

# **Transportation Initiatives Multi-pollutant Survey for the Colorado Department of Public Health and Environment**

**Center for Climate Strategies  
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## Executive Summary

The Center for Climate Strategies (CCS) prepared this survey for the Colorado Department of Public Health and Environment (CDPHE) as a follow-up to the climate planning work done by the state in the last several years. The purpose of this survey is to identify potential strategies that could be considered by the state to further reduce transportation-related air emissions, with the ancillary benefit of reducing greenhouse gas (GHG) emissions. This survey is intended to assist the Regional Air Quality Council with efforts underway to develop an Ozone State Implementation Plan (SIP) for the Front Range.

The state is investigating options for the Denver Metropolitan Area and Northern Front Range of Colorado that it can consider for incorporating in its next round of ozone and fine particulate matter (PM<sub>2.5</sub>) plans. One of the areas of interest is innovative transportation initiatives – especially those that focus on reducing vehicle travel or improving travel efficiency. This study uses a sample of 6 other ozone nonattainment areas to evaluate where transportation initiatives have been included in long range transportation plans, or specifically identified as creditable State Implementation Plan (SIP) measures. The six nonattainment areas studied were: Phoenix, AZ, Sacramento, CA, South Coast Air Basin, CA, Chicago, IL, Dallas, TX and Houston, TX.

One of the findings of this survey is that when areas put Transportation Control Measures (TCMs) in their SIPs, they select projects that have early completion dates, costs that are not very large, and funding that was already committed and likely to be delivered. Given the consequences with TCM failures (e.g., U.S. Environmental Protection Agency [EPA] sanctions for violating SIP requirements), these projects are specifically chosen to minimize those risks. In addition, when areas take SIP credits for TCMs, the categories of measures included as TCMs are usually bike/pedestrian projects, public transit projects and/or ridesharing initiatives.

Some areas list projects as TCMs, but have no associated emission reductions. Others have associated emission reductions, but provide aggregate vehicle miles traveled (VMT) and resulting emission credit values, so that emission reductions are not associated with individual measures or projects. The two ozone nonattainment areas in Texas have taken advantage of EPA's 1997 guidance that allows SIP credit for voluntary mobile source emission programs in SIPs. These programs attempt to gain additional emission reductions beyond mandatory Clean Air Act programs by engaging the public in making changes in activities that reduce mobile source emissions.

All of the areas studied include actions they are taking in all of the transportation initiative categories addressed in this study. The effects of such actions are incorporated in the baseline vehicle miles traveled estimates that are used to establish the motor vehicle emission budgets for state implementation plans and transportation conformity for the attainment years and long range planning horizon.

As currently managed by EPA, the SIP process presents more risks than rewards for including TCMs in SIPs. We believe this is so because of the difficulty in demonstrating that these measures achieve emission reductions in practice coupled with the uncertainty that any option that requires long-term financial commitments may not be fully funded at the levels needed to

achieve the expected emission benefits. One of the recommended next steps for this study is that there be a collaborative effort led by EPA Headquarters (Air Program and Office of Smart Growth) and involving EPA regional offices and the EPA Office of Transportation and Air Quality, to establish agreements for collaboration in establishing benchmark transportation initiatives and associated research that the ozone and PM<sub>2.5</sub> nonattainment areas can call upon for achieving significant multi-pollutant emission reductions going forward. This collaboration and information sharing should occur such that it is well-timed with SIP planning necessary to meet the soon to be announced tightened federal ozone standards. It is expected to lead to more areas focusing on innovative ways to improve their transportation systems that also produce multi-pollutant emission reduction benefits. This is also expected to produce more consistency across regions in transportation measure adoption.

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## Acronyms and Key Terms

AQMP	Air Quality Management Plan
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
GHG	greenhouse gas
HGAC	Houston Galveston Area Council
HOT	high occupancy toll
HOV	high occupancy vehicle
ITS	intelligent transportation systems
MAG	Maricopa Association of Governments
mph	miles per hour
MPO	Metropolitan Planning Organization
MTIP	Metropolitan Transportation Improvement Program
MTP	Metropolitan Transportation Plan
NAAQS	National Ambient Air Quality Standards
NCTCOG	North Central Texas Council of Governments
NO <sub>x</sub>	oxides of nitrogen
PAYD	pay as you drive
PM <sub>2.5</sub>	fine particulate matter
PTF	Public Transportation Fund
RARF	Regional Area Road Fund
RTC	Regional Transportation Council
RTIP	Regional Transportation Improvement Program
RTP	Regional Transportation Plan
SACOG	Sacramento Area Council of Governments
SCAG	Southern California Association of Governments
SIP	State Implementation Plan
SOV	single occupancy vehicle
STARNET	Sacramento Transportation Area Network
TCEQ	Texas Commission on Environmental Quality
TCMs	Transportation Control Measures
TDM	transportation demand management
TERMs	Transportation Emission Reduction Measures
TIP	Transportation Improvement Plan
tpd	tons per day
VMEP	voluntary mobile emission reduction program
VMT	vehicle miles traveled
VOC	volatile organic compound

## Chapter 1 - Introduction

The Center for Climate Strategies (CCS) prepared this survey for the Colorado Department of Public Health and Environment (CDPHE) as a follow-up to the climate planning work done by the state in the last several years. The purpose of this survey is to identify potential strategies that could be considered by the state to further reduce transportation-related air emissions, with the ancillary benefit of reducing greenhouse gas (GHG) emissions.

The Denver region has earned distinction as one of the nation's fastest growing metropolitan areas. More than 2.7 million people currently live in the region. By 2035, the Denver Regional Council of Governments forecasts show 4.2 million people will call the Denver region home and more than 920,000 new jobs will be created. The region's growing population has spread development outward, increasing the region's urbanized area. This development pattern requires people to travel farther and local governments and others to provide more infrastructure. Therefore, it is important to address the transportation needs associated with this development, and ways to preserve environmental quality.

This survey uses a sample of 6 ozone nonattainment areas to evaluate where transportation initiatives have been included in long transportation plans or specifically identified as creditable State Implementation Plan (SIP) measures. The pollutants considered include ozone and fine particulate matter (PM<sub>2.5</sub>) precursors as well as GHGs. This survey will consider the potential transportation initiatives which could be used in the Front Range area of Colorado. Many strategies that reduce ozone and fine particulate matter precursors will also reduce GHGs.

This survey was organized using the same organization of transportation initiatives as in the recent Moving Cooler report. The Moving Cooler report outlined nine types of strategies that transportation agencies can take to reduce transportation emissions. Of these, eight are viable choices for Metropolitan Planning Organizations (MPOs) to take in a SIP. These eight choices are used to categorize the potential actions taken by other cities to reduce ozone precursor emissions for their SIPs. They are as follows:

1. Pricing and taxes;
2. Land use and smart growth;
3. Nonmotorized transport;
4. Public transportation improvements;
5. Ride-sharing, car-sharing, and other commuting strategies;
6. Regulatory strategies;
7. Operational and intelligent transportation system (ITS) strategies; and
8. Capacity expansions and bottleneck relief.

A ninth option, multimodal freight sector strategies, is not used as a category in this analysis, because none of the options in our scope will fall into this category.

In order to illustrate the actions being taken in other metropolitan areas, six cities were selected, based on their range of transportation strategies and ozone levels, and their relative similarity to the Front Range area. All of these cities have recently submitted a SIP to the U.S. Environmental

Protection Agency (EPA) to demonstrate attainment for 8-hour ozone. The cities considered in this analysis are:

- Sacramento, CA
- South Coast, CA (Los Angeles and surrounding counties)
- Chicago, IL
- Phoenix, AZ
- Houston, TX
- Dallas, TX

While the 1970 Clean Air Act required the states to develop transportation control plans as part of their SIPs, the 1990 Clean Air Act Amendments and Intermodal Surface Transportation Efficiency Act (1991) required much tighter integration of clean air and transportation planning. The conformity regulations most directly affect MPOs – the public agencies that conduct transportation planning under federal transportation law. Other agencies and stakeholders also play a role. The relationship between SIP development and the conformity process can create difficulties for both planning and regulatory purposes for several reasons: assumptions, data, and forecasts. These difficulties occur when the two planning processes are not interconnected. The planning horizons for transportation and air quality planning differ. Under current requirements, transportation plans are required to have a 20 year horizon and conformity is done on that basis. An attainment demonstration and associated maintenance plan, however, need only a 10 year horizon. Transportation plans must therefore often use emission budgets that do not take account of future emission growth in transportation and other sectors.

This survey draws from Regional Transportation Plans (RTPs) as well as SIPs, because very few nonattainment areas have included many transportation initiatives as control measures in their SIPs. If a relatively untested policy is included as a transportation control measure (TCM) in a SIP, there is far less certainty that the emissions savings will actually take place. There is significant risk in putting unproven techniques into binding agreements such as SIPs. These policies are more likely to be implemented outside of SIPs, to determine their costs and efficacy without potential Federal monitoring and repercussions.

This survey provides an overview of the transportation situation in the six metropolitan regions in chapter 2. Chapter 3 outlines the actions that are being taken, either in SIPs or in RTPs, to reduce ozone emissions and contribute towards long term 8-hour ozone attainment.

All of the information here was developed from published documents – primarily SIPs and RTPs. Discussions with local, state, or Federal air pollution or transportation agency staff were only held to confirm or clarify the information in the published references.

While the SIPs and RTP documents do not provide their own assessments of GHG emission benefits, transportation initiatives provide an important benefit in meeting the GHG emission reduction goals that have been set by many states. Therefore, there is information provided in Chapter 2 that estimates the transportation initiative-related GHG benefits for each measure. These GHG benefit estimates were developed by CCS using SIP or RTP-estimated travel reductions and fleet average CO<sub>2</sub> emission factors for the analysis year.

## **Chapter 2 - Study Area Approaches to Transportation Control Measures and Regional Transportation Plans**

This chapter provides a summary of the approach that each of the six study areas took in incorporating transportation initiatives (including transportation control measures [TCMs]) in its latest ozone SIP and long range transportation plan.

### **Houston**

The Houston ozone nonattainment SIP proposed in September 2009 includes transportation initiatives at three different levels:

- transportation control measures;
- the voluntary mobile emission reduction program (VMEP); and
- other local programs, which were not committed to as transportation control measures or voluntary mobile emission reduction program measures, but may be implemented locally in the Houston area.

### **TCMs**

TCMs are transportation projects and related activities that are designed to reduce on-road mobile source emissions and are included as SIP control measures. Allowable types of TCMs are listed in §7408 of the Federal Clean Air Act and defined in the Federal transportation conformity rule found in 40 CFR Part 93. The Federal transportation conformity rule requires that timely implementation of TCMs be demonstrated. In general, TCMs are transportation-related projects that attempt to reduce vehicle use, change traffic flow, or reduce congestion conditions. The Houston MPO – the Houston Galveston Area Council (HGAC) – has identified TCMs that have been or will be implemented in the Houston nonattainment area. By the start of the 2018 ozone season, these TCMs will reduce oxides of nitrogen (NO<sub>x</sub>) emissions in the Houston area by 0.015 tons per day (tpd). *These six projects are all bicycle/pedestrian projects.* These are projects that create or enhance bicycle/pedestrian pathways throughout the region and serve to link individuals to non-single occupancy vehicle (SOV) methods of transportation.

### **Voluntary Mobile Emission Reduction Programs**

Houston is one of the areas within Texas that took advantage of EPA's 1997 Guidance on incorporating mobile source emission reduction programs in SIPs. This policy responded to state and local government interest in gaining SIP credits and funding for VMEP programs which will count toward their state's plan to make progress toward attainment and maintenance of the National Ambient Air Quality Standard (NAAQS) and builds on EPA's history of approving measures that rely to some degree on voluntary compliance, such as provision of mass transit. However, as part of its SIP submittal a state must commit to monitor, evaluate, and report the resulting emission effect of the voluntary measure, whether the measure is implemented directly by the state or another party, and to remedy in a timely manner any credit shortfall. Where voluntary measures meet the requirements of this policy, EPA believes that it is appropriate and

consistent with the Clean Air Act to allow a limited percentage of the needed total reductions to come from voluntary measures. EPA also set a limit on the amount of emission reductions allowed for VMEPs in a SIP. The limit is three percent of the total projected future year emission reductions required to attain the appropriate NAAQS. In addition, the total amount of emission reductions from voluntary measures is limited to 3 percent of the statutory requirements of the Clean Air Act with respect to any SIP submittal to demonstrate progress toward, attainment of, or maintenance of the NAAQS.

Mobile source strategies that attempt to complement existing regulatory programs through voluntary, non-regulatory changes in local transportation sector activity levels, or changes in vehicle and engine fleet composition were explored and developed. The Houston MPO identified three voluntary measures that will aid in the improvement of Houston's air quality. Nineteen meetings were held with stakeholders from the region to solicit comments and suggestions for voluntary programs. The Houston MPO's commitment for NO<sub>x</sub> reductions from VMEP is 2.25 tpd. The Houston MPO has committed to make a good faith effort to implement the projects and/or programs outlined in the proposed 2009 SIP and will be responsible for monitoring and reporting the emission reductions to the Texas Commission on Environmental Quality (TCEQ).

The three voluntary measures are their (1) clean vehicles program (vehicle retrofit and replacement), (2) Commute Solutions program (alternative commuting), and (3) local government programs for intersection traffic signalization, trail improvements, and livable centers (regional traffic flow improvement). The clean vehicles program primarily involves replacing older engines with new cleaner-burning engines. The Commute Solutions program includes vanpools, pilot transit projects, ride matching on-line, and telecommuting. Clean vehicle program benefits are tracked by monthly reporting by project for five years after engine change-out. Commute Solutions program invoices that are submitted to HGAC include information about vehicle miles traveled (VMT) reductions. Local government program emission reduction benefits are estimated via "before and after" analyses using methods that have been developed by the Texas Transportation Institute for the Texas Department of Transportation in what is known as the Moser's Manual. Note that the alternative commuting and regional traffic flow improvement programs are estimated to provide 0.25 tpd of NO<sub>x</sub> benefit—compared with the 2.25 tpd VMEP total.

### **Other Local Programs**

The HGAC submitted a list of programs in its proposed September 2009 ozone SIP, which were not committed to as TCMs or Voluntary Mobile Emission Reduction Program measures, but may be implemented locally in the Houston area. Transportation initiatives included in this list include Pay-As-You-Drive Insurance and Encourage/Mandate Livable Centers.

### **Dallas**

The structure of the Dallas ozone nonattainment SIP is similar to the Houston SIP, which is understandable given that both areas are in Texas. However, the latest Dallas ozone SIP amendment (2009) relies on stationary source control measures to demonstrate attainment, so the

information in this analysis relies on the information in the Dallas 8-hour ozone nonattainment area attainment demonstration adopted May 23, 2007.

## **TCMs**

The North Central Texas Council of Governments (NCTCOG) identified the TCMs that have been or will be implemented in the nine-county nonattainment area. By 2009, the SIP estimated that these TCMs will reduce NO<sub>x</sub> emissions in the Dallas nonattainment area by 1.53 tpd and volatile organic compound (VOC) emissions by 1.61 tpd. These TCMs included (1) bicycle/pedestrian projects, (2) grade separation projects, (3) high occupancy vehicle (HOV)/managed lane projects, (4) intersection improvement projects, (5) park and ride projects, (6) rail transit projects, and (7) vanpool projects. The region's transportation policy body (the Regional Transportation Council [RTC]) approved and identified funding for these local commitments. In addition to the information provided in the SIP about TCM commitments, the Federal transportation conformity rule requires that timely implementation of TCMs be demonstrated.

## **Voluntary Mobile Source Emission Reduction Programs (VMEP)**

A number of voluntary mobile source and transportation programs have already been initiated at the state and local level in response to increasing interest by the public and business sectors in creating alternatives to traditional emission reduction strategies. Some examples include economic and market-based incentive programs, trip reduction programs, growth management strategies, ozone action programs, and targeted public outreach. These programs attempt to gain additional emission reductions beyond mandatory Federal Clean Air Act programs by engaging the public to make changes in activities that will result in reducing mobile source emissions.

The new Dallas voluntary commitments under the 2007 SIP revision included just one transportation initiative: an employee trip reduction program. The other VMEPs focus on engine replacements, reduced idling, and aviation sector efficiencies. The estimated benefits for VMEPs are calculated for the attainment year (2009) only and may not be forecasted to estimate emission reductions for any other year. VMEP strategies are limited to 3 percent or less of the total emission reductions required. The estimated 2009 benefit of the employee trip reduction program is 0.43 tpd NO<sub>x</sub> and 0.28 tpd VOC. Total 2009 VMEP benefits are 2.63 tpd NO<sub>x</sub> and 0.61 tpd VOC.

NCTCOG, as the regional metropolitan transportation planning agency for the Dallas area, committed to make a good faith effort to implement the VMEP projects. NCTCOG is responsible for monitoring and reporting the emission reductions to the TCEQ. Any VMEP shortfall (of the total 2.63 tpd NO<sub>x</sub> committed) will be covered by supplementing additional Transportation Emission Reduction Measures (TERMs). The program areas that may be used to remedy this shortfall are traffic signal improvements ITS and/or freeway and/or arterial bottleneck removal. These programs would be surplus to those already credited in the SIP.

## **Other Local Programs**

The 2007 Dallas ozone SIP also includes a list of locally implemented strategies in the Dallas area including pilot programs, new programs, or programs with methodologies yet to be determined and accepted. These program benefits were not quantified, but all were expected to be implemented by March 2009. The exact form or extent to which they would be implemented was not known. The Dallas *Other Local Programs* list included the following transportation initiatives:

1. ITS
2. Parking Cash-Out Program
3. Roadway Peak-Period Pricing (I-30 value pricing pilot study)
4. Arterial/Freeway Bottlenecks (reduce vehicular delays and travel time)
5. Traffic Signal Improvements
6. Sustainable Development
7. Pay-as-you-drive Insurance Pilot Program

## **Phoenix**

While Phoenix has been a nonattainment area for three pollutants: carbon monoxide, ozone, and PM<sub>10</sub>, the approach that it takes for adopting control measures affecting highway vehicles is more straightforward than some of the other areas that are included in this study. The latest eight-hour ozone plan for the Maricopa nonattainment area was prepared in June 2007 by the Maricopa Association of Governments (MAG) (the Phoenix MPO) with technical assistance from the Arizona Department of Environmental Quality, Arizona Department of Transportation, the Maricopa County Air Quality Department, and EPA. The seven attainment measures used for numeric credit in this plan (with one exception that affects stationary sources) were also quantified for emission reduction credit in the one-hour ozone maintenance plan. These attainment measures include two transportation initiatives: coordinate traffic signal systems and develop ITS.

Coordinate traffic signal systems, develop ITS, and reduce traffic congestion at major intersections are committed control measures in the MAG one-hour ozone maintenance plan.

The most recent published update to the Regional Transportation Plan (RTP) occurred in July 2007. This 2007 RTP summarizes the results of the conformity test using the latest planning assumptions and emission models in force at the time the conformity analysis started in April 2007. This analysis found that the Transportation Improvement Plan (TIP) and RTP will provide for the timely implementation of the TCMs, and there are no obstacles to the implementation of any TCM.

## **South Coast Air Basin**

The long-term transportation planning requirements for emission reductions from onroad mobile sources within the Basin are met by the Southern California Association of Governments (SCAG)'s RTP, which is developed every four years with a 20-year planning horizon. The short-

term implementation requirements of the Transportation Conformity Rule are met by SCAG's biennial Regional Transportation Improvement Program (RTIP), the first two years of which are fiscally constrained and demonstrate timely implementation of a special category of transportation projects called TCMs.

In general, TCMs are those projects that provide emission reductions from onroad mobile sources, based on changes in the patterns and modes by which the regional transportation system is used. The various strategies considered as part of the 2004 RTP and 2006 RTIP are defined, collectively, as a single TCM, with specific strategies grouped into its following three components:

- HOV Strategy: This strategy attempts to reduce the proportion of commute trips made by SOVs by increasing the share of HOV ridership within the region. HOV lanes are one example of such projects, where particular segments of heavily used freeways are designated for exclusive use by HOV vehicles, particularly during rush-hour traffic. The purpose of such measures is to make car-pooling and ride-sharing practices more attractive to individuals who may otherwise prefer the convenience of a SOV commute trip.
- Transit and Systems Management: This strategy relies primarily on the provision of facilities and infrastructure that encourage an increase in the proportion of regional trips that make use of transit as a transportation mode. Such measures also promote the use of alternative modes of transportation (e.g., bicycle and pedestrian modes) and seek to incentivize increases in the average vehicle occupancy or ridership by facilitating van-pools, smart shuttles, and other such strategies. Systems management measures include projects such as grade separation and traffic signal synchronization.
- Information-based Transportation: This strategy relies primarily on innovative provision of information in a manner that successfully influences the ways in which individuals use the regional transportation system. One strategy attempts to increase the proportion of ride-sharing and car-pooling trips by providing information that makes it easier to match up people traveling to and from particular sets of origins and destinations. Another strategy attempts to shift the time-profile of demand – thus, transportation demand management (TDM) – by redistributing traffic flows from peak to off-peak hours. This strategy relies on providing SOV operators with realistic and near-real time estimates of congestion using internet-based information networks, in an effort to influence their decision to defer travel to a less congested time-of-day.

The TCMs specified in the 2004 RTP, as well as the projects listed for implementation in the first two years of the 2006 RTIP, were developed as part of an extensive and comprehensive decision-making process that actively sought the input of key stakeholders throughout the region. At the culmination of the process, SCAG's Regional Council approved the transportation control measures and strategies included in the 2004 RTP, and subsequently the investment commitments contained in the 2006 RTIP. These measures and recommendations have accordingly been moved forward for inclusion in the region's air quality plans.

## Sacramento

Sacramento Area Council of Governments (SACOG) is the MPO for the greater Sacramento region (includes Sacramento, Yolo, Placer, El Dorado, Sutter, and Yuba counties). SACOG provides transportation planning and funding for the region. SACOG, local governments, and the air districts have worked together over the years to develop and implement TCMs. They have included public transit, carpooling and vanpooling, bicycling and pedestrian enhancement, and land use programs. Many of the existing TCM efforts may be used in part to comply with the proposed operational indirect source rule. The *Spare The Air* program is also a TCM.

SACOG began with a Blueprint Program, which is the area's vision of the land use and transportation system and a set of seven principles for making investment decisions in the future. The seven Blueprint principles are: (1) transportation choices, (2) housing diversity, (3) compact development, (4) mixed land uses, (5) use of existing assets, (6) natural resource protection, and (7) quality design. The Blueprint Program contains a number of key assumptions including those for "smart growth". Within these assumptions lie TCMs that were used when running the SACOG transportation model to forecast future vehicle activity. What SACOG found is that by 2035, the Blueprint Preferred Growth Scenario as embodied in the Metropolitan Transportation Plan (MTP) for 2035 reduces VMT per household by 10 percent when compared with a no project alternative, and holds congested travel per household to less than a 5 percent increase. The Blueprint Program results were then considered for the SIP.

Federal MTP guidelines require that the land use allocations represent what is most likely to be built. Therefore, the specific Blueprint smart growth policies affect land use allocations only to the extent that the local jurisdictions and SACOG are able to demonstrate that the policies will actually be implemented. Therefore, the area has a process for reviewing planned projects in its communities to see if they are consistent with Blueprint principles. The Blueprint scenario activity data were used in setting the baseline projections for the area's motor vehicle inventory. While the Blueprint principles affect these baseline projections, Blueprint is not included in this plan as a TCM.

SACOG's approach of including TCMs in a SIP presents transportation planning implications that must be well understood. Every time the MPO makes a conformity determination to accompany a new MTP, a new Metropolitan Transportation Improvement Program (MTIP), or an amendment to either document, this conformity determination must demonstrate that all TCMs are still on track to be implemented in a timely fashion (pursuant to the Clean Air Act?). If a TCM does not stay on schedule, the MPO must show that all state and local agencies with influence over approvals or funding for TCMs are giving maximum priority to approval or funding of TCMs over other projects within their control. The MPO and any other responsible agencies would have to either ensure that the TCM is able to get back on schedule, or be able to substitute another TCM. In other words, the MPO may not be able to demonstrate conformity on a new or amended MTP, or MTIP, if a TCM is failing. SACOG was aware of these important requirements and pursued this approach nonetheless. EPA issued updated guidance about substituting and adding TCMs to approved state air quality plans during 2009 (EPA, 2009).

SACOG selected all of the new and continuing TCM projects to be included in the 2008 Federal 8-hour ozone plan because they had early completion dates, costs were not large, funding was already committed, and delivery appeared to be likely. These TCMs are in the following categories: ITS projects, park-and-ride lots/transit centers, transit service funding programs, other specific funding programs, and MTP regional funding programs. No ozone precursor emission reductions have been included in the SIP for these Sacramento area TCMs.

## **Chicago**

The SIP information in this survey is based on the Chicago attainment demonstration for 8-hour ozone, released on March 18, 2009. This SIP was prepared by the Illinois EPA and did not include transportation-related measures towards SIP attainment. The SIP was prepared in 2008 for approval and implementation in 2009, which is a very short time frame. This occurred in part because the Lake Michigan states decided to use a 2005 base year for their ozone SIP demonstrations while many areas used the earlier 2002 base year. The result is that the Chicago area did not include transportation measures in their SIP, because these require significant time to implement before emissions reductions will be seen. Ozone precursor reductions for the Chicago SIP instead come primarily from stationary combustion sources. Any transportation measures which will achieve ozone precursor emission reductions in Chicago will instead be included in the short term TIP or long term RTP. These will then be included in future baseline travel and emission estimates.

The RTP outlines Chicago's transportation infrastructure and planning through 2030. It was released by the Chicago Metropolitan Agency for Planning in October of 2008. This RTP includes elements of all the transportation initiatives discussed in greater detail in Chapter 3.

Table 2-1 lists all of the transportation control measures included in the ozone SIPs for the six study areas. This table is organized according to the transportation initiative categories identified in Chapter 1. Then the Table 2-1 information is sorted by geographic area. NO<sub>x</sub> and VOC emission reduction estimates are provided for the analysis year of interest (this is typically the ozone standard attainment year), and these benefit estimates are also expressed as a percentage of total onroad vehicle emissions in the area. The GHG emission reduction estimates provided in Table 2-1 were estimated by CCS using VMT reduction estimates for each measure and a fleet average CO<sub>2</sub> emission factor for the analysis year. The fleet average CO<sub>2</sub> emission factor accounts for the expected fuel economy benefits of the Administration's recent fuel economy regulations.

**Table 2-1. Transportation Control Measures Included in State Implementation Plans for Ozone (Six Study Area Sample)**

Measure Category	Area	Location	Measure Description/Type	Analysis Year	NO <sub>x</sub> Emission Reductions (tpd in analysis year)	NO <sub>x</sub> Emission Reductions (% of total onroad vehicle emissions)	VOC Emission Reductions (tpd in analysis year)	VOC Emission Reductions (% of total onroad vehicle emissions)	GHG Reductions (t CO <sub>2</sub> e)
Land Use and Smart Growth	South Coast		Part of South Coast Compass Program	2020	0.47	0.3%	0.5	0.5%	NQ
Nonmotorized Transport	Houston	Included in Houston TCM	Bike/Pedestrian Projects	2018	0.015	0.0%			642
	Dallas/Fort Worth	Included in Dallas TCM	Bike/Pedestrian Projects	2009	0.007	0.0%	0.005	0.0%	1,337
	Sacramento	Included in Sacramento TCM	Bike/Pedestrian Projects	2018	-- <sup>1</sup>		-- <sup>1</sup>		
	South Coast	Included in South Coast TCM	Bike/Pedestrian Projects	2020	See Postnote <sup>2</sup>		See Postnote <sup>2</sup>		
Operational and ITS Strategies	Phoenix	In Maricopa 8 hour Ozone SIP	Develop Intelligent Transportation Systems	2008	0.4	0.3%	2.2	3.0%	0
	Houston	Included in the Houston VMEP	Regional Traffic Flow Improvement Program (VMEP)	2018	0.05 <sup>3</sup>	0.1%			0
	Sacramento	Included in Sacramento TCM	Intelligent Transportation Systems (ITS) projects	2009	-- <sup>1</sup>		-- <sup>1</sup>		
Public Transportation	Dallas/Fort Worth	Included in Dallas TCM	Rail Transit Projects	2009	0.28	0.1%	0.21	0.2%	50,468
	Sacramento	Included in Sacramento TCM	Transit Service Funding Programs	2018	-- <sup>1</sup>		-- <sup>1</sup>		
	South Coast	Included in South Coast TCM	Improve Rail, Bus and Shuttle Infrastructure	2020	See Postnote <sup>2</sup>		See Postnote <sup>2</sup>		
Ridesharing	Houston	Included in the Houston VMEP	Alternative Commuting Program (VMEP)	2018	.20 <sup>4</sup>	0.4%			47,100
	Dallas/Fort Worth	Included in Dallas TCM and VMEP	Includes Vanpooling, Park and Ride and HOV/managed lane projects from the TCM and employee trip reduction from VMEP.	2009	1.35	0.7%	0.8	0.8%	15,020
	Sacramento	Included in Sacramento TCM	Park and Ride Lots	2018	-- <sup>1</sup>		-- <sup>1</sup>		
	South Coast	Included in South Coast TCM	Ridesharing and telecommuting programs	2020	See Postnote <sup>2</sup>		See Postnote <sup>2</sup>		

<sup>1</sup>Sacramento did not estimate emissions reductions for its TCMs.

<sup>2</sup>South Coast TCM is not broken out by individual measures, but does contain ridesharing components. There is an estimated 2.2 tpd reduction of NO<sub>x</sub> and 0.83 tpd of VOC associated with the TCM.

<sup>3</sup>Houston VMEP is not broken out by individual measures, but does contain ITS elements within the VMEP Regional Traffic Flow Improvement program. Regional Traffic Flow Improvement is estimated to account for a 0.05 tpd reduction of NO<sub>x</sub>.

<sup>4</sup>Houston VMEP is not broken out by individual measures, but does contain ridesharing elements within the VMEP Alternative Commuting program. Alternative Commuting is estimated to account for a 0.20 tpd reduction of NO<sub>x</sub>.

## Chapter 3 - Transportation Initiatives Analyses

This chapter is organized according to the eight transportation initiative categories listed in the Introduction to this report. For each transportation initiative, each area's experience with that option is described, followed by comments about SIP enforceability and EPA involvement in developing/evaluating approval of the strategy.

### Capacity Expansion and Bottleneck Relief

These strategies are ones that expand highway capacity to reduce congestion and to improve the efficiency of travel.

Expanded capacity and bottleneck relief can improve traffic flow and reduce the emissions associated with idling and stop-and-go driving. However, these investments also carry with them the potential to increase VMT, and an incentive towards increased vehicle traffic compared with lower emission-alternatives. Because of this, capacity expansion is rarely a part of SIP emissions reduction, because of the uncertainty associated with any emissions reduction estimate. However, reducing emissions from idling and congestion should be considered within the larger framework of reducing ozone precursor emissions.

#### Areas with Experience with this Option

In the Houston area, there are significant plans to expand infrastructure to prevent bottlenecks and improve traffic flow. However, perhaps because it can be difficult to demonstrate that road construction is contributing to emissions reductions, there were no SIP enforceable reductions attached to infrastructure investment to reduce bottlenecks. Houston also has a program in the RTP to quickly remove minor accidents to avoid causing traffic bottlenecks. Likewise no SIP credit is claimed for this program.

Dallas did not include any capacity expansion/bottleneck relief options in their SIP. There is however a voluntary program in the area aimed at addressing arterial/freeway bottlenecks. Both programs are meant to fund improvements of freeway problem areas and arterial intersections to reduce travel time and accidents. These could potentially reduce emissions due to reduced idling and stop/start driving, although there is no associated emissions reduction estimate. Dallas also included a congestion management pilot study within *Mobility 2030* to reduce bottlenecks.

The Chicago area includes capacity expansion and bottleneck relief within its RTP. However, these projects are not included within the SIP to account for any emissions reductions towards their attainment goal. Bottleneck relief includes incident detection, verification, clearance and information, which all serve to avoid congestion and bottlenecks as a result of an accident. Effectively removing vehicles involved in traffic incidents can reduce delay and secondary crashes. Providing information to other drivers about traffic bottlenecks ahead can help alleviate congestion by decreasing traffic on partially blocked roads. Chicago is also working to expand capacity in the form of expressway lanes and additional arterial lanes.

In the MTP for 2035, Sacramento recognizes the need for capacity expansion, but seeks to make this a part of the larger transportation planning process, including more compact, smarter growth and alternatives to driving. These capacity expansions seek to better separate local and interregional traffic, and to make the commute safer and faster for both types of traveler.

In the South Coast area, while roadway expansion is certainly a part of the long range transportation plan, there are no projects within the TCM that would be considered bottleneck relief or capacity expansion for the purpose of emissions reduction.

The Maricopa SIP contains no capacity expansion or bottleneck relief related options to reduce emissions in the Phoenix area. The Maricopa area is investing over 68 percent of its transportation budget on highways and arterial roads, although it is not clear how much of this is planned specifically to expand capacity or reduce bottlenecking. Without this information, it cannot be said what portion (if any) of this investment will be contributing towards an emissions reduction.

### **SIP Enforceability**

None of the SIPs in any of the areas considered included enforceable emissions reductions from capacity expansion or bottleneck relief.

## **Land Use and Smart Growth**

Strategies here focus on creating more transportation-efficient land use patterns, and by doing so reducing the need to make more motor vehicle trips and reduce the length of the motor vehicle trips that are made.

### **Areas with Experience with this Option**

The 2035 RTP for the Houston area includes creation of Livable Centers connecting transportation and land use. The three key principles of these Livable Centers are to (1) create bicycle and pedestrian friendly centers, (2) establish better connections between the centers, and (3) base designs on the context of surrounding land uses. Implementing this Livable Centers concept is included in the proposed September 2009 ozone SIP for the Houston area, but no specific emission credit is attributed to the Livable Centers program.

The Mobility 2030-2009 Amendment report for the Dallas area discusses land use policies under the heading of Sustainable Development. Promoting sustainable development is a specific objective of Mobility 2030 because of the direct link between land use, transportation, and air quality. A new addition to NCTCOG's sustainable development program is the alternative future policy program. Through this program, the RTC will take an aggressive approach to increasing the number of areas in the region in which sustainable development projects may be built by right. A variety of strategies have been adopted by the RTC to ensure the development of transportation plans, programs, and projects which promote air quality improvements through sustainable development. These strategies are designed to (1) respond to local initiatives for town centers, mixed use growth centers, transit-oriented development, infill/Brownfield developments and pedestrian-oriented projects, (2) complement rail investments with coordinated investments in park and ride, bicycle and pedestrian facilities; and (3) reduce the growth in VMT per person. The shift toward alternative modes of transportation and lower VMT will lead to reduced transportation-related emissions.

The Phoenix congestion management system explicitly considers 11 strategies prior to Federal disbursement of funds for additional general purpose lanes on the regional freeway system. These strategies include consideration of growth management and activity center strategies. However, the RTP 2007 update makes no mention of specific growth management and activity center strategies project plans in the Phoenix area.

Given the magnitude of growth projected over the 30-year RTP forecast period, and its potential impacts on traffic congestion, air quality, open space protection, etc., the South Coast initiated a comprehensive growth visioning process called Southern California Compass as part of the 2004 RTP development process. Compass seeks to accommodate growth while maintaining mobility, livability, prosperity, and sustainability goals for all residents in the South Coast region. Specifically, Compass aims to provide a policy framework for growth forecasts; consider balanced and efficient growth and transportation patterns; promote affordable housing choices; and provide direction on producing alternative urban form scenarios for the RTP.

At its core, Compass utilizes a technique referred to as scenario planning. Scenario planning, endorsed by the Federal Highway Administration (FHWA) and EPA, explores multiple options for a region's future and how the choices we make today will affect future outcomes. SCAG developed literally dozens of different scenarios and modeled and analyzed each. Through an iterative process these scenarios were refined, and eventually one scenario was selected as the growth alternative for the 2004 RTP.

The following policy assumptions aiming to better link transportation and land use established the framework for the 2004 RTP:

- Focusing growth in centers and major transportation corridors;
- Creating significant areas of mixed-use development;
- Targeting growth around transit stations;
- Providing housing opportunities to match changing demographics;
- Ensuring adequate access to open space;
- Changing land use to correspond to the implementation of a decentralized regional aviation strategy and its consequent short- and long-term job creation;
- Changing land use to correspond to the implementation of regionally significant major transportation projects and their consequent short- and long-term job creation; and
- Incorporating local input and feedback on future growth.

As part of the 2004 RTP planning process, the South Coast RTP was analyzed relative to baseline conditions. The analysis revealed that the strategies of the 2004 RTP contribute benefits to mobility, transit usage boarding, air quality, and energy consumption over the forecast period. As part of the 2004 RTP planning process, the RTP was analyzed relative to baseline conditions. The analysis revealed that the strategies of the 2004 RTP contribute benefits to mobility, transit boarding, air quality, and energy consumption over the forecast period. The 2007 Air Quality Management Plan (AQMP), while based on the 2004 RTP, incorporates changes to emission factors based on the California Air Resources Board's EMFAC2007 and to the socioeconomic data based on actual changes since the 2004 RTP was prepared. While the Compass 2 Percent Strategy assumptions remain the same, these other changes result in revised emission projections and benefits compared to what was shown for the 2004 RTP. For example, Growth Visioning in the 2007 AQMP is estimated to contribute a reduction of approximately 0.5 tpd of reactive organic gas in the year 2020 (approximately 30 percent of total reductions) versus a reduction of approximately 2 tpd in 2020 (approximately 70 percent of total reductions) when analyzed for the 2004 RTP.

In Sacramento, SACOG intends to pursue a number of policies to encourage smart growth. One of these policies is to educate and provide information to policymakers and the public about the mutually supportive relationship between smart growth development and transportation. In addition, SACOG will encourage local jurisdictions in developing community activity centers well-suited for high capacity transit service. SACOG also encourages local governments to direct Greenfield developments to areas immediately adjacent to the existing urban edge through the provision of information, incentives and pursuit of regulatory reform for cities and counties.

SACOG's MTP acknowledges that SACOG has no land use authority and cannot directly affect the pattern that future land uses will take. However, they will strive to implement the Blueprint Vision through existing and new programs. SACOG funds that area's Community Design Grant program, which funds transportation projects that are part of mixed use, higher density developments. SACOG's other Blueprint Implementation Programs include development of a Form-Based Code Handbook, Blueprint Development Reviews, and Technical Assistance to Local Governments.

For the Chicago area, the 2040 Regional Framework Plan was adopted by the Chicago Metropolitan Agency for Planning Board to guide the region's integrated approach to regional planning. The 2040 Plan identifies a regional planning framework that includes the elements of Centers, Corridors, and Green Areas.

### **SIP Enforceability**

The 2007 South Coast plan identifies expected reactive organic gas and NO<sub>x</sub> emission reductions associated with its Southern California Compass program in 2020 and 2023 (in the SIP Appendix). However, they also say that the regional transportation strategy is appropriately viewed on a systems-level basis and not by its components (e.g., TCMs, Compass, etc.) since each of the individual transportation improvements and strategies affect each other and the system. Nevertheless, they provide the results of the modeling analysis for the RTP as a whole as well as those for the TCM and Compass components of the RTP for the attainment years 2014, 2020 and 2023.

Chicago, Phoenix, Sacramento, Houston and Dallas did not include any enforceable land use/smart growth emissions reductions in their SIPs.

## Non-motorized Transport

These strategies encourage greater levels of walking and bicycling as alternatives to driving.

### Areas with Experience with this Option

Expanding non-motorized transportation is included in Houston's RTP, as well as transportation control measures within the SIP. Houston includes additional funding for bike and pedestrian infrastructure in both long range planning (RTP) and short range planning, in the TIP. The TCM for Houston identified six bicycle/pedestrian projects which create or improve pathways throughout the region. The TCM takes credit for an emissions reduction of 0.015 tpd as a result of these paths, because they reduce the need for SOV methods of transport.

Dallas's TCM include several bicycle/pedestrian projects, which will result in 15.4 additional miles of pathways in the area. This includes a North Central Texas veloweb, designed for use by fast moving bicyclists. These TCMs combine to account for a reduction of 0.008 tpd of NO<sub>x</sub> and 0.005 tpd of VOC.

In Chicago, non-motorized modes were a subsection within the RTP. Improvements to bike/pedestrian infrastructure such as increased bike and walking pathways are included under this subheading, as well as support for such activities, like bike parking, pedestrian signals, benches and bike route maps. Examples of planned infrastructure improvements include minimizing crossing distance at intersections, pedestrian medians, improved illumination for pedestrian crossings, and pedestrian refuge islands between turning and through lanes. Chicago is also conducting a regional inventory of bicycle and pedestrian plans and strategies called *Soles and Spokes*. This will be used in future planning to better incorporate bicycle and pedestrian issues into transportation planning as a whole.

The Sacramento MTP includes several policies to facilitate nonmotorized travel. These include increased connectivity and access of bike/pedestrian pathways, facilitating cooperation between jurisdictions to ensure pathway connectivity and the eventual creation of a regional bicycle and pedestrian network. The MTP includes \$350 million in funding for bicycle and pedestrian programs over the next 23 years.

The South Coast AQMP includes a discussion of the TCMs which will contribute towards SIP credit. These include projects to expand bicycle and pedestrian infrastructure in the form of bike lane widening, improved lighting on pathways and several bridges to avoid pedestrian crossing on major roads. Many projects were considered as exclusively bicycle or pedestrian pathways in their funding, although it is unclear what the difference is between bicycle pathways and bicycle/pedestrian paths. The TCM reductions are not broken out, although the TCM is responsible for 2.2 tpd reduction of NO<sub>x</sub> by 2020, and 0.83 tpd of VOC. How much of this reduction comes from nonmotorized transport is not clear.

The Maricopa SIP contains no bike or pedestrian related options to reduce emissions in the Phoenix area. The RTP understandably addresses nonmotorized transport, but none of these measures are binding, or have any quantified emissions reduction associated with them. Of the

total transportation funding planned for the Maricopa area in the RTP, just over 0.6 percent of it goes towards expanding bike and pedestrian infrastructure.

### **SIP Enforceability**

Houston takes SIP credit for emissions reductions from non-motorized transportation included in the TCM. These measures include several pedestrian and bike paths which are in total obligated to reduce NO<sub>x</sub> emissions by 0.015 tpd.

The 15.4 miles of additional bicycle/pedestrian pathways in Dallas account for a reduction of 0.008 tpd of NO<sub>x</sub> and 0.005 tpd of VOC. This is also part of the larger TCM program, and therefore is enforceable, but potentially flexible with respect to other TCM emissions reductions.

South Coast includes bike and pedestrian projects within their TCMs, which are used for SIP credit. However, TCM reductions are not broken out, so what portion of the TCM emissions reductions come from non-motorized transportation is not clear. The TCMs as a whole are responsible for a reduction of 2.2 tpd of NO<sub>x</sub> and 0.83 tpd of VOC.

Chicago, Phoenix, and Sacramento did not include any enforceable emissions reductions from non-motorized transportation within their SIPs.

## Operational and ITS Strategies

Strategies improve the operation of the transportation system to make better use of the existing capacity; strategies also encourage more efficient driving.

### Areas with Experience with this Option

Phoenix has two programs which seek to improve the performance of their transportation systems. The first seeks to coordinate traffic signal systems across jurisdictional boundaries, which had only minimal (less than 0.1 metric tpd of both VOC and NO<sub>x</sub>) impact on overall emissions. The development of ITS in the Phoenix area was more effective, reducing emissions by 2.2 metric tpd of VOC and 0.4 tpd of NO<sub>x</sub> (summer weekday in 2008). These reductions were achieved by investing in technology-based solutions to achieve greater traffic flow, including electronics, telecommunications and sensor technology.

The Los Angeles SIP included a range of information based transportation initiatives. These include greater access to information to encourage ridesharing and carpooling. A forum is to be created to make setting up carpools easier, and should likely reduce the number of SOVs in the Los Angeles area. Congestion monitoring also seeks to optimize roadway use and encourage off-peak driving by providing real time information on congested roadways. This effort is part of the SCAG regional transportation strategy and control measures.

In Chicago, the RTP for Northeastern Illinois recommends forming numerous regional traffic management centers to serve as “information hubs” to coordinate the communication between, and operations of, rail, highway and arterial systems. These would also serve to provide real time traffic condition and emergency management information to emergency service providers, transportation agencies and the general public. The plan also encourages methods to integrate transit schedules and itineraries, making it easier for commuters using multiple methods of travel.

There were several ITS recommendations in the SACOG RTP. These include advanced technology solutions such as freeway ramp meters, dynamic message signs, and traffic signal timing, which all serve to provide real-time traffic information. This, combined with the creation of several traffic operations centers, could potentially improve traffic flow and help coordinate the local response to traffic and emergency events. An information exchange system called the Sacramento Transportation Area Network (STARNET) will serve to provide information and facilitate communication between traffic centers and emergency response vehicles.

Within Houston’s VMEP is a Regional Traffic Flow Improvement Initiative. This seeks to improve traffic flow through reversible lanes, as well as signalization and intersection improvements. This is estimated to result in a reduction of 0.05 tpd of NO<sub>x</sub> reductions. The Houston-Galveston region does have one of the most advanced intelligent transportation systems in the nation. The region’s premier intelligent transportation management and operations system is anchored by the Houston TranStar Traffic Management Center. Houston TranStar is one of the most comprehensive advanced traffic management centers in the country, and is responsible for coordinating the planning, design, operations and maintenance of transportation and emergency

management in the greater Houston region. Additional traffic management elements in the region include: incident detection and response; courtesy patrol and motorist assistant; changeable message signs; and coordinated traffic signal timing. Houston is investing \$312 million on ITS projects in the 2008-2011 TIP and 111 ITS projects are included in the 2035 RTP. Advanced ITS technologies over this planning horizon will include:

- Increase freeway surveillance with an expanded surveillance system;
- Centralized control of traffic signals beyond the City of Houston city limits;
- Automated HOV operations;
- Multi-modal and transit traveler information systems using real-time data;
- A regionally integrated Smart Card system for electronic payment of tolls, transit fares and parking; and
- A HAZMAT identification system.

There are no ITS options used for SIP credit in the Dallas area. Dallas's SIP does contain a section on voluntary measures being considered, which includes ITS. According to the SIP, ITS attempts to improve traffic speeds and reduce idling time through advanced traffic control systems and more efficient incident and corridor management. ITS also combines the strengths of RTPs and traffic simulation models with overall transportation management strategies. Examples of ITS projects include transportation management centers and dynamic message signs. Traffic monitoring and incident detection and response systems are operating on portions of the freeway system in Collin, Dallas, Denton, and Tarrant Counties.

### **SIP Enforceability**

ITS projects are included in the Sacramento plan as "New and Continuing TCM projects". Such projects were included because they had early completion dates, costs were not large, funding was already committed and delivery was likely. However, note that SACOG TCMs have no associated 2018 emission reductions for VOC or NO<sub>x</sub> in the Sacramento plan.

The 8-hour ozone plan for Phoenix, Arizona takes numeric credit for seven attainment measures, and traffic signalization improvements and developing ITS are among these measures. These same measures were also qualified for credit in the area's 1-hour ozone maintenance plan.

In Houston, the Regional Traffic Flow Improvement program is estimated to reduce NO<sub>x</sub> emissions by 0.05 tpd, and this program contains primarily ITS elements. This emissions reduction is part of the larger VMEP, and therefore is not individually enforceable.

Chicago, Dallas, and South Coast did not include any enforceable emissions reductions from ITS in their SIPs.

## Pricing and Taxes

These strategies raise the costs associated with the use of the transportation system, including the cost of VMT and fuels.

### Areas with Experience with this Option

Pay as you drive (PAYD) insurance, or mileage-based insurance, has the potential to be an effective transportation pricing strategy, with multiple benefits, including reductions in VMT, fuel consumption, and vehicle emissions. The NCTCOG – the Dallas area – in partnership with Progressive County Mutual Insurance company (Progressive) conducted a pilot program to evaluate the feasibility of implementing mileage-based insurance and whether such a program would affect driver behavior. During the first phase of the study, a statistical analysis of available data produced a positive correlation between mileage driven and accident frequency, and validated the hypothesis that insurance companies can provide financial incentives to customers who drive fewer miles because of an associated reduction in claims costs. A second phase of the pilot program offered financial incentives to volunteer participants who were able to reduce their mileage from a personal baseline condition. Data collected from the participant's vehicle onboard diagnostic system resulted in an average mileage reduction of five percent. Additional spatial analysis concluded that mileage reduction was independent of residence location, suggesting that PAYD insurance would be a viable regional strategy to reduce vehicle mileage. Both Progressive and Mile Meter Insurance both offer PAYD as an option for all of Texas. There is no planned action to make PAYD mandatory.

The South Coast Air Basin has experience with variable-priced toll lanes. The four variably-priced express lanes in the median of the State Route 91 Freeway opened in December 1995. The toll schedule is adjusted every three months based on traffic observed over the three-month period. Speeds are 60 to 65 miles per hour (mph) on the express lanes while congestion on the free lanes has reduced average peak hour speeds to no more than 15 to 20 mph. During the peak hour, which occurs on Friday afternoon (5-6 p.m.) in the eastbound direction, the two “managed” express lanes each carry almost twice as many vehicles per lane than the free lanes, because of the effect of severe congestion on vehicle throughput in the free lanes. Toll revenues have been adequate to pay for construction and operating costs. The prices vary throughout the day, but do not vary based on congestion. The Metropolitan Transit Authority is also going to implement congestion pricing on the San Bernardino portion of the I-10 freeway, and the transitway portion of the 110 freeway. SCAG is currently undertaking a large regional congestion pricing effort, which is expected to identify a number of potential pricing strategies.

The Houston-Galveston area 2035 RTP includes plans to implement peak period pricing within the managed high occupancy toll (HOT) lanes of the major freeway corridors in the region. Through 2035, the Houston area is expected to see increases in HOV, HOT and regular toll lane miles. By 2035, the region will see an overall decrease in HOV lanes offset by increases in HOT lanes. The Houston September 2009 proposed ozone SIP mentions PAYD insurance under Other Local Programs, but there is no commitment in the SIP to implement such a program. However, the SIP mentions that the area may choose to implement PAYD under *other local programs*. (It

seems likely that administratively any PAYD insurance program would have to be a statewide effort.)

The Roadway System chapter of the Dallas area long range transportation plan (Mobility 2030) addresses the challenge of balancing the area's huge demand on an over-used roadway system with less than adequate funding resources from traditional fuel tax and vehicle registration fee revenues. Over the last few years, the idea of user fee-based roadways has been growing in popularity and acceptance, and recently the Texas Transportation Commission adopted a favorable tollway policy to promote the future study of additional tollways throughout the state. Through this new policy direction, the Texas Transportation Commission authorized the Texas Department of Transportation to evaluate a project during any phase of development or construction for consideration as a tollway, including new location and expansion highway projects on controlled access roadways, such as adding lanes or constructing new main lanes. In June 2007, Governor Perry signed into law Senate Bill 792, a statewide transportation bill that expands the powers of local transportation authorities to develop toll projects and ensures Texas will continue to build needed roads.

Managed lane policies adopted by the RTC include having operators phase-in operational strategies such as occupancy management or congestion pricing as the roadway matures in lieu of, or in conjunction with, future roadway widening. This concept, including a congestion management pilot study, will initially be applied as part of the widening of the President George Bush Turnpike recommended in Mobility 2030. This congestion management pilot study will collect necessary *before and after* traffic data to determine the system wide and corridor effect on meeting regional goals of improved mobility, increased safety, system reliability, additional traveler choice, and air quality benefits. The results of this initial pilot study could help to shape and fine tune the introduction of congestion management strategies in future corridors as improvements are warranted.

Mobility 2030-2009 Amendment contains recommendations for an elaborate and widespread managed facility system. This system recommendation is the result of analysis of the current and proposed freeway/tollway system in conjunction with the proposed managed facility system.

On November 2, 2004, the voters of Maricopa County passed Proposition 400, which authorized the continuation of the existing half-cent sales tax for transportation in the region (also known as the Maricopa County Transportation Excise Tax). This action provides a 20-year extension of the half-cent sales tax through calendar year 2025 to implement projects and programs identified in the MAG RTP. The previous half-cent sales tax for transportation was approved by the voters of Maricopa County in 1985 through Proposition 300, and expired on December 31, 2005. The current half-cent sales tax extension approved through Proposition 400 went into effect on January 1, 2006.

The revenues collected from the half-cent sales tax are deposited into the Regional Area Road Fund (RARF), and allocated between freeway/highway and arterial street projects; and into the Public Transportation Fund (PTF) for public transit programs and projects. These monies must be applied to projects and programs consistent with the MAG RTP. Projects and programs in the MAG RTP that are not categorized into the freeways-highways, transit, or arterial street modes,

have not been allocated sales tax funding. As specified in ARS 42-6105.E, 56.2 percent of all sales tax collections will be distributed to freeways and highways (RARF); 10.5 percent will be distributed to arterial street improvements (RARF); and 33.3 percent of all collections will be distributed to transit (PTF).

The MAG congestion management system explicitly considers 11 strategies prior to Federal disbursement of funds for additional general purpose lanes on the regional freeway system. These strategies include consideration of congestion pricing. However, the RTP 2007 update makes no mention of specific congestion pricing project plans in the Phoenix area.

For the Sacramento area, their MTP 2035 says that SACOG should study ways to use pricing more effectively in funding of transportation. Their planned strategy is to consider a Federal value pricing pilot program grant from the FHWA to examine road and auto pricing options, such as HOT lanes or bridges, pay-at-the-pump auto insurance, or auto loans, at an appropriate opportunity.

The Chicago area RTP recommends that the Congestion Management Process investigate and implement, as appropriate, value pricing to larger portions of the highway system.

### **SIP Enforceability**

There are no commitments in the six nonattainment ozone SIPs for any pricing measures and associated emission credits.

## **Public Transportation**

Strategies expand public transportation by subsidizing fares, increasing service on existing routes, or building new infrastructure.

### **Areas with Experience with this Option**

Public transportation is a significant part of the overall investment being made in Houston's long range RTP. While emissions reductions from public transportation are not enforceable within the SIP nor specifically quantified, they nonetheless will contribute to an overall reduction in the baseline emissions estimate.

A HGAC sponsored analysis examined the potential effects of reducing transit fares on travel. Their analysis simulated the effects of reducing the current average transit fare of \$2.95 per trip to \$2 per trip. This is a 32 percent fare reduction. The analysis performed for the HGAC examined the travel changes and associated emission reductions from such a strategy based on estimates of the elasticity of travel via transit with changes in price. Cost estimates were based on the reduced annual revenue from lower prices. This analysis was conducted in support of an ozone attainment plan, but this measure has not been adopted in the Houston-Galveston area, and has not been included in the Houston-Galveston area ozone SIP.

The Dallas TCM includes a rail transit project. This is aimed at expanding transit services across all modes, such as bus, rail and paratransit. This includes over 70 miles of rail projects that will be implemented in the Dallas nonattainment area. In order to attract new transit passengers and increase overall ridership, the program seeks to expand services provided and improve operations while keeping ridership costs low. The TCM is used for SIP credit, and the public transit option is estimated to reduce emissions by 0.29 tpd of NO<sub>x</sub> and 0.21 tpd of VOC.

Transit is an important part of the Chicago RTP, although no related SIP credits were taken in the area. One planned transit initiative includes fare incentives to encourage off-peak travel and transit use generally. Also discussed are general fleet improvements and increased transit service to the Chicago suburbs.

Sacramento was careful to prioritize providing transit to minority and low-income areas, because in many cases these groups have the greatest need for public transit. The SIP outlines transit spending within its TCMs and this accounts for over \$380 million in investment in transit acquisitions and operations. There were no emissions reductions accounted for in the SIP from public transportation.

In the South Coast AQMP, transit operations and expansion are given significant attention. The TCM includes numerous projects to increase bus service to new areas and expand the bus and shuttle fleet. Rail transit is also included in the TCM, including added rail track, railroad consolidation and expanded rail stations. The TCM reductions are not broken out, although the TCM is responsible for 2.2 tpd reduction of NO<sub>x</sub> by 2020, and 0.83 tpd of VOC. How much of this reduction comes from additional transit is not delineated.

The Maricopa SIP contains no transit-related options to reduce emissions in the Phoenix area. The RTP understandably includes transit, but none of these measures are binding, or estimated to result in any emissions reduction. Of the total transportation funding planned for the Maricopa area in the RTP, just over 30 percent of it goes towards expanding rail and bus transit.

### **SIP Enforceability**

The reduced transit fare has not been adopted in the Houston-Galveston area, and has not been included in the ozone SIP.

The additional public transit investment in the Dallas nonattainment area is part of their TCM program, and therefore the reductions are included in the SIP. The additional investment in public transit is estimated to reduce NO<sub>x</sub> emissions by 0.29 tpd and VOC emissions by 0.21 tpd.

South Coast includes transit projects with their TCMs, which are used for SIP credit. However, TCM reductions are not broken out, so what portion of the TCM emissions reductions comes from public transportation is not clear. The TCMs as a whole are responsible for a reduction of 2.2 tpd of NO<sub>x</sub> and 0.83 tpd of VOC. None of the other areas (Phoenix, Chicago, Sacramento) considered enforceable emissions reductions within their SIPs from public transit.

## **Regulatory Strategies**

These strategies include implementing regulations that moderate vehicle travel or reduce speeds to achieve higher fuel efficiency.

### **Areas with Experience with this Option**

The Houston ozone nonattainment area SIP has a speed limit reduction measure, which affects roadways where speed limits were 65 mph or higher, and speed limits remain at 5 mph below what was posted before May 1, 2002. This program began in September 2003. After this program was enacted, the Texas legislature passed a law that only allows speed limit reductions to be made for safety reasons. Further changes to speed limits cannot be made for environmental reasons.

For the Dallas area, the environmental speed limit strategy began in September 2001. Affected facilities with posted speed limits of 70 mph or 65 mph were identified and given speeds reduced by 5 mph to model this strategy in future planning years. The Texas law mentioned above also applies in the Dallas area.

Sacramento is researching a regional parking regulation policy to provide incentives for alternative travel modes. This analysis is to address impacts of parking maximum and minimum requirements, shared parking systems, and parking pricing on travel behavior and air emissions.

The RTP for Chicago recommends parking management policies as part of their overall TDM strategy. Parking management manages the cost of parking, reduces its availability, and provides information regarding availability – so as to reduce travel demand and reduce excess VMT searching for parking.

In 2008 a Congestion Reduction Demonstration was approved by the U.S. Department of Transportation, the City of Chicago, and the Chicago Transit Authority. Included in this agreement is implementation of congestion-reducing parking strategies, including a peak-period surcharge on off-street non-residential parking, and a system for variably priced downtown on-street metered parking. The implementation of the Congestion Reduction Demonstration, like other committed projects, is thus a planning assumption for the Region.

The South Coast 2008 RTP notes that the area will need to emphasize some hard strategies in the future, especially parking and congestion pricing. This will require significant analysis, consensus building, and public education. The RTP also points out that pricing benefits have proven to be more sustainable over time than soft strategies like ridesharing, work at home and non-motorized transportation.

The Phoenix RTP does not mention any regulatory strategies.

## **SIP Enforceability**

There are no commitments in the six nonattainment ozone SIPs for any pricing measures and associated emission credits.

## **Ridesharing**

Strategies expand services and provide incentives to travelers to choose transportation options other than driving alone.

Single occupancy vehicles are typically the most emissions intensive major transportation choice available. Thus any policy which encourages alternative methods of transportation, particularly when commuting, are likely to have benefits in terms of emissions reductions from less emissions intensive travel options, and reduced traffic and idling.

### **Areas with Experience with this Option**

In Houston, ridesharing was considered as part of VMEP emissions reductions. These include actions that encourage pedestrian/bike transportation, internet ridesharing program and vanpooling. Houston also recommended forming a ride matching service to reduce SOVs. This program allows people offering rides to track their mileage, and gain points towards rewards such as gift certificates to stores and restaurants. These incentives served to dramatically increase the practice of ridesharing in Houston, from only a few hundred in 2005 to around 5,000 in 2008.

The Dallas area has several options which contribute to the TCM emissions reductions. Dallas is planning to expand its HOV lanes by 70 miles, although it is possible that existing HOV lanes may also be converted to HOT lanes. Dallas's TCM also includes a program to set up 216 vanpools, which would allow travelers to meet at a park and ride lot, and travel the rest of the way by van. Also included in the TCM is expanded park and ride projects, which would further encourage car and vanpooling. Within Dallas's VMEP is an employee trip reduction program, which would encourage business to provide more flexibility to workers in terms of scheduling. This should ideally reduce emissions at peak times, and serve to increase telecommuting, with no associated vehicle emissions. Dallas estimated a 0.43 tpd reduction of NO<sub>x</sub> and 0.28 of VOC from employee trip reduction as a part of their VMEP, which is not enforceable within this SIP. Dallas also has several local programs to reduce single occupancy vehicles, including a parking cash-out program, which would serve to provide a financial incentive to give up their parking space. This program would reward workers who choose alternative forms of transportation which do not require a parking space. Without a program such as this in place, employees who drive to work are receiving a free service (parking) while employees who make alternative arrangements receive no such benefit.

The Sacramento SIP lists three planned park and ride lot/transit center projects for the area. The implement or complete date is listed as either 2009 or 2010 for each of these projects. No specific VOC or NO<sub>x</sub> emission reductions are claimed for these projects. Under MTP Funding Programs, they indicate that their TDM funding program includes funding the SACOG regional rideshare program for \$1.2 million through 2018.

The Sacramento MTP included several ridesharing elements, including parking pricing and ridesharing databases. A parking pricing program would encourage ridesharing and facilitate more intense land use. A ridesharing database could be updated regularly to encourage ridematching, and to potentially coordinate ridesharing incentives in a single place.

Chicago's RTP outlined several elements of ridesharing as part of future transportation projects in the area. Chicago plans to implement several ridesharing policies within their larger travel demand management strategy. Included in this is a plan to manage the cost of parking, reduce parking availability, and provide information on this availability to reduce excess VMT searching for parking spaces. There is also a planned guaranteed ride home program to help assure that transit users will be able to get home when transit is not available. Also included in the travel demand management subheading were plans to increase carsharing, alternative work arrangements, and ridesharing incentives.

Additional ridesharing efforts in Chicago include increased HOV priority lanes and support services such as preferential parking, and park and ride facilities.

Within the South Coast TCMs are several policies aimed at increasing ridesharing and reducing single occupancy vehicles. These include information campaigns about the potential to save money through ridesharing, as well as information on ridematching services. A forum is to be created to make setting up carpools easier, and should likely reduce the number of SOVs in the Los Angeles area. There are also several planned expansions to park and ride centers, as well as new facilities. HOV lanes are also being built in many areas, and expanded in places where there is need. The TCM reductions are not broken out, although the TCM is responsible for 2.2 tpd reduction of NO<sub>x</sub> by 2020, and 0.83 tpd of VOC. How much of this reduction comes from ridesharing is not delineated.

The Maricopa SIP contains no ridesharing related options to reduce emissions in the Phoenix area. While Maricopa is pursuing ridesharing initiatives, it is not certain the level of investment the area is making, because it is not a specific line item in the budget outlined in the RTP.

### **SIP Enforceability**

In Houston, alternative commuting efforts are estimated to reduce NO<sub>x</sub> emissions by 0.20 tpd. This emissions reduction is part of the larger VMEP, and therefore is not individually enforceable. In addition, many of these emissions could be part of other policy areas, because it includes elements such as public transportation and bike/pedestrian infrastructure. Exactly what portion of the 0.20 tpd reduction of NO<sub>x</sub> comes from ridesharing elements cannot be determined.

In Dallas, both the HOV lanes and the vanpooling option are TCMs, which are enforceable at that level within the SIP. Funding for these projects has already been allocated, and they are estimated to result in a reduction of 0.80 tpd and 0.09 tpd of NO<sub>x</sub>, respectively. There is also a reduction of 0.45 tpd VOC from HOV lanes, and 0.06 tpd of VOC from vanpooling. Expanded park-and-ride lots, also a part of the TCM, will entail over 2000 additional parking spaces, and have associated reductions of 0.04 tpd of NO<sub>x</sub> and 0.03 tpd of VOC in associated benefits.

All of the Sacramento area projects listed were chosen to be included in the Federal 8-hour ozone plan because they had early completion dates, costs were not large, funding was already committed, and delivery appeared to be likely.

Chicago, Phoenix and South Coast did not include any enforceable emissions reductions from ridesharing in their SIPs.

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## Chapter 4 – Key Conclusions and Recommended Next Steps

**Conclusion 1:** To date, the SIP process presents more risks than rewards for including TCMs as SIP measures. This occurs because of the difficulty in demonstrating that these measures achieve emission reductions in practice coupled with the uncertainty that any option that requires long-term financial commitments may not be fully funded at the levels needed to achieve the expected emission benefits.

**Recommendation:** One of the recommended next steps for this study is that there be a collaborative effort led by EPA Headquarters (Air Program and Office of Smart Growth) and involving EPA regional offices and the EPA Office of Transportation and Air Quality, to establish agreements for collaboration in establishing benchmark transportation initiatives and associated research that the ozone and PM<sub>2.5</sub> nonattainment areas can call upon for achieving significant multi-pollutant emission reductions going forward. This collaboration and information sharing is expected to lead to more areas focusing on innovative ways to improve their transportation systems that also produce multi-pollutant emission reduction benefits. This is also expected to produce more consistency across regions in transportation measure adoption.

**Conclusion 2:** MPOs have been using strategic visioning processes as a public participation technique and to develop information for its MTP. Visioning is seen as a useful and accepted part of the comprehensive planning process. The results of the visioning process form the basis for the assumptions about land use, smart growth, and transit-oriented development that become the baseline scenario for long-range transportation plans.

**Recommendation:** Innovative smart growth and land use initiatives for the Front Range should be incorporated in the area's long-range transportation plans, and their expected emission reductions included in the emission budget estimates associated with that long-range plan.

**Conclusion 3:** Areas that have included TCMs in SIPs have selected TCM projects with early completion dates, costs were not large, funding was already committed, and delivery appeared to be likely.

**Recommendation:** Recommend that the Front Range evaluate options based on this tendency and identify which measures might be used for attainment purposes and which might be used for maintenance purposes.

**Conclusion 4:** Those places that pursued TCMs took full advantage of state of the art tools and processes (Visioning Scenario Planning and Modeling) to evaluate them

**Recommendation:** The Front Range is poised to do this and should seriously consider such efforts as part of long term ozone planning.

**Conclusion 5:** Any area beginning new evaluations of TCMs should keep abreast of current EPA policy and technical guidance on this subject.

**Recommendation:** Review the 2009 updated EPA guidance on substituting and adding TCMs to approved state air quality plans (EPA, 2009). In addition, EPA is about to release a TCM guide as one in their series of local government climate and energy strategy guides. All guides are available at [www.epa.gov/statelocalclimate/resources/strategy-guides.html](http://www.epa.gov/statelocalclimate/resources/strategy-guides.html).

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