Bay Area 2004 Ozone Attainment Strategy
Preliminary Draft Control Measure Descriptions
March 16, 2004

Introduction

Air District and MTC staff have been evaluating potential control measures for inclusion in the Bay Area 2004 Ozone Strategy. The Air District has evaluated control measures for stationary, mobile and miscellaneous other sources. MTC has taken the lead on evaluating transportation control measures, in consultation with Air District staff.

Staff have presented the evaluations for public review at two meetings of the Ozone Working Group and have made them available on the Air District website. Based on discussions at the OWG, written comments, and further analysis, staff have begun developing draft control measures for inclusion the Draft Ozone Strategy. The attached materials present preliminary draft control measure descriptions. These draft control measure descriptions are still undergoing analysis and review, and thus are preliminary.

Work to date

The Air District control measure evaluations identified 57 potentially viable measures for stationary, mobile and miscellaneous sources. Staff is developing draft control measure descriptions for the potentially viable measures. In most cases, a draft control measure description includes proposals or concepts from more than one suggestion in the evaluation tables, because several suggestions may address the same source category or propose closely related control strategies. Thus, the number of draft control measures is less than the number of suggestions on the evaluations.

Stationary source measures will be implemented through revisions to Air District regulations. Mobile source measures will be implemented through incentive programs and public education programs. Miscellaneous measures will be implemented though public education programs and transportation programs. Preliminary draft control measure descriptions have been completed for the following stationary and mobile source control measures:

- Auto Refinishing
- Boilers Rated Between 5 and 10 MMBTU/HR
- Flares
- High Emitting Spray Booths
- Large Water Heaters and Small Boilers
- Low Emission Vehicles
- Marine Loading Operations
- Organic Liquid Storage Tanks
- Pressure Relief Devices
- Stationary Gas Turbines
- Wastewater Systems
- Wood Products Coating

Work is proceeding on developing control measure descriptions for the remaining stationary and mobile source measures:

- Gasoline Bulk Terminals and Bulk Plants
- Graphic Arts Operations
- Green Contracting Ordinance

- Polystyrene Resin Operations
- Truck Idling Ordinance

MTC has evaluated enhancements to transportation control measures covering a wide range of travel behavior and systems management concepts. Based on the evaluations and public input, MTC staff, in consultation with District staff, have prepared draft TCM descriptions. The TCMs address State ozone planning requirements for the Bay Area. TCMs adopted by MTC for federal air quality planning will be identified separately in the Ozone Strategy, in the section addressing national ozone planning requirements. TCMs will be implemented through State, regional and local funding processes, incentive programs, outreach and public education, and other programs. Preliminary draft descriptions have been completed for the following TCMs:

TCM 1Support Voluntary Employer Based Trip Reduction Programs
TCM 3Improve Local and Areawide Bus Service
TCM 5Improve Access to Rail and Ferries
TCM 7Improve Ferry Service
TCM 8Construct Carpool/Express Bus Lanes on Freeways
TCM 9Improve Bicycle Access and Facilities
TCM 12Arterial Management Measures
TCM 13Transit Use Incentives
TCM 15Local Land Use Planning and Development Strategies
TCM 18Transportation Pricing Reform
TCM 19Improve Bicycle Access and Facilities
TCM 20Promote Traffic Calming

Work is proceeding on developing draft descriptions for the remaining seven TCMs:

TCM 4Improve Regional Rail Service
TCM 6Improve Interregional Rail Service
TCM 10Youth Transportation
TCM 11Install Freeway/Arterial Metro Traffic Operation System
TCM 14Improve Rideshare/Vanpool Services and Incentives
TCM 16Intermittent Control Measures/Public Education
TCM 17Conduct Demonstration Projects

Next Steps

Air District and MTC staff invite public discussion and input on the preliminary draft control measure descriptions. Staff will consider public input, and conduct further analysis where necessary, in order to develop proposed control measures for inclusion in the Draft 2004 Ozone Strategy. Staff also will continue to develop draft control measure descriptions for the remaining potentially viable measures and TCMs, including contingency and other measures required for future federal air quality plans, as necessary. The remaining draft control measure descriptions will be released for public review, no later than the May meeting of the Ozone Working Group.

DRAFT

BAY AREA

2004 OZONE STRATEGY

Preliminary

Transportation Control Measure Descriptions

Prepared by
Bay Area Air Quality Management District in cooperation with
Metropolitan Transportation Commission
and
Association of Bay Area Governments

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The transportation control measures (TCMs) in this appendix for the 2004 Ozone Strategy were designed to reduce emissions from motor vehicles by reducing vehicle trips and vehicle miles traveled. TCMs may also reduce vehicle use, vehicle idling or traffic congestion. These TCMs address State ozone planning requirements for the Bay Area. TCMs adopted by MTC for federal air quality planning are identified elsewhere in the Ozone Strategy, in the section addressing national ozone planning requirements. Some of the TCMs are included in local, regional and state transportation programs. We expect to see those measures implemented, and achieve the emissions reductions we have projected. Other measures have little or no funding, and may require legislative authorization and voter approval prior to implementation. One example is TCM 18, Transportation Pricing Reform. While the Air District would also like to see the most effective TCMs implemented, we acknowledge that there are significant obstacles that first must be overcome. Public education efforts must be undertaken in order to gain acceptance of these often-controversial measures.

TCM 1 - SUPPORT VOLUNTARY EMPLOYER-BASED TRIP REDUCTION PROGRAMS

Purpose

TCM 1 will support and encourage voluntary efforts by Bay Area employers to promote the use of commute alternatives by their employees.

Background

The political and economic climate for employer-based trip reduction has changed since the early 1990's, when employer-based trip reduction programs received greater emphasis in Bay Area air quality plans. Major developments include 1) the enactment of SB 437, which prohibited mandatory employer trip reduction programs as of January 1, 1996, and 2) the reduction in public sector funding for transportation demand management programs.

Despite these developments, the need for trip reduction programs remains strong. As the Bay Area economy recovers from the current recession, employment will grow, which means that peak period congestion on Bay Area freeways and local roads will increase. Increased traffic volumes in general will increase motor vehicle emissions, and congestion in particular increases auto emissions due to stop and go traffic and lower average speeds. Employment growth in the Bay Area has been especially robust in suburban areas, which due to land use patterns and limited transit infrastructure, tend to have the highest drive alone rates. In the near term, carpool and vanpool programs are especially suited for many suburban locations.

Commute trips, which comprise 25% of daily trips, are still logical targets for employer-based trip reduction efforts due to: a) their key role in contributing to peak period traffic congestion and ozone formation, b) the long average distance of commute trips compared to other trip types, c) the repetitive nature of commute trips that occur on the same route and schedule each day, d) the pool of potential candidates for ridesharing at larger work sites, and e) the ability of employers to influence employee commute mode choice by means of the facilities, services, and incentives that they provide.

While the need for employer programs is undiminished, TCM 1 will focus on assessing employer needs and maintaining core support services to employers. Generally, most of this effort will be accomplished through the regional ridesharing program administered by MTC and through discussions between the Air District and employers involved in the Spare the Air program, the Bay Area Clean Air Partnership (BayCAP), and other outreach efforts.

Description

TCM 1 includes the following:

Phase 1 (2004-2006). Generally maintain current efforts:

- Provide core support for employer programs, based on an assessment of employer needs and the level of employer interest. Potential support includes assistance in developing or enhancing employer programs, information and referrals, employer networks, and programs to recognize outstanding employer programs.
- Support legislation to maintain and expand incentives for employer programs, such as tax deductions and/or tax credits for employer efforts to promote ridesharing, transit, and other commute alternatives. (MTC, Air District, Congestion Management Agencies.)
- Implement employer elements of the *Spare the Air* program (see TCM 16).
- Provide information and assistance to employers in organizing transportation fairs and other marketing events at Bay Area work sites.

- Work with employers to implement regional promotions such as Rideshare Week, Bike to Work Day, etc.
- Work with employers to implement provisions of the State parking cash-out law, where certain employers who lease parking and provide subsidized parking to employees must offer their employees the choice of the subsidized parking or the equivalent value of the parking space as a cash payment to use for commute alternatives such as carpooling, transit, bicycling and walking, or to retain as additional income (see TCM 18).
- Promote ***Commuter Check*** transit subsidy program to employers (see TCM 13).
- Implement sub-regional or local programs to promote employer-based trip reduction in those cities and counties that choose to allocate local resources to such efforts. (Congestion Management Agencies, county transportation authorities, cities and counties).
- Work with cities, counties and other public agencies who are also employers to develop commute alternatives, including telecommuting, compressed work week schedules, guaranteed ride home programs, etc. (MTC and the Air District can make special efforts to work with governmental agencies to encourage their support for these types of programs and explore new funding opportunities).

Phase 2 (Beyond 2006)

- Continue programs listed above.
- Seek legislation to create incentives for stronger voluntary programs for all employers or to require certain minimum elements of a basic commute alternatives program for public employers.

Travel Market Affected

This TCM targets commute travel, which accounts for approximately 25% of trips and 33% of VMT on a typical weekday.

Effectiveness

Due to existing legislation and the voluntary nature of this measure, no new emissions reductions are assumed. However, without maintaining current efforts, drive alone commute trips and emissions would likely increase.

Empirical results show that employer trip reduction programs can decrease vehicle trips to a typical worksite by as much as 5-10 percent. Results from a 1996 BayCAP survey showed that work sites with voluntary trip reduction programs reduced commute trips by about 8 percent compared to the average for large work sites in 1994-95 before implementation of mandatory employer-based trip reduction.

Cost

The costs of this TCM include the public sector costs to provide services to promote voluntary employer efforts as well as the costs to employers that choose to implement such programs. Much of the public sector costs are included in the cost of funding the regional rideshare program (see TCM 14).

Employer costs depend upon the number of employers that implement voluntary programs and the specific services and incentives that they offer to their employees. Data from studies of mandatory trip reduction programs indicate that employer costs typically ranged from $25 to $100 per employee per year. It is expected that employer costs for voluntary programs are lower, perhaps a maximum of $40-$50 per employee per year on average. Employer costs are offset to

some extent by indirect gains such as increased productivity of employees due to less stressful commutes and improved recruitment and employee retention.

Impediments

The primary impediment is the reduced employer interest in trip reduction efforts given the cost of implementing these types of programs in a weakened economy and the lack of authority for the Air District to require these programs.

Other Impacts

In addition to reducing emissions, this TCM reduces auto trips in congested corridors and reduces fuel consumption and greenhouse gas emissions (CO2). Employees will benefit from reduced commute costs, such as vehicle operating and maintenance costs.

TCM 3 - IMPROVE LOCAL AND AREAWIDE BUS SERVICE

Purpose

This TCM will help to reduce motor vehicle trips, vehicle miles traveled, and mobile source emissions by maintaining and improving the Bay Area's extensive bus system, and by funding replacement of diesel buses with clean fuel buses.

Background

TCM 3 will increase the attractiveness of local and regional bus service by ensuring the system is well maintained, adding more service as revenues permit, and developing new service concepts (such as enhanced bus, Rapid Bus Transit and Regional Express buses) to better serve existing markets and fill in regional transit gaps. There are 26 transit operators in the Bay Area that provide local and regional bus service. Each operator must tailor its service to local conditions. Cumulatively, these operators provided over 95 million revenue miles of bus service in FY 2001-2002. Fixed route bus service accounts for approximately _66% of all transit riders in the Bay Area. Certain elements of this TCM – e.g., express bus, enhanced bus, clean fuel buses – will reduce motor vehicle emissions; elements regarding maintenance of the current system seek to assure that existing emission benefits continue.

MTC's long range *Regional Transportation Plan (RTP)* dedicates significant funding to maintaining existing bus facilities and vehicles, but capital and operating shortfalls will still remain to meet future needs. Also, transit operators will be hard pressed to expand service without new revenues. Recent financial conditions have caused many operators to curtail service and/or raise fares. Therefore, the RTP does not anticipate significant improvements to local bus routes at this time, other than some of the improvements discussed below.

Two examples of recent service improvements which would be continued and expanded under this TCM are the enhanced bus/BRT concepts being developed by AC Transit, Muni, and Santa Clara VTA and the Regional Express Bus Program funded with State transportation dollars.

The Air District funds replacement of diesel buses with clean fuel buses through the Transportation Fund for Clean Air. Clean fuel buses meet specified emission standards and do not use diesel as their primary fuel. The Air District also funds retrofits of diesel buses to reduce emissions from existing diesel bus engines.

Description

Improvements in local bus service are determined by the individual transit operator boards, based on revenues available. Decisions on expanding local service must address both the needs of

commuters as well as low income travelers who do not have access to a car. MTC has defined a Lifeline Transit Network which addresses some of these needs.

The Regional Express Bus program was funded with $40 million in State transportation funds which were used to purchase about 90 buses serving 12 new regional express bus routes. Participating transit operators included: AC Transit, CCCTA, Fairfield/Suisun, Golden Gate Transit, LAVTA, Samtrans, Tri-Delta, Vallejo, and West Cat. These buses serve generally longer distance routes that fill in key transit gaps, and use freeway HOV lanes where possible to improve travel times and service reliability.

Several transit operators are considering or have implemented enhanced bus service on major arterials, most notably AC Transit's Route 72 along San Pablo Avenue. Enhanced bus service is a concept that includes more frequent service, relocated bus stops and signal priority treatment for better schedule adherence , real time bus arrival information, improved signage and other passenger amenities. San Francisco Muni has also developed a long range Vision Plan which would provide similar types of services along certain Muni routes. Bus Rapid Transit (BRT) includes most of the features of enhanced bus, and involves even more ambitious enhancements to bus service and would typically include dedicated lanes for bus operations as well.

Phase 1 (2004-2006)

- Continue to fund the timely replacement of worn out buses in local transit operator bus fleets; while providing flexibility to some operators to use federal funds for preventive maintenance (operating expenses) on a case by case basis.
- Sustain the existing Regional Express Bus Program (12 routes); possible expansion with RM 2 revenues
- Assist transit operators with further planning work on enhanced bus and Bus Rapid Transit concepts
- Continue to seek new funding for MTC's Lifeline Transit Network, to serve low income communities and assist persons transitioning from Welfare to Work (12 new services were recently funded by MTC using federal, state, and local funds).
- Complete retrofitting of 1,700 public transit buses with particulate traps and NOx catalysts. Continue Air District programs to fund the replacement of diesel buses with clean fuel buses and retrofitting of existing diesel buses with diesel emission control technology.
- Sustain current bus services to the three Bay Area commercial airports for air passengers and employees.

Phase 2 (Beyond 2006)

- Restoration of some local routes that were eliminated or where service was curtailed during the current economic recession
- Additional lifeline service as new funds become available
- Implementation of new Enhanced Bus and Bus Rapid Transit services consistent with the financial assumptions in MTC's long range Regional Transportation Plan
- Expansion of Regional Express Bus Programs in North and South Bay as defined in Regional Measure 2

Travel Market Affected

This measure would affect all intraregional travel, including commute travel, shopping, personal business, social and recreational travel, passenger and commute trips to airports, and school trips.

Effectiveness

Emission reduction estimates for 2006 include the following elements:

1) Regional Express Bus Program

2) AC Transit Route 72 Enhanced Bus

3) MTC program to fund catalytic converters for NOx on 1,700 public buses (2005-use Harold's latest calculation). The calculation would also include funding for clean fuel buses through the Air District's Transportation Fund for Clean Air – [Air District provide data]

These programs are expected to yield the following emissions reductions:

ROG	NOx
TBD	TBD

Emission reductions for 2015 [or other year TBD], the calculation would be based on:

1) Modest expansion of the Regional Express Bus program

2) AC Transit and Muni Routes likely to be included in the Transportation 2030 Plan

Cost

The cost of restoring and expanding local bus service cannot be estimated at this time. Capital and operating costs for the existing Regional Express Bus Program and various the AC Transit, Muni and VTA enhanced bus and Bus Rapid Transit programs are shown below (to be supplied later):

- Regional Express Buses
- AC Transit Enhanced Bus
- AC Transit BRT
- Muni Enhanced Bus
- Muni BRT
- MTC Lifeline Service (from Transportation 2030)

Impediments

According to MTC's latest financial estimates, the six largest operators of bus service will have combined funding shortfalls of $1.4 billion in operating and $740 million in capital replacement over the next 25 years (some of these transit operators also operate rail service as well). Thus restoring service that has been cut and expanding service will require new funding. New

revenues may be available in the future from higher gas taxes, bridge tolls, and voter approved sales tax revenues in individual counties.

Other Impacts

An improved bus system will offer more mobility choices for Bay Area travelers, provide a better transit network for those without a car, and reduce vehicle use. The Lifeline Transit Network improves mobility options for low income households. Reductions in vehicle travel will have corollary benefits in terms of saving energy, reducing greenhouse gases, and improving water quality through reduced runoff of oil laden water from roads.

TCM 5 - IMPROVE ACCESS TO RAIL AND FERRIES

Purpose

TCM 5 will reduce motor vehicle trips, vehicle miles traveled and mobile source emissions by reducing auto trips used to make short access trips to rail stations and ferry terminals and by increasing transit ridership by improving access to transit. This measure will expand feeder buses and shuttles, and improve bicycle and pedestrian access. By improving rail and ferry access options, these systems will become more convenient and there is a greater likelihood people will choose transit for their overall trip instead of a car. This measure will complement TCMs 3, 4, 6 and 7.

Background

The Bay Area's extensive investment in rail and will be maximized if there is convenient access to the stations and terminals. Often access is constrained because of limited parking and because transit service to stations may be infrequent or not serve nearby destinations. Walking and bike access may be unsafe or difficult due to local traffic conditions, inadequate bicycle parking, terrain or other obstacles. The same issues apply to existing and potential new ferry terminals that would be developed by the Water Transit Authority in the future.

From the standpoint of air quality, short station access trips by autos present particular problems and opportunities. Motor vehicle emissions are much higher when a cold engine has just been started ("cold start emissions"). Therefore, much of the air quality benefit of transit is negated if riders drive to the station. On the other hand, since most users of transit generally live within a few miles of the transit service, there is considerable potential for alternative access options other than by car. Feeder bus and shuttles, walking, and biking are the principal options. Extensive feeder bus service already exists to many rail stations, so the opportunities for further improvement may be limited, and new service can be expensive. Walking and biking improvements have been a recent focus of public attention, including the Safe Routes to Transit concept. Currently only about 1% of BART's riders bikes to BART. In addition there are a number of employer shuttles using vans or small buses that serve individual employers or groups of employers. (MTC estimates that there are about 170 small shuttle services in the Bay Area.)

Another new station access concept that is currently being explored is the use of "station cars" for short trips. Station cars could be reserved in advance by transit riders and used for the "last mile" of a passenger's trips from the station to their destination, where bus service, walking, or other means of transportation would take too long or be too inconvenient. Ideally, the station cars themselves would be low emission vehicles to reduce air emissions.

Improved rail/bus connectivity at key transit hubs is another aspect of improved access. MTC is currently evaluating improvements to regional transit connectivity in an ongoing study, and it is likely that there will be station specific recommendations for these hubs addressing signage, transit information, or specific physical modifications.

Many of these station access concepts were recently evaluated by MTC as part of the 2001 Ozone AttainmentPlan set of Further Study Measures (FSM 5), and findings from the study are included in this TCM.

Description

Bike/Walk Access: Improvements would include bicycle routes and lanes near transit stations, with connections to local and regional bike route networks; increased secure bicycle storage at transit, with bikestations at certain hubs; sidewalks, crosswalks, and direct pedestrian connections to nearby neighborhodds and activity centers, and better signage of bike/pedestrain access routes. This range of improvements is sometimes referred to as "Safe Routes to Transit".

Feeder Buses: Improvements would primarily focus on the transfer arrangements between rail and ferries and the buses to make the transfer more convenient. New ferry routes and terminals and new rail stations will need to be developed in collaboration with local transit operators who will provide the feeder bus service.

Station Cars: These are vehicles that could be located at rail stations for use by transit riders who need to travel to destinations near the stations, but which do not have good transit service or are too far or inconvenient to bike/walk to. Station cars would be shared vehicles that could be checked out in advance. Transit riders would pay for the use of the vehicle depending our on far and long it is driven. Station cars would need to meet the most stringent vehicle emissions requirements for maximum air quality benefit.

Shuttles: Bay Area shuttles are operated by a diverse group of employers, cities, and other transit operators. Since most shuttles require operating subsidies, the main issue is the need to provide stable funding sources so that the successful shuttles can be sustained over the long term. There may be additional opportunities to establish new shuttle services, on an a case be case basis. MTC analyzed new shuttle service in the 2001 Ozone Plan (Further Study Measure 5).

Phase 1 (2004-2006)

- Develop demonstration program for station car and bike station concepts at selected regional transit centers
- Determine long term funding needs for existing shuttles and examine funding options
- Begin implementation of Safe Routes to Transit to improve bicycle and pedestrian access (RM 2 provides about $20 million)
- Complete Regional Transit Connectivity Plan (MTC is required to complete plan by December 2005 under RM2)

Phase 2 (Beyond 2006)

- Continue Safe Routes to Transit improvements
- Continue and expand other successful concepts from Phase 1
- Develop a master plan for implementation of bike stations or other innovative secure bicycle storage strategies at key transit hubs.

The Air District's Transportation Fund for Clean Air (TFCA) funds public agency improvements to bicycle and pedestrian access, and local feeder bus or shuttle service to rail and ferry systems. The TFCA program funds several shuttle projects currently operating in the Bay Area. The amount of TFCA funds allocated to these routes generally decreases over time, and there is no guarantee these routes will continue to receive TFCA funding in the future. Efforts should be

made to capture and retain the transit market created by the these shuttle routes. The Air District will work with transit operators to develop TFCA applications for new shuttle and feeder bus service to rail and ferry stations that reduce emissions.

The Air District's TFCA program and MTC's Transportation for Livable Communities program fund bicycle and pedestrian improvements at transit facilities.

Cost

The cost of expanding fixed route feeder bus service is not known, and would depend on the operator and routes which would be expanded. Current operating costs vary between $76 and $114 per revenue service hour.

The cost of providing shuttles varies as well. Recent estimates for leasing a shuttle vehicle run between $35 and $75 per hour of service.

A very large station car program (1000 cars) would cost approximately $25 million for the cars (assume hybrid/SULEV type vehicles) and about $5 million per year in administration costs.

The cost of adding bicycle storage at transit stations depends on whether the storage is provided as an enclosed locker or through a more substantial Bike Station arrangement. Lockers are fairly inexpensive, costing about $1,500. Bike Station costs vary considerably depending on the services provided, ranging from under $100,000 for the Berkeley BART bike station to over $700,000 for the downtown S.F. Caltrain bike station. Assuring long term operating costs for bike stations also must be considered. A comprehensive program of Safe Routes to Transit to BART stations could cost over $45 million, as estimated by one bicycle advocacy group.

Effectiveness

Emission reductions associated with TCM 5 are based on the following programs and assumptions.

1) An increase in feeder bus trips by riders who formally drove to rail/ferry

2) Additional bicycle access trips based on provision of new storage and safe routes to transit.

3) 24 new shuttle services to rail and ferries

4) 1000 car station car program.:

ROG	NOx
TBD	TBD

Impediments

The ability of local transit operators to increase fixed route feeder bus service depends on availability of new operating funds, which are scare. While employers could underwrite the cost of shuttles, most of the time the costs are prohibitively expensive unless the employee pays a large portion. Comprehensive efforts to improve bike and walk access to a number of rail stations, will require new funding sources, such RM 2. An initial demonstration program for station cars at 4-6 stations may be able to access existing fund sources (CMAQ, RM2)

Travel Market Affected

TCM 5 will affect all types of trips, including commute travel, shopping, personal business, social and recreational travel, and school trips.

Other Impacts

This measure will improve traveler safety for pedestrians and bicyclists. Additional feeder and shuttle services would produce emissions which could be mitigated by retrofitting vehicles with catalysts (if diesel powered), or by purchasing CNG or electric vehicles. The measure could reduce local auto traffic and congestion around stations and alleviate potential auto parking shortages.

TCM 7 - IMPROVE FERRY SERVICE

Purpose

TCM 7 will reduce emissions from Transbay auto trips, which tend to be longer in length, and will also reduce auto traffic in highly congested bridge corridors. New high speed ferry service will offer a transportation alternative for crossing the Bay that is reliable, comfortable and provides a pleasant and relaxing travel experience. New ferry technology will result in overall emissions that are lower than those attributable to current passenger ferry service.

Background

Freeways and bridges that serve Transbay travel are already heavily congested in the peak periods, and during portions of the weekend. The number of trips crossing the Bay is projected to grow at a higher rate than the regional average over the next 25 years. Existing ferry services have all been expanded with newer, high speed vessels on the Larkspur, Vallejo and Alameda/Oakland routes to San Francisco. In 1999 state legislation created the new Bay Area Water Transit Authority to plan and operate new ferry routes beyond those currently in service. Their work produced an Implementation and Operations Plan in 2003, which recommended an expansion of existing ferry service and an initial set of routes shown below:

- Pittsburg/Antioch-Martinez-San Francisco
- Hercules/Rodeo-San Francisco
- Richmond-San Francisco
- Berkeley-San Francisco-Mission Bay
- Oyster Point (South San Francisco)-San Francisco
- Redwood City-San Francisco
- Treasure Island – San Francisco

Description

TCM 7 contains several elements. Phase 1 (2004-2006) primarily involves initial planning for new ferry service. A new low emission ferry will start Vallejo service in 2004. Phase 2 includes the start up of these services as well as further study into other possible new ferry service.

Phase 2 (Beyond 2006)

- Expansion of existing ferry service between Oakland/Alameda and San Francisco (two new vessels)
- New intermodal transit hub at Vallejo Ferry Terminal
- Expansion of service between Larkspur and San Francisco
- New Berkeley/Albany service to San Francisco (two vessels)
- New South San Francisco service to San Francisco (two vessels)
- Expand berthing capacity at the Ferry Building in San Francisco
- Feeder bus service to provide access to ferries (see also TCM 5)
- Expand carrying capacity for bicycles on ferries (see also TCM 9)
- Hydrogen fuel-cell ferry demonstration project from Treasure Island to San Francisco
- Assist operators in converting vessels to lower emissions

Phase 2 will also include the continuing study of other new services, including:

- Potential new service between, Richmond, Hercules/Rodeo, Martinez, and Redwood City to San Francisco;
- Further study of using the Port of Sonoma
- Potential new service for passengers and cargo between Oakland and San Francisco airports

MTC has worked with ferry and other transit operators to develop transfer arrangements, including low cost transfers and joint passes (see TCM 13).

Travel Market Affected

Transbay trips across the Bay bridges are projected to increase by 40% over the next 25 years, higher than the Bay Area average. This measure will focus primarily on peak period commute travel, when congestion on bridges is greatest. It will also provide an additional transportation option for shopping, personal business, and social and recreational trips. Tourism is also expected to generate a number of new riders for many of the ferry services.

Effectiveness

TCM 7's emission reductions are based on MTC's analysis of the seven new services above. Emissions from the ferry vessels would be lower than those attributable to current passenger ferry service, given the WTA's commitment to the operate ferries that are 85% cleaner than the EPA's 2007 Tier 2 standards for marine vessels. Phase 2 improvements are expected to yield the following emission reductions:

ROG	NOx
TBD	TBD

Cost

New ferry service requires funding for vessels, terminals and parking, and feeder bus service. Funds for several new services (vessels and operating funds) were provided through voter approval of Regional Measure 2 in March 2004. Local jurisdictions together with County Congestion Management Agencies will need to prioritize funding for terminals in their local funding process. Future expansion of existing ferry services is uncertain given current transit funding problems.

The capital cost of the seven (7) new ferry routes (as estimated by WTA) is $175 million (plus the cost for fuel cell project to Treasure Island), and the net annual operating cost is estimated to be $90 million.

Impediments

Passage of Regional Measure 2 provides partial funding for the Oakland/Alameda/Harbor Bay; Berkeley/Albany, and South San Francisco routes.. Planning for new ferry terminals, including environmental review and obtaining the necessary permits, could be lengthy depending on the site. Funding for feeder bus service to the new terminals will also need to be identified (see TCM 5).

Other Impacts

System level environmental impacts of an expanded ferry system were recently analyzed by the WTA in a comprehensive EIR; impacts of individual terminals would be assessed in separate project level EIRs. New ferry service could impact existing transit operators by shifting some existing passengers to water transit, resulting in some revenue diversion. New ferry terminals may result in traffic impacts on neighborhoods near the terminals. There could also be an increase in cold start emissions from the increase in passenger vehicles parked at ferry terminals during the workday.

An extensive system of ferries could add to the attraction of the Bay Area as a tourist destination and provide an economic stimulus.

Another major advantage of an expanded ferry system would be the role ferries would play in the event of a future earthquake that damaged one or more Bay bridges or BART. If an earthquake were to strike the Bay Area (highly probable over the next 30 years), ferries could play a vital role in post quake evacuation and in the immediate to longer term recovery period.

TCM 8 - CONSTRUCT CARPOOL / EXPRESS BUS LANES ON FREEWAYS

Purpose

The California Air Resources Board considers an HOV lane network to be a "reasonably available" transportation control measure. This TCM could help reduce mobile source emissions by continuing the development of an integrated Bay Area HOV lane system that will encourage use of carpools, vanpools and other high occupancy vehicles (HOVs), such as express buses. Well managed HOV lanes will encourage commuters and other trip makers to use high occupancy modes by providing faster more reliable travel compared to travel in the adjacent mixed flow freeway lanes. HOV lanes act in combination with other factors that influence carpooling and transit, such as free passage on the Bay bridges and limited or high cost parking in some areas.

Background

The Bay Area currently has 295 lane miles of HOV lanes, including freeways and expressways (in Santa Clara County). Another 70 lane miles are programmed in MTC's current Transportation Improvement Program. Monitoring of existing HOV lanes by Caltrans indicates that most all of these lanes carry considerably more people than the adjacent mixed flow lanes. Under state law, alternatively fueled vehicles identified with a sticker may also use the HOV lanes.

MTC periodically reviews HOV lane performance and updates the Bay Area HOV Lane Master Plan. Recommended HOV lane improvements are then included in the Regional Transportation Plan and programmed in the TIP. The latest HOV Master Plan would expand the system to 534 lane-miles. The HOV Master Plan also addressed other related issues, such as HOV lane

occupancy requirements, hours of operation, and enforcement. The latest update (February 2003) also included a comprehensive analysis of regional emissions from different HOV lane configurations, including conversion of existing lanes to HOV lanes, raising occupancy requirements to 3+ on all HOV lanes, and providing exclusive lanes for express buses.

Description

The measure primarily addresses the physical configuration of the HOV lane system and operational requirements. Express bus service is addressed under TCM 3. The Phase 1 HOV lanes are those included in MTC's current Transportation Improvement Program (TIP), whereas the Phase 2 lanes are those in the long range Regional Transportation Plan.

Phase 1 (2004-2006)

- 70 new miles of HOV lanes programmed in 2003 TIP
- New HOV to HOV lane connector at Rt 101/85 interchange in Mountain View
- New park and ride lots at various locations

Phase 2 (Beyond 2006)

- The 2001 RTP includes funding for an additional 144 lane miles beyond those in the TIP, plus other park and ride lot projects

Phase 2 will also include the further development of HOV lane support infrastructure and programs, including strategically located park and ride lots, HOV bypass lanes at freeway on ramps, direct access HOV ramps ("slip ramps") for carpools and buses to major employment centers, HOV-to-HOV lane freeway connectors to better integrate the entire network, possible use of freeway shoulders by express buses to bypass bottlenecks, and active enforcement of occupancy and use restrictions.

Increases in certain express bus services will be considered to maximize person carrying capacity of HOV lanes. TCM 3 discusses regional express bus service, which would be operated on HOV lanes in the Bay Area.

Average vehicle occupancy of all HOV lanes should be carefully monitored. MTC's HOV Lane Master Plan predicts that by 2010, seven corridors will have HOV lane volumes in excess of of the practical capacity of 1,600 vehicles per hour, and by 2025 15 out of 18 HOV corridors will exceed this volume. An increase in vehicle occupancy from 2+ to 3+ would normally be considered after other feasible corridor management strategies (Express Bus, expanded CHP enforcement, ramp metering, etc.) have been deployed.

As congestion continues to increase in the Bay Area and the length of the peak period expands, the Bay Area should consider moving toward a consistent regionwide set of hours (this would correspond to the current maximum spread of 5:00 a.m. to 10:00 a.m. and 3:00 p.m. to 7:00 p.m.). Additionally, there may be selected corridors and travel directions where hours of operation could be extended to mid-day hours (10:00 a.m. to 3:00 p.m.) based on travel conditions in the mixed flow lanes and the number of transit, carpools and vanpool users who could take advantage of these lanes.

Travel Market Affected

TCM 8 is aimed primarily at commute trips, which account for the majority of trips during the morning and evening peak periods. In the future, HOV lanes should help to increase average vehicle occupancy for other types of trips as hours of operation are expanded (e.g., shopping, personal business, school, recreational.

Effectiveness

MTC has estimated the regional emission reductions associated with the proposed HOV Master Plan update (total system of 534 miles) as shown below. Additional information on other configurations can be found in MTC's full report on Further Study Measures in the 2001 Ozone Plan

ROG	NOx
TBD	TBD

Cost

The cost of the HOV lanes is the 2003 TIP is $1.2 billion, and the cost of additional lanes in the 2001 RTP is $770 million. New county sales tax measures, if passed by voters, could provide funding for new HOV lanes in some counties (e.g., Sonoma Route 101).

Impediments

A review of the history of HOV lane violation rates indicates that there has been a dramatic improvement in HOV lane compliance, with only one lane exceeding the national average. However, continuing monitoring is important to preserve public support. Evaluation of future HOV lane performance in the HOV Lane Master Plan indicates that some lanes could become overcrowded in the future, and it may be necessary to consider changing occupancy requirements to preserve travel time savings; however, public resistance to such changes may be difficult to overcome.

Other Impacts

Increasing the use of carpools, vanpool, and express buses will have significant payoffs in conserving fuel, reducing dependence on foreign oil, and lowering greenhouse gas emissions. TCM 8 may have a short term negative impact on air quality due to emissions generated during construction and increased localized congestion.

HOV lanes outside the urban core may have some marginal impact on land use by making longer distance commuting more attractive. However, development decisions involve many other factors as well, and ABAG's adoption of a Smart Growth land use scenario (see TCM 15) is intended to focus more population growth in the Central part of the Bay Area, where HOV lanes will provide an important augmentation to mobility.

A well developed HOV lane network could serve as the foundation for conversion of these lanes to a High Occupancy Toll Network as discussed in TCM 18.

TCM 9 - IMPROVE BICYCLE ACCESS AND FACILITIES

Purpose

Bicycles are a low cost, widely available (60% of Bay Area households have at least one bicycle) and pollution free mode of transportation. TCM 9 will reduce mobile source emissions by expanding bicycle facilities serving employment sites, educational and cultural facilities, residential areas, shopping districts, and other activity centers. Typical improvements would include bike lanes, routes, paths, and bicycle parking facilities. Accessibility of transit to bike riders is also part of this TCM.

Background

According to the 1995 Nationwide Personal Transportation Study, 40% of all trips are two miles or less, and two-thirds are five miles or less. One-third of Bay Area employees live within five miles of their worksite. These short and medium length trips are well suited to bicycle travel, especially in the Bay Area's mild climate.

While a number of factors influence people's decisions about whether to use bicycles for their trip, key obstacles are the lack of safe and convenient bicycle routes and storage. Currently bicycles are widely used for recreational riding, but are less used as a commute mode, with only 1% of total daily trips being made by bike (compared to 9% by walking), or for other trips such as shopping or school trips. Greater use could be expected with a variety of local and systemwide improvements. MTC's 2001 Regional Transportation Plan defined a regional bike network for the first time, and MTC has decided to set aside funding in the Transportation 2030 Plan to complete critical gaps in this network.

Experience in cities such as Palo Alto, Davis, Seattle, and Portland, Oregon shows that bicycles can play an important role in local transportation. To obtain TDA funding from MTC local jurisdictions must have a Bicycle Advisory Committee to plan and prioritize funding for bike projects. These plans can also address related bicycle mobility and safety features such as signage, bike detectors at signals, safe lane widths, etc. Also, a number of Bay Area cities routinely incorporate bicycle improvements when maintaining or upgrading local streets.

Bicyclists also use transit extensively for their longer trips, and most Bay Area transit systems currently accommodate bikes (though some have restrictions during peak commute times). Buses accommodate bikes either through front mounted racks or on board of they can be folded. BART and Caltrain accommodate bikes on their trains, but with some restrictions. The Regional Express buses accommodate bikes with front racks as well.

A special issue for the bicycle community has been the provision of bike lanes on the Bay bridges. Bay bridges with bicycle lanes currently include the Golden Gate, new Carquinez Bridge, Antioch, and Dumbarton bridges. New bridges under construction that will include bicycle lanes are the new eastern span of the Bay Bridge (Oakland to Treasure Island) and new Benicia Bridge. A feasibility study has been completed of installing bike lanes on the western portion of the Bay Bridge (costs range from $160 million to over $300 million), and a study is being conducted of bicycle access across the Richmond-San Rafael Bridge.

Description

TCM 9 would focus on improvements to the Regional Bike Network defined in MTC's 2001 Regional Transportation Plan. TCM 9 also supports local efforts to provide bicycle access and amenities and to better integrate bicycles into roadway improvement and Caltrans' efforts to consider non motorized travel in all of their plans, programs, and projects.

The TCM includes the following types of programs and activities:

- MTC's Regional Bike Plan consists of over 600 miles of bike routes. MTC's proposed Transportation 2030 Plan provides $200 million in funding to complete critical links and to leverage local funds to construct even more facilities. As part of MTC's monitoring of the regional transportation system, MTC collects bike counts at a number of heavily traveled bike facilities.
- MTC and Air District grant programs fund bicycle improvements.

- Caltrans Deputy Director Order 64 requires Caltrans to incorporate non-motorized transportation options in design and construction of state highway facilities.
- Many local jurisdictions have developed bike plans and incorporate bike facilities when they rehabilitate or improve their local arterials (for example, in Santa Clara County).

Improvements to bicycle access and facilities is also discussed in TCM 15, Local Land Use Planning and Development Strategies and TCM 20, Traffic Calming.

Phase 1 (2004-2006)

- Fund Regional Bike Plan improvements (specific projects TBD)
- Develop on line bicycle mapping tool as part of the regional 511 traveler information number (MTC)
- Bike to work day promotion (MTC)
- Funding for bike improvements included in MTC's Transportation for Livable Communities (TLC) projects
- The Air District's TFCA program funds bicycle routes, storage and other facilities.
- Funding for other local bicycle improvements through local sales tax measures and state TDA Article 3 funds
- Fund Safe Routes to Transit improvements (see TCM 5).
- Encourage local jurisdictions to continue to develop safe and convenient networks of bicycle lanes and routes.
- Encourage local jurisdictions to provide bike racks or other secure storage in downtowns, shopping areas, and other activity centers.
- Encourage local jurisdictions to require bicycle access and amenities (e.g., bike storage, showers and lockers, etc.) as conditions of approval of development proposals.

Phase 2 (Beyond 2006)

- Generally a continuation of the above activities, but with the potential for additional funding from passage of local sales tax measures for transportation in various counties.
- Additional emphasis on bicycle training and safety related projects, including public education for both bicyclists and motorists

Travel Market Affected

TCM 9 will promote bicycle use (or bicycles combined with transit) for the entire range of local trips, including commuting, shopping, personal business, and social and recreational travel. The potential market for TCM 9 is significant, given that short distance trips of less than five miles account for the majority of all trips in the region.

Effectiveness

The emission reductions below represent a higher bicycle mode share for regional trips, assuming an aggressive development program that would increase the overall mode share from 1% to 2%.

ROG	NOx
TBD	TBD

Cost

MTC's current 2001 Regional Transportation Plan provides over $400 million for bike improvements over the 25 year planning period. The cost of completing MTC's Regional Bike Plan is estimated to be $625 million, and as mentioned above, the new 2030 Transportation Plan will provide a dedicated source of funding to help complete this network. Annual TDA Article 3 funding produces about $3 million per year for local bike improvements throughout the Bay Area, which can be applied to a wide variety of projects. MTC's TLC/HIP program also funds local community based projects, many of which involve bike facilities or bike related improvements. The Air District's TFCA program funds bicycle lanes, routes and bridges, bike racks and lockers, and other projects.

Impediments

Widespread use of bicycles is limited by a number of factors, including the user's physical ability, terrain, weather, need to carry cargo or packages, etc. Personal safety is another concern for riders who may not have extensive experience in riding in different traffic conditions, but can be addressed through training and by providing bike lanes and other safety improvements. Public education for motorists and cyclists to obey traffic laws and "share the road" would also improve safety. While most transit operators have formulated workable arrangements for accommodation of bikes, increased accommodation of bikes during peak passenger loads will still present operational issues for some operators. Dedicated bike lanes across some bridges may be extremely expensive or operationally infeasible. Bicycle accommodation at work sites may create additional costs for employers.

Other Impacts

Bicycles have low impact on the environment across all resource categories. Some major bike facilities may have localized environmental impacts that would be addressed in project specific EIRs. Since bicycles are an excellent means of physical exercise, TCM 9 will also promote public health. Increased bicycle use may reduce the need for auto parking at some employment or residential sites and transit stations.

TCM 12 – ARTERIAL MANAGEMENT MEASURES

Purpose

Arterial traffic controls include signals, stop signs, and yield signs. Coordination of signals on major arterial routes can reduce vehicle idling and acceleration by dedicating extra "green" time to the major traffic direction and thereby reducing vehicle emissions Bus operations will also benefit from these strategies through faster and more reliable travel times.

Background

Over 40% of daily regional vehicle miles of travel (VMT) occurs on arterials. By coordinating the operation of multiple signals, vehicles can travel at fairly constant speed over a long route, reducing stop and go emissions. Close to 60% of 7000 signals in the Bay Area are currently subject to some kind of coordination. Advanced technologies allow signal timing plans to be reset based on actual traffic conditions at an intersection or group of intersections. Signals may also be adjusted from a central traffic management facility that manages large signal systems. For all signal systems it is important from an efficiency standpoint to ensure that their signal timing plans are periodically updated to reflect changes in local and areawide traffic conditions over time.

Additionally, most local bus routes use arterials, and their operations can be impeded due to local traffic congestion which slows buses and reduces schedule reliability. Improving the performance and reliability of buses on arterials can stimulate increased ridership. Slower bus travel times also results in more buses being required to provide the desired headways. Signals can be equipped with software to extend the green time or switch the signal to green earlier to move buses faster and help maintain the schedule..

Description

This measure includes both the coordination of signals that have not yet been coordinated as well as the periodic retiming of signals that are coordinated to update their timing plans based on current traffic conditions. Of the approximately 2,500 signals in the Bay Area that have not been coordinated, it is estimated that roughly 50% are near enough to another coordinated signal to merit coordination. Also, for the 4,400 signals that have already been coordinated, the basic feature of this TCM is the updating of their timing plans to ensure they are optimized for current traffic conditions.

Arterial management projects should pay careful attention to the needs of transit. Cities and counties should assure that retiming plans include discussions with transit operators to determine whether it is feasible and desirable to implement bus priority treatment on an arterial. Arterial management strategies that can enhance transit operations include dedicated transit-only lanes, queue jumper lanes at intersections, signal priority, bus bulbs, increased enforcement of bus loading zones, and relocation of bus stops. Reports on the effectiveness of transit signal priority systems indicate that they could provide up to 15% improvement in travel time along a given route.

MTC also provides technical assistance grants to local jurisdictions to update signal timing plans. Another intersection treatment that can be evaluated, if local conditions permit, is development of "roundabouts", which allow intersecting traffic streams to move in a circle around an intersection, thus eliminating vehicle stops and idling associated with traditional signalized intersections. (Roundabouts are employed extensively in the United Kingdom and throughout Europe.)

Phase 1 (2004-2006)

- Maintain current technical assistance program (MTC) for local jurisdictions that wish to retime signals; the program will also encompass evaluation of bus priority treatments as part of retiming plans.
- Continue Air District TFCA program to fund projects to improve arterial conditions.

Phase 2 (Beyond 2006)

- Coordinate additional 1,200 signals and continue updating timing plans
- Working with bus operators, provide priority treatment along major bus routes

Travel Market Affected

TCM 12 will affect the entire range of trips made on arterials, including commute travel, school travel, shopping, personal business, recreation, and commercial travel.

Effectiveness

The emission reduction calculations include two components: 1) coordination of an additional 1,200 new signals, and 2) retiming one fifth of the existing coordinated signals each year.

ROG	NOx
TBD	TBD

Cost

The cost of coordinating/retiming signals is about $1,200 per signal. Advanced signal software and development of centralized traffic management centers would add to this cost and would vary depending on the sophistication of the installation.

Impediments

The main impediment to maintaining a well coordinated signal system is the interest and level of effort required from local governments who have had to reduce staff resources due to financial pressures. Where signal coordination on an arterial requires cooperation of multiple jurisdictions, the negotiations can take time to resolve both technical and policy issues.

Other Impacts

Optimized signal timing plans have been shown to be potent strategies for reducing automobile fuel consumption, and the attendant greenhouse gas emissions (early interest in signal timing sprang up during the fuel crisis of the early 70's and 80's). To the extent that bus priority treatments improve travel times and schedule reliability, ridership and transit revenues could increase. Also consistent travel time savings could allow operators to serve a high volume route with fewer buses, saving capital and operating costs.

It is also critical that arterial management projects carefully consider pedestrian and bicyclist safety. Reducing idling and stop and go traffic can reduce emissions, but arterial improvements – particularly those that speed the flow of traffic – should also assure that pedestrian and bicycle safety is preserved and enhanced. Measures to enhance pedestrian and bicyclist safety include: prominent crosswalks and pedestrian signals; signage and striping; provision of or improvements to mid-block crossings; bicycle loop detectors for signals; and consideration of bicycle access in planning new arterial construction or modifications. Bike/ped safety on arterials is also discussed in TCM 20, Traffic Calming.

TCM 13 - TRANSIT USE INCENTIVES

Purpose

TCM 13 will focus on programs that could potentially increase transit use and lower vehicle emissions, such as monetary incentives, better transit information, deployment of a universal fare card for transferring between operators, and better signage at transit stops and transfer locations.

Background

With 26 different transit operators in the Bay Area, transit users need convenient ways to plan trips, transfer between operators, and pay fares. Through cooperative efforts between MTC and the Bay Area transit operators, new technologies and strategies are being developed to make transit trips more convenient and to take less time.

Transit fare policies are determined by the policy boards of the individual operators, but MTC is developing a new universal fare card (Translink) to make fare collection easier and to make it easier for riders to transfer between systems. Under state law, MTC requires each transit agency in the region to maintain a fare/transfer revenue sharing agreement with every connecting agency. The ability of transit operators to stimulate ridership growth by providing discounted fares for

different age groups or various trip purposes depends on the individual operator's revenue base and the ability of the operator to pay for ongoing operating costs as well as longer term capital replacement needs. Increasing fares can decrease ridership, and has a particularly adverse impact on low income transit users. (MTC is currently conducting a study of overall transportation affordability.)

Various operators have also designated key transit hubs or centers for improvement (e.g., AC Transit's Comprehensive Service Plan which is developing 11 transit centers, 6 at BART stations), and these improvements are being made as funding becomes available.

Description

TCM 13 includes the following:

Phase 1 (2004-2006)

- TransLink®. TransLink is a program that utilizes "smart card" technology for the collection of fares on all the region's transit systems. It will significantly improve the convenience of fare payment and collection. The universal fare card is being deployed on transit systems throughout the region, making it easier for riders to use multiple transit systems and providing an improved revenue tracking mechanism for transit operators. The initial phase will include deployment of Translink with the major transit operators.
- Improvements to the 511 transit information service. Information for trip planning can be obtained by calling 511, which connects people to the individual transit operator, or through web based information on the internet at http://transit.511.org/. Web based transit information is also available for planning trips.
- Commuter Check/Ecopass. The Commuter Check program, which sells transit vouchers to employers who then give them to employees to purchase tickets and passes, continues to expand with over $12 million in annual sales. A similar type of program in Santa Clara County, called EcoPass, provides discounted tickets to employees through their employer. Residential EcoPass programs have also been implemented. MTC and the Air District will encourage employers, transit operators, local governments and others to promote and expand such programs.
- Improved signage at transfer hubs. MTC's Transit Connectivity Study is addressing the need for better signage and other information at transfer hubs, which would be a low cost improvement. The Study will be completed in early 2004, with Regional Measure 2 providing funds for an expanded effort.

Phase 2 (Beyond 2006)

In addition to the continuation of the efforts above, additional activities would include:

- Deploy real time transit arrival information. Bay Area transit operators are in different stages of studying and deploying equipment to provide real time bus/train arrival information. (BART has electronic arrival information signs, Muni is planning on a systemwide application, and AC Transit has installed bus arrival information signs along the San Pablo Ave. enhanced bus route.) Real time information improves the transit experience by removing uncertainty in knowing the arrival time for the next vehicle, minimizing waiting time, and increasing a passenger's sense of security for late night trips.

- Increased amenities at transit hubs and stops. The purpose for providing new amenities at transit hubs would be to improve comfort and convenience for riders and create a sense of "place" by having food, retail activities, restrooms, improved shelters, lighting improvements, etc. These improvements enhance the transit experience for riders, particularly regarding the quality of service and ease in making transfers.

- Complete transit centers as identified in AC Transit's *Comprehensive Service Plan* in Alameda and Contra Costa Counties.

Travel Market Affected

TCM 13 will make transit a more attractive and convenient option for a wide range of trips. Measures to promote the sale and subsidy of transit passes through employers focus on commute travel, whereas other measures would improve convenience for all types of transit trips.

Effectiveness

While it is likely that these types of activities could attract new riders to transit, the diversity of the measures and indirect manner in which they influence travel choices makes it difficult to assign specific air quality emission reductions to them. For example, several European studies of real time transit information attribute ridership gains of up to 5% with these systems, but it is not clear that the same results would be transferable to other locations.

Cost

Annual costs for various types of programs are provided below:

TransLink®

511

Commuter Check. The RTC Clearinghouse and Commuter Check program cost approximately $400,000/year

Real Time Transit Arrival Information. With the passage of Regional Measure 2 in March 2004, about $20 million in competitive grant funding will be available to implement real time transit information systems (the cost of large scale deployment is unknown because of the different types of systems and applications which are being considered in the Bay Area by different transit operators). Priority will be given to projects identified in MTCs Transit Connectivity Plan mentioned above..

Impediments

Most of the key elements of this measure are already in a mature stage of deployment. Development of more ubiquitous transit arrival information will depend on resolution of technological issues among by different transit operators and new funding. Provision of enhanced transit amenities at hubs will require new funding.

Other Impacts

TCM 13 is likely to enhance the overall perception of the quality of transit service in the Bay Area, and would have indirect benefits for reduced auto fuel consumption and greenhouse gas emissions to the extent the combination of strategies above produce new transit riders. Deployment of of real time transit information systems result in an unknown additional claim on transit operating funds.

TCM 15 - LOCAL LAND USE PLANNING AND DEVELOPMENT STRATEGIES

Purpose

Land use patterns directly affect how we travel between homes, jobs, schools, shops and services, and other destinations. Motor vehicles are a major source of ground-level ozone precursors, fine particulates, toxic air contaminants, carbon monoxide, and other air pollutants. TCM 15 seeks to reduce motor vehicle use and emissions by promoting land use patterns and development projects that facilitate walking, bicycling and transit use.

Background

The Air District since1986 has encouraged local governments to address the air quality impacts of all local activities by incorporating air quality elements or sections into their general plans. Since 1999 the District, ABAG, MTC and the Bay Area Alliance for Sustainable Communities have undertaken the Smart Growth Strategy/Regional Livability Footprint Project. The goal of the Smart Growth Project is to develop and implement a preferred land use vision for the region to promote environmental quality, economic vitality and social equity. During an extensive public workshop process, workshop participants identified a vision for the region that favors compact, mixed use development near transit stations, transit corridors and town centers. The Smart Growth vision is reflected in ABAG's Projections 2003, and will inform the Regional Transportation Plan (Transportation 2030), air quality strategies, and implementation programs of the regional agencies.

The California Clean Air Act (CCAA) requires regional clean air plans to include indirect source control programs to encourage developments, as well as local and regional plans, that:

- Minimize dependence on motor vehicles and, thereby, reduce air contaminant emissions;
- Require mitigation of adverse air quality impacts of facilities that do attract a significant volume of motor vehicle traffic.

TCM 15 responds to the indirect source requirements of the CCAA and the increasing understanding of the connection between land use, transportation and environmental quality as reflected in the Smart Growth Project.

Description

The location, mix, intensity and design of development influence travel choices. Communities can promote transit, walking and cycling by encouraging compact, infill development providing a mix of uses at moderate or high densities.

Local governments can address the land use/transportation/air quality connection through planning and development policies and programs. Cities and counties can integrate air quality-beneficial policies and programs into general plans and related implementation programs such as subdivision regulations, zoning ordinances, capital improvement programs, parking requirements, and development design guidelines. Localities can produce separate air quality elements, or can incorporate air-quality beneficial policies into the land use, circulation/transportation, and other required elements of the general plan.

Local governments and transit districts can prepare specific plans for downtowns, transit stations, and other activity centers. Development patterns can support transit, walking and cycling in various ways, including:

- focusing higher density development near transit stations and corridors

- Encouraging compact development with a mix of uses that locates housing near jobs, shops and services, schools, and other community facilities

- Encouraging infill development
- Locating shops and services near employment centers
- Designing streets, sidewalks and bike routes to ensure safe and convenient access for pedestrians and bicyclists
- Designing development projects to provide safe, convenient pedestrian access to transit stops and nearby services
- Reducing parking requirements

Phase 1 (2004-2006)

MTC's Transportation for Livable Communities (TLC) planning grants fund local planning programs to promote community revitalization. .

MTC will consider a new planning grant program to fund specific plans around transit stations and corridors.

MTC's TLC capital grants fund local projects that promote transit, walking and cycling.

MTC's Housing Incentive Program (HIP) provides financial incentives to cities to provide high-density housing near transit stations and corridors.

MTC's "T-Plus" program will provide funding to each county congestion management agency to promote community revitalization projects.

The Air District's Transportation Fund for Clean Air (TFCA) funds bicycle projects, traffic calming, shuttles, low emission vehicles, trip reduction programs, and other clean air projects. Funding levels average approximately $20 million/year.

ABAG will periodically update and monitor its Smart Growth demographic Projections.

MTC will include in the RTP a transportation/land use policy statement.

MTC will develop incentives and conditions to promote supportive local land use policies around major new transit investments that generate ridership sufficient and make new transit investments economically viable.

MTC, ABAG and the Air District could develop financial and other incentives to encourage innovative parking strategies to promote reduced amounts of parking, parking fees, and other parking programs. Cities and counties have authority over parking policies. Local governments could take various actions to promote innovative parking strategies, including:

- Reduced parking requirements. Reduce parking requirements, particularly at transit oriented and infill development, mixed use projects, senior and affordable housing, and other appropriate locations.
- Shared parking. Promote shared parking at mixed use projects and other appropriate locations.
- Parking fees. Raise public parking fees, and consider residential permit programs to alleviate spillover concerns.
- Parking cash out. Promote parking cash out through outreach, financial assistance, and requirements through CEQA processes or conditions of approval.

- Technical assistance. Maintain examples of best practices and innovative parking strategies. Highlight and publicize through workshops, guidance documents, awards, and other methods.

MTC, in cooperation with transit operators and local governments, will examine promising opportunities for transit oriented development.

ABAG will promote multi-jurisdictional planning along selected transit corridors to encourage transit oriented development.

MTC, ABAG and the Air District will pursue legislative changes to remove barriers and provide incentives for smart growth.

MTC, ABAG and the Air District will engage in outreach and public involvement processes to build support for smart growth programs.

The Air District, MTC and ABAG will explore ways to promote carsharing as a way to reduce parking requirements. The regional agencies and cities and counties could support carsharing through financial incentives, helping secure additional parking, assistance with marketing, and pilot programs. Emphasis should be placed on hybrid and SULEV vehicles to maximize air quality benefits.

The Air District will monitor implementation of indirect source mitigation programs in other regions for potential feasibility in the Bay Area.

The Air District, MTC and ABAG will consult with and provide technical assistance to local jurisdictions interested in pursuing smart growth strategies.

The Air District, MTC, and ABAG will highlight and publicize noteworthy examples of local clean air plans, policies and programs, as well as noteworthy development projects.

Cities and counties are encouraged to require the provision of bicycle access and facilities (e.g., bike lanes/routes, secure parking and showers/lockers, where appropriate) at developments such as employment centers, shopping centers, and residential complexes (see TCM 9).

Cities and counties should assure that local plans, policies and programs encourage walking and promote a safe and convenient pedestrian environment (see TCM 19).

Cities and counties, in cooperation with transit providers, should prepare transit station area plans for appropriate transit stations and transit centers, with the goal of promoting higher density, mixed use development, multimodal connections and convenient pedestrian access in order to increase transit use, walking and other alternative modes.

The Air District will continue to provide technical support to local jurisdictions and others on air quality analyses in environmental review processes.

The Air District encourages cities and counties to develop strategies to reduce emissions from sources other than motor vehicles, such as lawn and garden equipment, woodstoves and fireplaces, and residential and commercial energy consumption.

The Air District, ABAG and MTC will study opportunities to promote location efficient mortgages (LEMs) to encourage home purchases near transit.

Phase 2 (Beyond 2006)

Implementation of smart growth strategies will occur over many years. MTC, ABAG and the Air District will continue the programs listed above, and refine and augment them as appropriate, in future years. Budgetary and legislative constraints may influence long-term programs.

Travel Market Affected

Local planning and development to improve air quality and reduce motor vehicle travel will address all types of trips–commute, shopping, school, recreation, social, and personal business.

Effectiveness

TCM 15 is expected to yield the following emission reductions:

ROG	NOx
TBD	TBD

This TCM would reduce emissions over the long term by promoting better integration of land use and transportation at the local level and by supporting the implementation of the other TCMs in the Ozone Strategy.

Cost

It is impossible to quantify costs associated with this measure. Costs would include preparation of general and specific plans, development review and environmental clearance, public capital investments, private investment in development projects, and other costs. Costs would be offset by rents and tax revenue from new development.

Impediments

Because the Smart Growth land use pattern results in accommodating more people in the urban core with more in fill type development, there will sometimes be jurisdictional and neighborhood concerns with increased density, traffic, localized air pollution and other impacts. Providing appropriate levels of transit service for this new development will require additional funding. A full range of incentives will need to be developed, which will take time and possible legislative action. Local governments may have limits to the staff resources available to making major changes in their plans and zoning to reflect the Smart Growth projections..

Other Impacts

Local plans, policies and programs that effectively integrate land use, transportation and air quality considerations can help cities and counties achieve the following benefits:

- Preserve open space, agriculture and other land resources
- Improve housing supply and affordability
- Reduce long distance commuting
- Increase mobility
- Conserve energy
- Improve water quality
- Use infrastructure and land more efficiently
- Increase transit ridership

- Improve economic competitiveness
- Enhance community attractiveness and quality of life

The Smart Growth Strategy/Regional Livability Footprint Project preferred land use vision will provide emission benefits in neighboring counties as more housing is provided in the Bay Area, cutting down on long distance in commute trips. MTC analyzed effects in neighboring counties and estimated roughly a 2.8% decrease in VMT and ozone precursor emissions.

TCM 18: IMPLEMENT TRANSPORTATION PRICING REFORM

Purpose

There is growing interest in new strategies to price the use of the region's transportation system that could have long term implications for improving air quality and addressing persistent congestion issues. Pricing of transportation facilities would not only affect travel behavior, but would generate new revenues for future transportation improvements and for TCMs in this plan. Sound economic principles require a link between the cost of providing transportation facilities and services and the cost of using them; however, recent transportation funding decisions have decreased the proportion of funding from user based charges (such as gas taxes and tolls) and increased reliance on non user charges (such as local county sales). A variety of pricing strategies have been suggested to restore and better link the price of transportation with user demand and with the indirect costs of transportation consumption related to air and water quality impacts.

Background

Gas taxes have been the historic means for paying for transportation improvements, and as prices increase motorists generally will curtail some of their travel. Federal and state taxes currently amount to about 36 cents per gallon, and have not increased in over a decade. Increases in fuel efficiency and increased use of alternative fuels also reduce revenues from gas taxes. The arguments for new transportation fees are based on the need to provide enhanced transportation choices as much as they are on providing near term emission reductions. In order to affect the number of trips and amount of travel made by autos, pricing strategies would need to significantly increase the cost of gas, tolls, parking, etc., to levels that probably are not currently acceptable to the public (particularly given the already high cost of living in the Bay Area). Public surveys of interest in increasing the gas tax, even at modest levels of 10 cents per gallon, show significant public opposition. Efforts to secure legislative interest in strategies such as congestion pricing on the Bay Bridge also have failed to garner enough support to advance this concept, even as a demonstration project. Thus, the theory and implementation of new strategies must be coupled together in a pragmatic approach, and include outreach to business and environmental organizations and the public at large to build support for these measures.

Specific traffic management fees include congestion pricing (fees change by time of day), High Occupancy Toll (HOT) lanes (solo drivers pay to access freeway carpool lanes where they would otherwise be prohibited), and cordon pricing (such as the fee paid to drive in central London).

Vehicle based fees that could encourage motorists to purchase low or zero emission cars included registration fees and fees based on the emission characteristics of the car and amount of mileage driven.

Parking availability and the pricing of parking are also key determinants in how often people use their vehicles and are discussed under TCM 15.

With all of the above pricing concepts, the new revenue could be applied to transit, carpooling, bicycle facilities, pedestrian improvements, and other programs to enhance alternatives to driving alone. Or they could be used for some system management programs that lead to more efficient

vehicle operations, or approaches to reduce emissions frommore polluting vehicles, such as diesel vehicles.

Although pricing measures offer potential for reducing air pollution and congestion, certain aspects of these fees could have disproportionately large effects on low income households, and would have to be designed with remedies in mind.

Description

Pricing measures under this TCM would require close cooperation between the Air District, MTC, the business community and other stakeholders to develop legislative support. This TCM would consist of the following pricing options:

Phase 1 (2004-2006)

- **Higher Bridge Tolls**. Regional Measure 2 will increase bridge tolls, by $1. Higher bridge tolls will have a modest impact on shifting Transbay trips to various modes of transit. Bridge tolls are still relatively inexpensive compared to similar tolls on other bridges around the country.

- **Gas Tax Increase**. MTC has authority for placing a regional gas tax measure on the ballot for up to a $0.10 increase over 20 years. Through periodic polling, MTC will continue to investigate the viability of proposing a regional gas tax to Bay Area voters (which would currently require a 2/3 margin of approval). This measure would include building legislative and public support for higher federal and state gas taxes, either through a tax increase or indexing current taxes to keep up with inflation. In addition, in the 2004 legislative session, two bills have been proposed that would increase gasoline and diesel taxes to provide additional revenue for transportation and air quality programs.

Phase 2 (Beyond 2006)

- **Congestion Pricing**. MTC and the Air District will continue to test legislative support for congestion pricing on the Bay bridges. If authorized by the legislature, MTC and Caltrans will begin a demonstration of congestion pricing. If this demonstration is successful, congestion pricing may be expanded to other bridges in the region.

- **High Occupancy Toll (HOT lanes)**. The most likely lane to be developed for testing this concept would be in the I-680 corridor (Sunol Grade), and would allow single occupant vehicles to pay for using the carpool lane to avoid congestion in the adjacent mixed flow lanes. Additionally MTC will be investigating the concept of a much more extensive system of HOT lanes, using the existing HOV system as a foundation for this network. Surplus revenues (those available after paying for the direct operating costs) generated by a HOT lane could be used to pay for expanding the HOT network or for commute options in congested corridors. Real time pricing would also be considered, which would factor in the value of the travel time savings compared to slower travel in the more congested mixed flow lanes. A preliminary evaluation by MTC of the air quality benefits shows decreases in VOC and increases in NOx. Any HOT lanes pursued under this TCM should be those showing the greatest emission reduction benefit.

- **Regional and State Gas Tax Increases of up to 50 Cents per Gallon**. This measure would consist of a 10 cent regional gas tax and an additional amount equal to the current federal and state tax. The increase in federal and state taxes can be supported by the rising cost of maintaining the existing transportation infrastructure and the need to provide transportation improvements to accommodate future growth. Still, this increase would be far less than the taxes paid in Europe and Japan on gasoline. In the long term, this TCM

assumes gas prices approaching levels in Europe and Japan, given the declining production of oil over time due to depletion of existing reserves.

- **Regional VMT Fees.** VMT fees would directly relate to wear and tear on the roads and the amount of running emissions generated by on road travel (but not cold start emissions). VMT would be less susceptible to revenue loss due future increases in fuel efficiency of cars and would have some impact on moderating the amount of vehicle travel conducted. A portion of the fee could be based on the air pollution characteristics of the vehicle (i.e., cleaner vehicles would pay less). These fees could eventually be considered as an alternative to raising the gas tax, and revenues could be used for a broad array of transportation and air quality programs. (Also see Vehicle Registration Fees below.)

- **Taxes on Diesel Fuel.** A higher diesel fuel tax would be used to reduce NOx and particulate matter emissions from older heavy duty diesel trucks, which can stay on the road for many years due to the durability of their engines. Funds could go to help offset the cost of purchasing new vehicles, repowering existing vehicles with cleaner engines, or retrofitting trucks with catalytic converters that significantly reduce NOx and particulate matter.

- **Emissions-based Vehicle Registration Fees**. Vehicle registration fees would be used to influence the purchase choices of new vehicles. Annual fees would be based on vehicle emission characteristics and the amount of annual driving that is conducted (which would be assessed at the time the vehicle undergoes a Smog Check). The fees would be used in turn to pay for various air quality programs, such as vehicle buy back, fixing emission controls on mid-aged vehicles, incentives to tune up vehicles prior to the next smog season, financial assistance to low income families that would face hardships with costly tune-ups, and other programs.

Travel Market Affected

Market-based measures would affect all types of travel, including commuting, commercial trips, shopping, personal business, and social and recreational travel.

Effectiveness

TCM 18 is expected to yield the following emission reductions:

	ROG	NOx
Congestion Pricing Gas Tax $0.10/gal.	TBD*	TBD*
HOT Network Regional VMT fee ($0.05/mi) Gas Tax $0.50/gal. VMT fees Diesel taxes Emissions-based fees		

* Emission reductions would vary, depending on whether program is revenue neutral.

Cost

Different fees would generate different amounts of revenue. Pricing measures would obviously entail out-of-pocket expenses for many drivers, in some cases substantial expenses, especially those who are either unable or unwilling to shift to alternatives to the single occupant vehicle. However, most of these expenses represent transfers within the region's economy that could be directed to enhanced transportation alternatives and vehicle emission reduction programs. Increased costs to households and businesses would be offset to a certain degree by reduced costs of vehicle ownership, operations and maintenance.

Impediments

Bay Area business associations, government agencies and environmental organizations have historically expressed support for consideration of new pricing measures. Their support will be needed to secure legislation authorizing pricing measures. New fees would, however, have significant impact on business related costs and household expenditures, and therefore would continue to be unpopular with the public and Legislature. To obtain approval of new pricing strategies directed at improving air quality, there will need to be compelling reasons for their implementation based on tangible and near term improvements in traffic and air quality. Programs involving substantial pricing increases will need to mitigate the impacts on low income households.

Other Impacts

Pricing strategies that reduce the number of vehicle trips by modest amounts in congested corridors could produce relatively large improvements in delay. Revenues from pricing strategies could also provide new transportation options that provide faster or more convenient travel and save users considerable amounts of time. Reduced travel demand could lead to considerable savings in fuel consumption, dependence on foreign oil, and greenhouse gas emissions. Reduced vehicle use could extend the useful life of vehicles, and may stimulate consumers into purchasing more fuel-efficient and lower polluting vehicles.

TCM 19 – IMPROVE PEDESTRIAN ACCESS AND FACILITIES

Purpose

Implementing measures to make pedestrian travel safer, more convenient and more attractive will promote walking, reduce the need to use autos, and therefore reduce mobile source emissions.

Background

Virtually all travel, regardless of mode, entails some walking at some point in the trip. Many trips are very short in length. Approximately 14% of all trips are one-half mile or less in length, and 28% of all trips are one mile or less. These trip lengths are a reasonable walking distance for most people and represent an enormous opportunity to reduce motor vehicle use and emissions. Eliminating short vehicle trips is especially beneficial to air quality because vehicle emissions are highest at the beginning of a trip. In many parts of the Bay Area the share of trips made by walking is very small, as many people rely on the car. Much of this low level of pedestrian travel can be attributed to low density, single-use land use patterns and development of streets and roads and development projects that lack adequate attention to the pedestrian environment. MTC has recently focused more attention on pedestrian safety issues by creating a Regional Pedestrian Committee in 2002 to address the gamut of pedestrian planning and education issues of interest to local communities. Pedestrian improvements proposed in this TCM complement measures in other TCMs, particularly TCM 15 and TCM 20.

Description

There are numerous actions that can be pursued in order to increase pedestrian travel, including the following:

- Local general plans, specific plans and zoning ordinances should promote land use patterns that facilitate walking, such as increased densities, mixed land uses, focusing development around transit stops, strengthening downtowns and community centers, infill development and reuse/redevelopment of underutilized land.
- The design and placement of buildings in new development should encourage walking, for example by providing sidewalks/paths, minimizing setbacks, locating entrances near sidewalks and transit stops, etc.
- Locate and design parking so that pedestrians have direct, attractive access.
- An integrated street network with direct routes for pedestrians and ensuring easy pedestrian access between neighboring developments, as well as downtowns, commercial areas and community centers, should be provided.
- Pedestrian amenities such as sidewalks, benches, landscaping, etc. should be provided at new development.
- Existing development and streets should be retrofitted to incorporate pedestrian-friendly improvements.
- Street design standards should enhance pedestrian safety and comfort through measures such as reduced street width, reduced turning radii, crosswalks with activated signals, curb extensions/bulbs, buffers between sidewalks and traffic lanes, street trees, etc. Traffic calming strategies are discussed in greater detail in TCM 20.
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Cities and counties can undertake a variety of actions to promote pedestrian travel, including the following:

- Review and revise general and specific plans to assure that land use policies promote development patterns that encourage walking and circulation policies that emphasize pedestrian travel.
- Review and revise zoning ordinances, subdivision ordinances, parking requirements and other local programs to include pedestrian-friendly design standards/guidelines.
- Review and revise street design standards to promote pedestrian access, safety and comfort.
- Include pedestrian improvements (e.g. sidewalks, lighted crosswalks, traffic medians and better signage) in local capital improvement programs.
- Designate a staff person to be pedestrian or non-motorized (pedestrian/bicycle) program manager.
- Require developers to provide pedestrian amenities in new projects.
- Identify and implement pedestrian-friendly improvements to existing streets and developments.
- Emphasize pedestrian safety in enforcement of local traffic codes and public education campaigns.

Phase 1 (2004-2006)

- The Air District, MTC and ABAG will comment on pedestrian improvements in related elements of city and county on general plans, policies and programs, and in CEQA documents (see TCM 15).

- MTC will continue to fund the Transportation for Livable Communities (TLC) program which includes funding for projects in local communities which improve pedestrian mobility.

- MTC will continue to support the Pedestrian Safety Task Force, develop pedestrian safety programs, collect data on pedestrian safety issues, and report on safety trends in the annual State of the System Report.

- The Air District's TFCA program funds certain pedestrian improvements (those that support development projects that reduce motor vehicle emissions).

Phase 2 (Beyond 2006)

- MTC and the Air District will continue to identify and fund planning projects to identify ways to enhance pedestrian movement in neighborhoods, downtown centers, and near transit stops.

- Continue funding specific improvements through a variety of programs, including TLC, TDA Article 3, local sales tax measures, etc.

- Support Safe Routes to Schools (also see TCM 10)

Travel Market Affected

Pedestrian improvements will tend to have a greater impact on trips for shopping, school, recreation and personal business since these trip types generally are shorter in length than work trips.

Effectiveness

TCM 19 is expected to yield the following emission reduction:

ROG	NOx
TBD	TBD

Cost

MTC's current TIP provides $69 million for bike and pedestrian projects. Owing to the very localized nature of a large number of small projects, it is difficult to develop a comprehensive estimate of pedestrian funding needs.

Impediments

Pedestrian improvements tend to have a lower priority in communities than improvements for autos and bicycles; therefore there is a need to raise the general awareness of the importance of pedestrian issues in communities and the need to integrate pedestrian improvements into street upgrade and maintenance projects.

Safety concerns related to crime as well as conflicts with motor vehicles sometimes dissuade people from walking. Pedestrian improvements and related programs, e.g., enforcement of traffic laws, should enhance pedestrians' actual and perceived safety.

Other Impacts

In addition to reducing motor vehicle emissions, pedestrian improvements will decrease the chance of personal injury, benefit health and fitness, and generally foster a greater sense of community vitality.

TCM 20 - PROMOTE TRAFFIC CALMING MEASURES

Purpose

"Traffic calming" is the combination of mainly physical measures that slow vehicle traffic and improve conditions for pedestrians and bicyclists in residential and retail areas. These measures are often desired by communities that experience excessive cut through traffic or that want to slow vehicle speeds to protect pedestrians and cyclists. Children and older adults are often considered particularly vulnerable. Motor vehicle emissions are reduced to the extent that walking and cycling increase and overall vehicle travel in an area is reduced.

Background

Traffic calming modifies the streetscape to reduce the number and speed of motor vehicles, smooth speeds and increase the attractiveness of transit, bicycling and walking. Traffic calming has been most extensively implemented in Western Europe. Traffic calming has grown fastest in Germany, with one province reporting over 8,000 traffic calming areas in 1989. Many of the traffic calming techniques used in Europe are implemented on an areawide basis, which is generally not the case in the US. Areawide traffic calming strategies are preferable because they improve pedestrian and cycling conditions throughout an entire neighborhood or district, rather than shifting traffic from one street to another.

Many communities in the Bay Area are developing traffic calming plans and installing traffic calming devices. Berkeley is developing a residential traffic calming program, and has installed numerous traffic diverters, speed humps, and other devices. Palo Alto has a Neighborhood Traffic Calming Program and has implemented traffic calming improvements in many parts of the city. Cotati completed a traffic calming plan for the downtown area. Oakland constructed a traffic median on International Blvd. in the Fruitvale district. San Francisco's traffic calming program is implementing a variety of site specific and areawide projects.

Description

There are many traffic calming strategies that cities and counties may consider. The most effective programs generally involve thorough consultations with residents and merchants, as well as public safety officials.

MTC's Transportation for Livable Communities program and the Air District's Transportation Fund for Clean Air fund traffic calming projects.

The following actions can be taken to implement traffic calming in the Bay Area:

- **Pedestrian Streets.** Pedestrian streets exclusively reserve streets for use by pedestrians. Consider converting streets to pedestrian streets where:

- Streets have significant pedestrian activity, and
- Pedestrians are able to access the area via transit, bicycle or walking and the area is difficult to access by motor vehicle.

- **Residential and Neighborhood Traffic Calming.** Implement traffic calming on residential and neighborhood streets through:

- Road humps and speed tables which raise the surface of the road,
- Traffic circles/mini-roundabouts that replace traffic signals and stop signs at intersections,
- Narrowing of motor vehicle lanes, introduction of dedicated bike lanes and wider sidewalks,
- Chicanes, which place physical obstacles or parking bays, staggered on alternate sides of the street so that motor vehicles must slow down to maneuver through the street,

- Traffic throttles/pinch points that restrict a two-way road over a short distance to a single lane,
- "No Entry" signage restricting through motor vehicle access,
- Surface treatments including textured surfaces such as brickwork, paving and rumble strips designed to warn drivers of excessive speed or of an approaching hazard where speeds should be lowered, and
- Merging the street/sidewalk to the same height and use of the same paving materials so that there is no distinction between the road and sidewalk.

- **Arterial and Major Route Traffic Calming.** Arterial traffic calming generally limits motor vehicle speeds to 33 mph on arterials and major routes, with the recognition that bicycle and pedestrian activity can still be enhanced. Implement traffic calming on arterials and major routes by:

- Installing sidewalk bulbouts and traffic medians.
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- Replacing traffic signals and stop signs with modern roundabouts,
- Improving pedestrian amenities and safety through making wider and attractive sidewalks, adequately marking crosswalks and installing count-down pedestrian signals. Strategies to facilitate pedestrian travel are discussed in greater detail in TCM 19.
- Reduced speed limits and/or increased enforcement of speed limits and other traffic laws.

Travel Market Affected

TCM 20 will affect the entire range of motor vehicle, transit, bicycle and pedestrian trips, including commute travel, school travel, shopping, personal business, recreation, and commercial travel.

Effectiveness

Traffic calming techniques are most effective when implemented on an area-wide basis. TCM 20 is expected to yield the following emission reductions:

ROG	NOx
TBD	TBD

Cost

The cost of traffic calming ranges from $9 per square yard to $18 per square yard of street/sidewalk. These costs are outweighed by the benefits of reduced traffic accidents and congestion. In 1990, traffic accidents alone cost the nation up to $137 billion a year in directs costs, lost time and productivity. Traffic calming has the potential to reduce injury accidents by 50 percent.*[Need current safety data]*

Impediments

If traffic calming is not implemented area wide but only in select and isolated streets, there is the potential for an increase in traffic in the surrounding areas due to trip diversion.

Police and fire protection agencies may have concerns with barriers and other devices that slow their response times. However, experience in many communities has shown that close coordination between transportation planners and public safety officials can resolve most of these

potential conflicts. Also, some studies have shown that when traffic calming leads to fewer traffic accidents, there are fewer emergencies needing a response.

Cities and counties can include area-wide traffic calming policies in general or specific plans, or develop traffic calming plans, to ensure effective traffic calming measures in the overall area and minimize potential adverse affects.

Other Impacts

Traffic calming results in fewer vehicle and pedestrian accidents and injuries in areas where it is implemented. Lower traffic volumes on residential streets results in lower community noise levels. Traffic reductions on some streets may lead to more traffic on other streets without any traffic calming measures as diverted vehicles use alternative routes. Traffic calming can contribute to more livable neighborhoods and vibrant shopping areas.