. The CMP model estimates the measure, which is reported as a single number for all modes. The model generates a VMT/P-T for a base year (e.g., 2010) and forecasts future VMT/P-T estimates for a base case investment scenario and other investment alternatives. The change between the base year VMT/P-T and the future year VMT/P-T shows the improvement or decline in the efficiency of the countywide transportation system as a whole (across all modes).

The current VMT are only those VMT inside the county and do not include the VMT for trips originating or terminating outside the county. This measure can report two VMT/P-T values. The first includes all internal (I-I) trips plus the internal-external (I-X) trips. The second shows the total VMT/P-T for all trips within (I-I) out-of (I-X) and into (X-I) the county. Both of these measurements require breaking up the external zones in the CMP model in order to account completely for an external trip's final origin or destination.

APPLICATION

VMT/P-T identifies the number of roadway vehicle miles of travel required to satisfy the mobility demand, measured in person trips. Vehicle miles of travel per person trip (VMT/P-T) is a compound performance measure, taking account of the intensity of the population's demand for vehicle travel. When monitored over time, it is an indicator of development density or urban sprawl. In addition, this measure may indicate the level of utilization for high-occupancy modes: the lower the value of this measure, the greater the reliance on high-occupancy vehicle travel.

If VMT decreases relative to person trips, it may be an indication that developing land use patterns are becoming more conducive to shorter trips. This would also be true if person trips were increasing while VMT remained the same. Conversely, an increase in VMT without an increase in person trips could indicate increasing urban sprawl.

VMT/P-T will increase if:

- Jobs and housing continue to decentralize, and people take longer trips to access their worksites and other activities.
- There is a reduction in transit or HOV mode share and more people rely on the private automobile as their primary mode.

VMT/P-T will decrease if:

- There is increasing density in an existing developed area.
- Transit use increases.
- HOV use increases.

The difference between VMT/P-T for I-I and I-X and Total VMT/P-T (I-I, I-X, and X-I) will increase if:

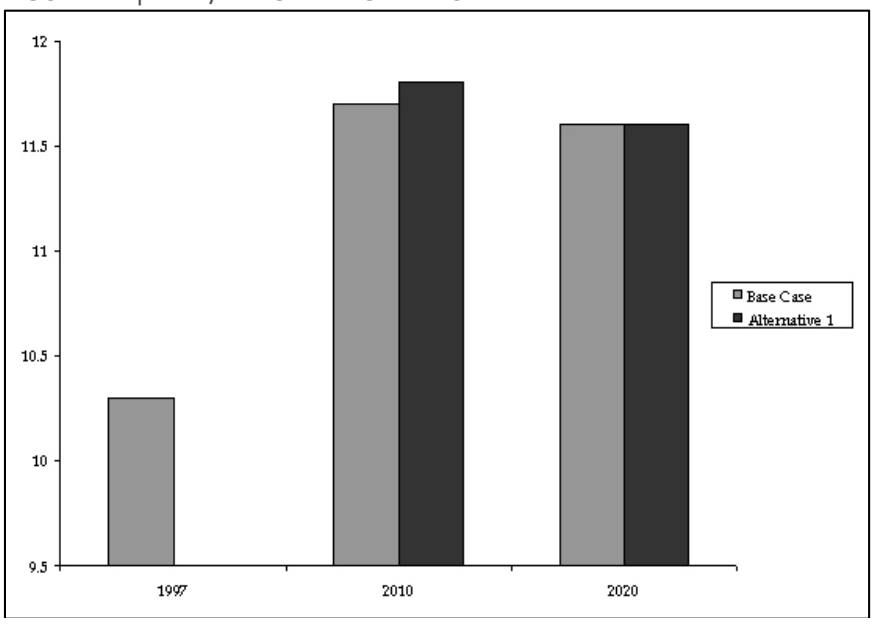
- The share of workers who are commuting from outside the county increases, thus people take longer trips to access their worksites and other activities.

Although VMT/P-T is not a good measure of congestion, it is a useful measure of mobility because it indicates the extent to which people must travel in vehicles to satisfy their travel needs. It is also a good measure for air quality, since it relates vehicle usage, mileage, and trip length. In other words, it indicates travel intensity and trip length, which LOS cannot measure. Thus, it can evaluate travel demand management (TDM) measures such as transit and carpool incentives, VMT fees and other private auto disincentives, and land use measures, such as improving the jobs-housing balance, which result in more concentrated trip patterns.

EXAMPLE OUTPUT

Figure I.2 shows the system-wide VMT/P-T for a hypothetical alternative over time.

FIGURE I.2 | VMT/PT FOR HYPOTHETICAL ALTERNATIVE



MODAL SPLIT

DESCRIPTION

Modal split measures the extent to which travelers use the various available modes. It is measured as the proportion of people making a trip on a given mode.

IMPLEMENTATION

Modes accounted for in the VTA CMP model are all monitored and reported in a modal split table. As of this writing the modes are:

- drive alone/single occupant vehicles (SOV);
- shared ride (HOV-2);
- shared ride (HOV-3+);
- transit (bus and rail); and
- walk, bicycle, and "work at home."

Transit can be split further into sub-modes including local bus, express bus, Caltrain, light rail transit (LRT), and Bus Rapid Transit (BRT). With updates to the CMP and regional travel demand models in recent years, the CMP model now has the capability of estimating walk and bicycle trips separately. Work at home, i.e., telecommuting is not estimated in the CMP model. Mode split can be measured for the A.M. and P.M. peak hour both system-wide and for the travel markets. At the travel market level, mode split can be measured exclusively for facilities on the CMP network within that travel market. System-wide mode split can be estimated using all facilities within the CMP system.

APPLICATION

Modal split is a direct measure of all the trips made on all modes. If specific mode split goals are established, trade-offs between highway, HOV, and transit improvements can be identified for programming decisions.

Modal split measures the effects of such projects as HOV improvements, rail or BRT capital projects, improvements to bus service, and various transportation control measures (TCMs). For example, mode share can measure the effectiveness of increasing parking rates at San Jose Airport or employment sites (to encourage use of transit) or other transit use incentives. When analyzed in conjunction with LOS, modal split provides valuable information on the state of the transportation system. If LOS improves, mode shares indicate if the change in LOS is due to the greater use of HOV modes. However, modal split does not specifically identify locations where problems may exist; therefore, it must be combined with other measures of system performance.

EXAMPLE OUTPUT

Table I.2 shows an example of mode split estimated by the CMP model. This table shows the current and 2030 projected mode shares for home based work trips. In this example, the number of transit riders is expected to more than triple, but the transit share of home based work trips will only increase by four percentage points.

TABLE I.2 | MODE SPLIT ESTIMATED BY THE CMP MODEL

	Drive Alone	HOV2	HOV3+	Transit	Bike	Walk	Total
2000	1,304,872	196,066	62,208	48,288	14,784	28,059	1,654,277
Percent of 2000	78.9%	11.9%	3.8%	2.9%	0.9%	1.7%	100%
2030	1,832,353	302,604	96,031	153,632	21,735	35,964	2,442,319
Percent of 2030	75%	12.4%	3.9&	6.3%	0.9%	1.5%	100%
Percent change 2000-2030	40.4%	54.3%	54.4%	218.2%	47%	28.2%	47.6%

PEDESTRIAN AND BICYCLE QUALITY OF SERVICE (QOS)

As part of the 2014 update of the VTA TIA Guidelines, VTA established a requirement for land use development projects proposing changes to existing roadway or intersection geometry or changes to signal operations to include a Quality of Service (QOS) analysis for bicyclists and pedestrians. A QOS analysis is also recommended for other projects and for documenting existing conditions. QOS methodologies typically measure features of the environment that affect the comfort and safety of bicyclists and pedestrians from the user's perspective, such as the presence and width of sidewalks and bicycle lanes, intersection crossing distance and delay, lateral separation from auto traffic, auto volumes, and the presence of landscaping or trees.

A comparison of QOS methodologies is provided below in Table I.3 (an excerpt from the 2014 VTA TIA Guidelines)

TRANSIT VEHICLE DELAY

As part of the 2014 update of the VTA TIA Guidelines, VTA established a requirement to disclose project effects on transit vehicle delay. The analysis shall include a quantitative estimate of additional seconds of transit vehicle delay resulting from automobile congestion caused by the project and any changes to signal operations proposed by the project, and a qualitative assessment of additional transit vehicle delay cause by any changes to roadway or intersection geometry proposed by the project, taking into account unique considerations of transit vehicles compared to autos (e.g. pulling into and out of stops, longer gaps needed for left turns). The transit vehicle delay analysis may utilize information from the auto LOS analysis to derive an estimate of additional seconds of delay to transit resulting from auto congestion.

A hypothetical example of a Transit Vehicle Delay analysis results is provided below in Table I.4.

TABLE I.3 EXAMPLE OF TRANSIT VEHICLE DELAY ANALYSIS RESULTS

Corridor	Peak Hour	Additional Transit Delay (seconds)						Affected Transit Routes
		Existing Plus Project		Background Plus Project		Cumulative Plus Project		
		NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	
Saratoga Avenue	AM	0.5	1.0	2.3	1.9	4.3	3.8	58
	PM	0.4	0.6	0.5	8.2	0.2	11.6	
Quito Road	AM	0.2	0.5	0.2	0.3	0.2	0.3	57
	PM	0.5	0.3	0.4	0.2	0.4	0.2	
Prospect Road	AM	0.1	0.0	0.3	0.0	1.1	0.0	26
	PM	0.0	0.0	0.2	0.0	0.7	0.0	

TABLE I.4 QOS METHODOLOGIES COMPARISON

Methodology	Analysis Level		Project Type		Mode		Data Required	Reference
	Intersection	Street Segment	Development	General Plan	Pedestrian	Bicycle		
Charlotte Bicycle and Pedestrian LOS	X		X	*	X	X	Medium	City of Charlotte *Urban Street Design Guidelines*, Appendix B
Pedestrian/Bicycle Environmental Quality Index	X	X	X	*	X	X	High	San Francisco Dept of Public Health, *Bicycle* and *Pedestrian Environmental Quality Index*
HCM 2010 Bicycle and Pedestrian LOS	X	X	X	*	X	X	High	*HCM 2010: Highway Capacity Manual*
Layered Network Approach		X		X	X	X	Varies	*LA Street Classification and Benchmarking System*, 2010.
Level of Traffic Stress	X	X	X	X		X	Medium	Mekuria, Furth and Nixon, 2012. *Low-Stress Bicycling and Network Connectivity*
Built Environment Factors	X	X	X	X	X	X	Varies	- Fort Collins, Colorado, *Pedestrian Plan,* 2011. Level of Service - Burien, Washington, *Transportation Master Plan, 2012.* Table 4, Pedestrian LOS Checklist.
* This methodology is appropriate for General Plan-level goal setting, but evaluating an entire street network would involve a substantial effort.								

TRANSIT ACCESSIBILITY

DESCRIPTION

Transit service performance can be measured using a local transit accessibility index, which disaggregates transit performance, by geographic zone. In contrast to the traditional mobility-based approach for the measurement of transit service performance that emphasizes the supply side of the transit service and underrates the interaction between land use and transit use, accessibility provides a place-based approach for understanding how transit service is divided between areas in Santa Clara County while accounting for demographic variation. This understanding can facilitate the development of integrated transit and land use plans and policy, as well as grant insights on locations with the most intense transit service or lack thereof.

IMPLEMENTATION

Transit accessibility can mean different things from various perspectives. Viewed from the production end of a transit trip, it refers to people's ability to reach opportunities, be it goods, service, recreations, or jobs, via transit. From the attraction end, the transit accessibility instead refers to the magnitude of the labor force or the size of the market area accessible via transit. The attraction end measure is especially meaningful for an urban center where parking is very restricted. Both being valuable, and with distinct policy implications, the accessibility measures from the perspectives of both ends are evaluated.

The accessibility measure for a zone is derived by aggregating values in a certain demographic field for all zones on the other end of transit trips and satisfying a defined transit travel time threshold. For the calculation of the production end measure, the employment at all the qualified attraction zones get aggregated to each corresponding production zone in question; while, for the attraction end measure, it is the households at all the qualified production zones that get aggregated. The transit travel time derived from the VTA Countywide Transportation Model is used to determine whether the value of a zone should be included for the aggregation or not. The transit time is calculated based on model inputs such as the transit service schedule, route coverage, street network connectivity etc, including time components such as walk time from origin to transit stop, wait time at stop, in-vehicle travel time, wait time at transfer interchanges, and time spent walking to the destination.

Besides traffic analysis zones, the access measures can be derived for other geographical units as well. However, by tying to traffic analysis zones, the measures can quickly analyze and incorporate both travel model and demographic data into any accessibility analysis. The measures derive from travel model data, so the outputs are in line with the travel model estimations and assumptions to a certain degree. Furthermore, it encourages a systems

approach to accessibility analysis through the combined estimation of multiple transit operator performance.

APPLICATION

The transit accessibility measures can indicate how well transit service serves the residents and businesses in Santa Clara County. These measures can indicate required changes in transit service parameters (such as headway and frequency) and highlight areas for new service through the addition or deletion of routes and stops. Due to the balance it strikes between zonal travels and demographic data, the accessibility measures also provide a sophisticated tool for measuring the effects of changing land uses and densities. In addition, the juxtaposition of the production end measure with the attraction end measure can expose the zones with high transit accessibility to job opportunities but low in residential units, or zones with high transit accessibility to workers or customers but lack of business or job opportunities.

Due to the large size of the VTA transit service network relative to the likely amount of route and service changes, the measure may show only small marginal effects of some transit improvements. However, due to the straightforward nature of the calculation, the resulted measures are still ratio data which make the comparison or calculation of interval still meaningful. The change in the measures can be captured with a simple subtraction.

EXAMPLE OUTPUT

Figures I.3 and I.4 show example outputs of this measure; Figure I.3 presents the relative access to employment by transit in Santa Clara County and Figure I.4 shows the relative access to workers or customers. The thematic maps are generated using the standard deviation categorizing method. The maps show the deviation of each zone from the median value of the whole county. The dark reds represent highest accessibility (near downtown San Jose), the medium reds indicate moderate accessibility (most corridors), and the light reds represent lower accessibility (in outlying parts of the county). This sort of output gives a concrete realization of the effects of transit improvements as well as a visual analytic tool for route location and alignment.

It should be noted that the transit travel time used in the calculation is based on the transit service and the roadway congestion level during the peak commute hours. Thus, the measures are more appropriate in evaluating accessibility for home-based work trips than for the trip purposes usually carried out during off-peak hours. Nevertheless, off-peak measures can be derived easily in the similar way by substituting the transit travel time with the off-peak one and employment attribute with a demographic attribute more appropriate to represent the off-peak activity.

FIGURE I.3 RELATIVE ACCESS TO EMPLOYMENT BY TRANSIT

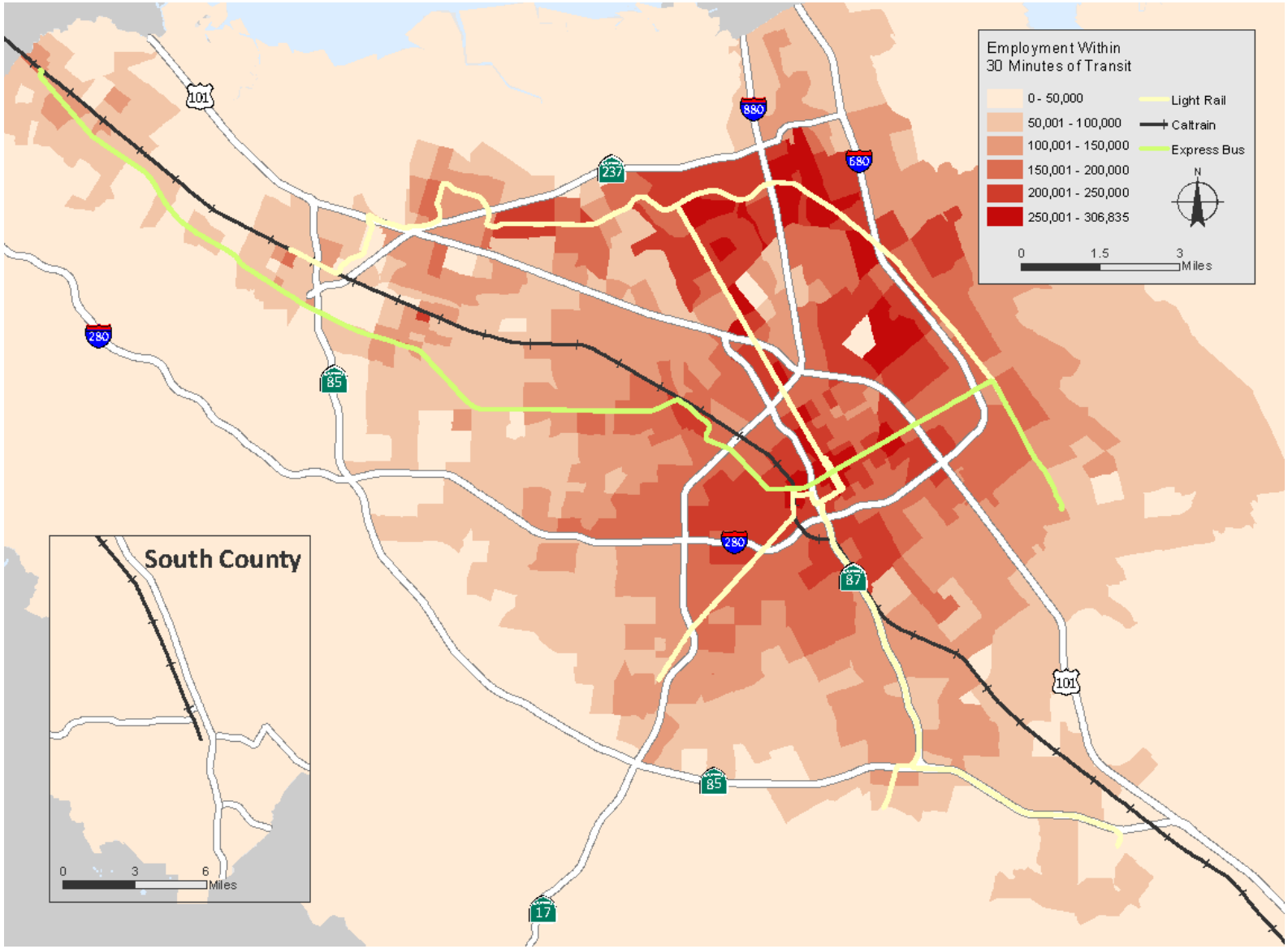
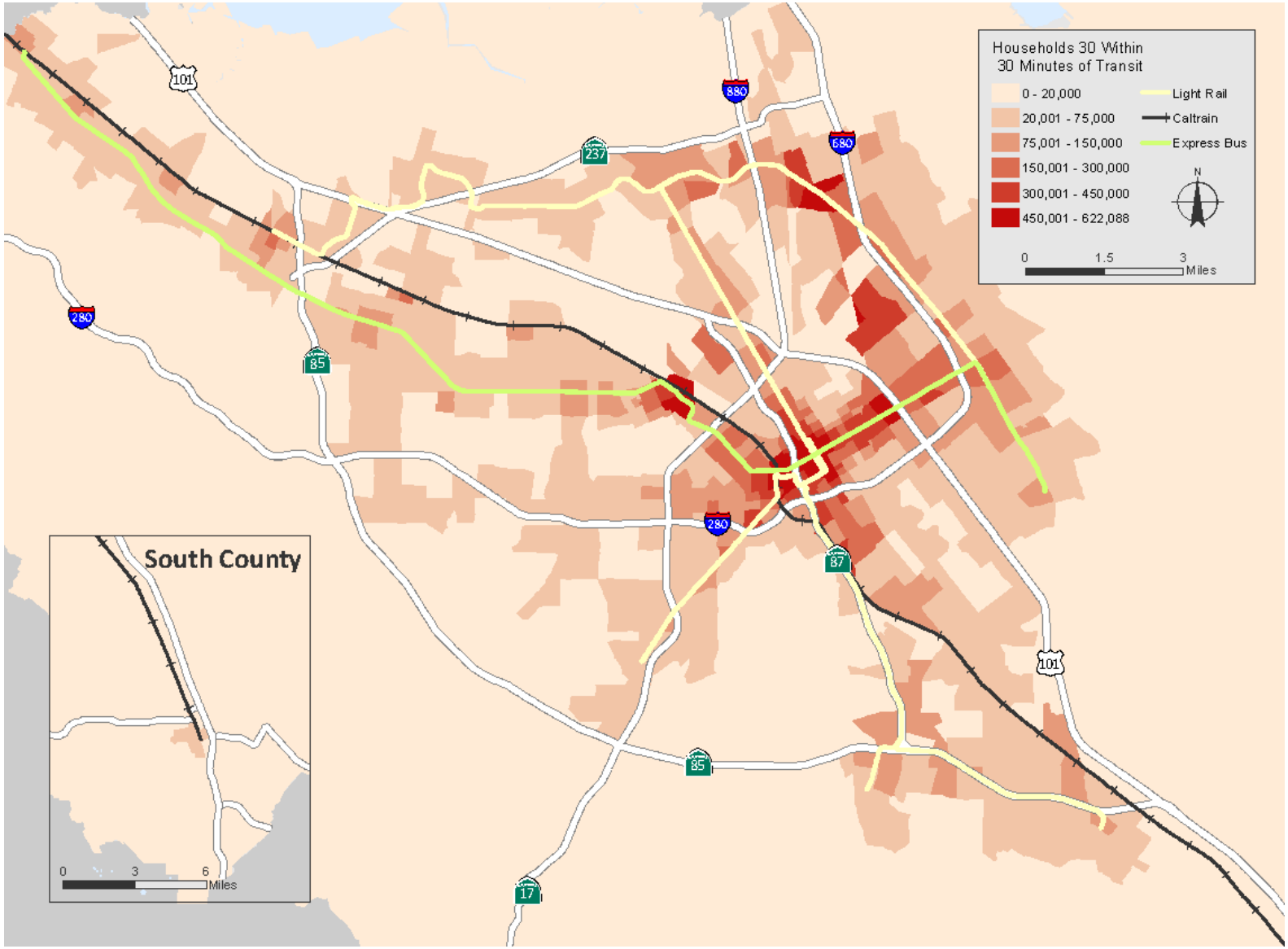


FIGURE I.4 RELATIVE ACCESS TO HOUSING BY TRANSIT



AIR QUALITY

DESCRIPTION

Vehicle emissions of air pollutants are measured in tons of pollutants and are related to several factors. These factors include cold and hot starts and stops, speed changes, and idling time. The air quality performance measure is necessary for conformance with state CMP guidelines for consideration of air quality impacts.

IMPLEMENTATION

Air quality is measured systemwide by pollutant type for the A.M. and P.M. peak hours using the CMP model. The pollutants measured include carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NOx), and particulate matter (PM).

APPLICATION

Improvements in air quality may indicate the benefits of an efficient multimodal transportation system, although it can be degraded by other performance measures (e.g., an improvement in the VMT per person trip measure is sometimes accompanied by a degradation in air quality due to an increase in cold starts). It is difficult to know whether improvements in air quality are due to efficient modal use or other factors. Air quality is a good measure of overall external impacts of transportation system operation, but it seldom diagnoses specific problems (as an individual measure). Since traffic speed and the amount of stopping and starting affect emissions, actions which improve traffic flow generally, reduce emissions. However, NOx tends to increase as speeds increase.

EXAMPLE OUTPUT

Table I.5 presents an example output for the air quality performance measure for a hypothetical Base Case and alternative.

TABLE I.5 | EXAMPLE AIR QUALITY PERFORMANCE MEASURE

Type	Time	Base Case	Alternative 1
Carbon Monoxide (CO)	A.M.	10.57	10.65
	P.M.	13.09	12.93
Hydrocarbons (HC)	A.M.	0.96	0.97
	P.M.	1.14	1.13
Nitrous Oxides (NOX)	A.M.	3.72	3.76
	P.M.	4.2	4.17
Particulates (PM)	A.M.	4.53	4.58
	P.M.	5.1	5.03

DURATION OF CONGESTION

DESCRIPTION

Duration of congestion measures the length of time that particular links are subject to congested conditions. This is a measure of peak spreading and it provides a good way of showing the length of time over which congested traffic conditions persist. When travel demand begins to exceed capacity, travelers have four adaptive responses: 1) they shift modes; 2) they choose not to travel (e.g., telecommute); 3) they take alternative routes, or 4) they travel at less congested times. If travelers adapt by any of the first three responses, the duration of congestion will not necessarily increase. If travelers choose to shift the time that they travel, then the congested period will spread.

IMPLEMENTATION

The CMP model is able to report volume and capacity on a link by link basis. A series of links can be selected and monitored for congested conditions. The monitoring can be done during the P.M. peak hour and the peak period. A curve depicting the peak spread can be estimated by evaluating the peak hour level of congestion relative to the peak period level of congestion. The method for estimating this measure is currently under development.

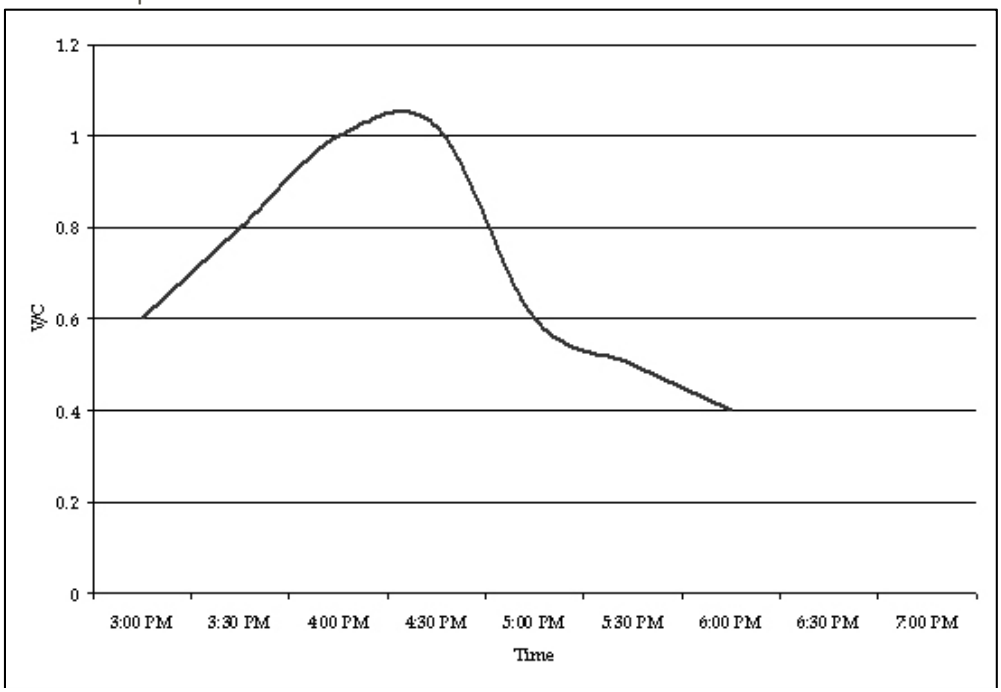
APPLICATION

Several of the performance measures already discussed measure the intensity of activity on the transportation system. As with Level of Service (LOS), duration of congestion is a highway and auto oriented performance measure and is typically measured on highway links in mixed-flow and high occupancy vehicle lanes and on arterials. Duration of congestion can be effected by changes in travel demand or changes in transportation capacity: such as adding highway lanes, improving intersections, increasing transit infrastructure, and using ITS strategies. Changes in travel demand include congestion pricing, land use policies that result in shorter trip patterns, and mode shifts.

EXAMPLE OUTPUT

Figure I.5 shows an estimated curve representing the P.M. peak duration of congestion for a hypothetical alternative. V/C in the y-axis refers to the volume over the capacity on the roadway.

FIGURE I.5 | ESTIMATED DURATION OF CONGESTION



HOURS OF DELAY/PERSON-TRIP

DESCRIPTION

This measure identifies the system-wide delay (in hours) due to congestion experienced by transportation system users. It measures the change in congestion and mobility. Increases in delay are typically due to increases in congestion, which represent a loss of mobility. It is generally measured for private vehicle users (SOV and HOV), but can also be measured for transit or other modal usage. Delay is generally determined by comparing travel time on the roadway facilities during peak congested conditions with off-peak uncongested conditions. In this case, delay is considered the difference in travel time between peak and off-peak conditions. Dividing by the number of person trips accounts for the changes associated with population and job growth.

IMPLEMENTATION

The CMP travel model can assess hours of delay system-wide during the P.M. peak hour.

APPLICATION

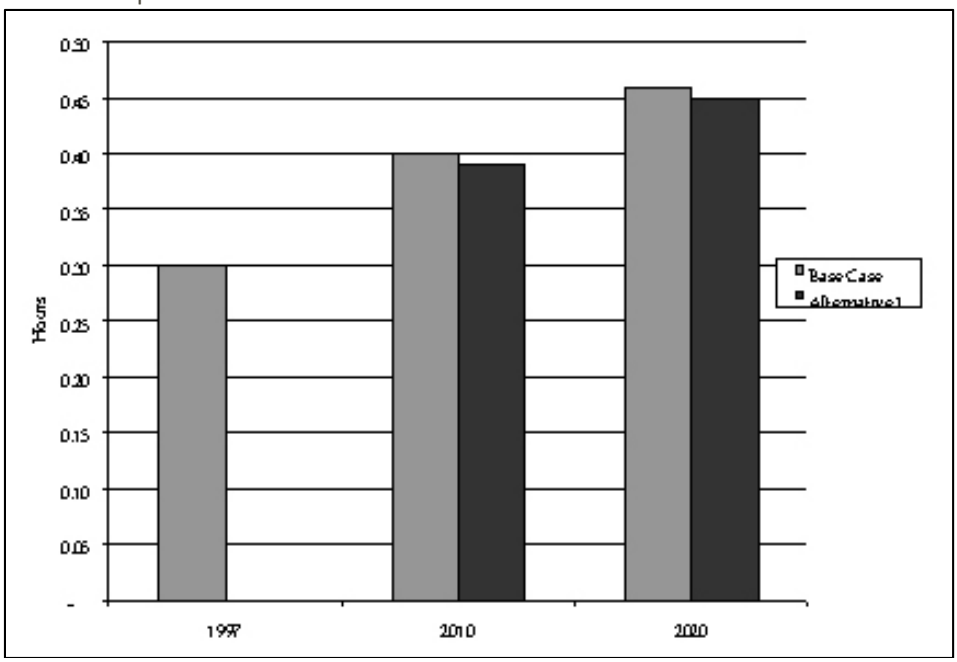
Delay tends to be more sensitive to mitigation efforts than LOS. For example, an intersection is currently operating at LOS F with a delay of 100 seconds. An action (or group of actions) improves the delay measure to a value of 85 seconds, but the LOS value remains at F, despite

the reduction. Hours of delay/person trip is a good supporting performance measure for freeway/expressway ramp and intersection improvements since most of the delays are felt in queuing and stop-and-go situations. Hours of delay can be a good indicator of the effectiveness of adding roadway and transit capacity to a travel market or system-wide. It is also a good indicator for system management projects such as ramp metering and signal timing.

EXAMPLE OUTPUT

Figure I.6 presents hours of delay per person trip for a hypothetical alternative.

FIGURE I.6 | EXAMPLE OF DELAY PER PERSON TRIP



TRAVEL TIME AND TRAVEL TIME INDEX

DESCRIPTION

Travel time is measured for the selected travel markets for a base year and some future year. The difference indicates the change in congestion over time. Travel time can be a more intuitive measure of mobility than delay, because the traveling public thinks more about how long a trip takes than comparing actual travel time to the hypothetical minimum under free flow conditions. This time differential can be converted into an index by normalizing it to a base year. The index facilitates the comparison of travel time over different years, between different alternatives and between different modes.

IMPLEMENTATION

The CMP model estimates travel times for a given base year and forecasts future travel times under alternative scenarios. The model estimates an aggregate travel time system-wide by mode. Travel time savings and loss are calculated by comparing the travel time of each trip with the baseline travel time for the same trip. A trip that is faster in the baseline than it is in an alternative will show a loss. A trip that is faster in the alternative will show a savings. The travel time index employs a set of origin and destination (O-D) pairs that are monitored over time. Once the O-D pairs are determined, a weighted average travel time is created.

To graphically display the O-D trip time information in a concise, easy-to-understand fashion, the trip times for the selected O-D pairs are aggregated into a trip time index. This index is generated by summing the travel times for all of the selected O-D pairs with an appropriate weighting factor (e.g., total peak hour person trip volume), and then normalizing the resulting value to 100 for a selected base year. As compared to measures based on LOS or delay, using a travel time index allows VTA to compare the travel time performance of different modes. This measure can be monitored for the A.M. and P.M. peak hours.

APPLICATION

The travel time index reports an average travel time (across modes). The strength of this measure is in its ability to show the differences in point to point travel times by mode. Thus, it is an effective measure for transit projects as well as roadway improvements.

EXAMPLE OUTPUT

Output from this measure can be presented in two ways. The trip times by mode for the alternatives can be presented in bar charts as in Figure I.7. Travel times monitored over time can be presented as line charts, as in Figure I.8.

FIGURE I.7 | EXAMPLE OF TRAVEL TIMES BY MODE (BAR GRAPH)

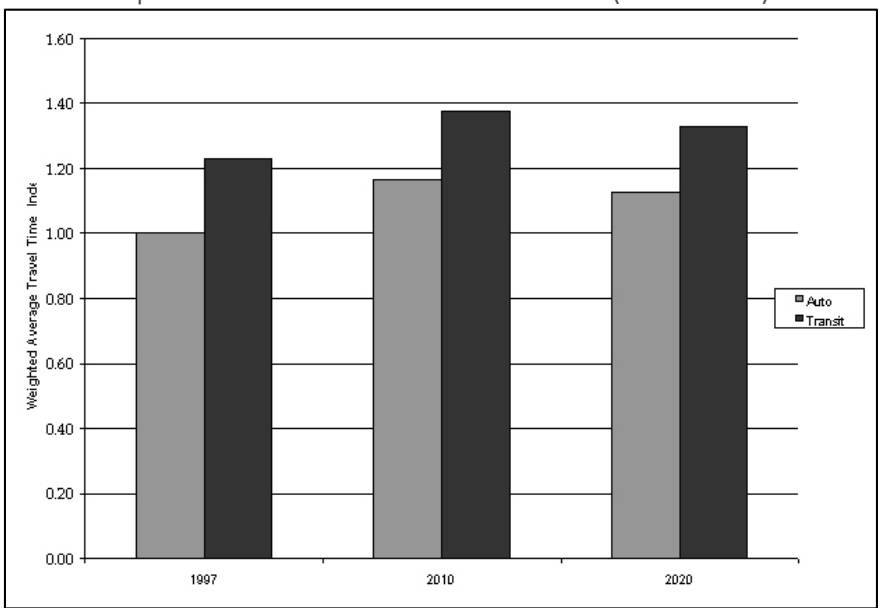
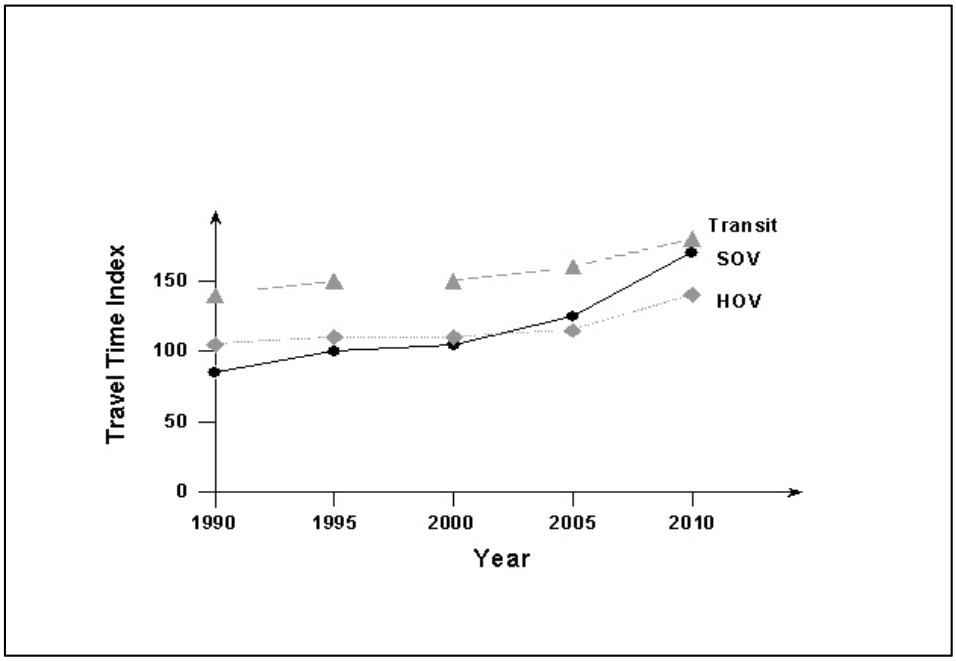


FIGURE I.8 | EXAMPLE OF TRAVEL TIMES OVER TIME (LINE GRAPH)



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