

Air Quality Guidelines for General Plans



San Joaquin Valley
Air Pollution Control District

Revised June 2005

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SECTION I

EXECUTIVE SUMMARY

I. EXECUTIVE SUMMARY

Overview

Air Quality Guidelines for General Plans (Air Quality Guidelines) is a guidance document and resource for cities and counties to use to address air quality in their general plans. It includes goals, policies, and programs for adoption in general plans to reduce vehicle trips, reduce miles traveled, and improve air quality.

AB (Assembly Bill) 170, passed in 2003, and subsequent revisions to California Government Code require cities and counties in the San Joaquin Valley to amend appropriate elements of general plans to include data, analysis, comprehensive goals, policies, and feasible implementation strategies to improve air quality no later than one year after the first revision of their housing elements that occurs after January 1, 2004. The next revision for Fresno and Kern Counties is June 30, 2008, and the next revision for Stanislaus, San Joaquin, Merced, Kings, Tulare, and Madera Counties is June 20, 2009. Cities and counties are required to submit these air quality amendments to the San Joaquin Valley Unified Air Pollution Control District (District) at least 45 days prior to the adoption of those amendments, and the District then has 30 days to return comments and advice. The District believes that implementing the goals and programs suggested in the *Air Quality Guidelines* will result in a win-win situation: cities, counties, and developers save money through more efficient land use and transportation systems, and the public benefits from a more livable community and better air quality. While developing the document, the District found that many Valley general plans already contain goals and policies that support improved air quality. To obtain full benefit from these adopted goals and policies, cities and counties must proceed rapidly with strong implementation programs.

Document Development Process

The District has attempted to maximize participation of Valley's cities, counties, industry, and general public developing the original *Air Quality Guidelines*. At the beginning of the process, phone interviews were conducted with many of the planning agencies in the Valley to identify issues to be addressed in the document. Administrative drafts were forwarded to all city and county planning agencies, transportation planning agencies, and interested individuals for their comment and suggestions. On October 20, 1994, the District Governing Board adopted the original version of the *Air Quality Guidelines for General Plans* after a series of public workshops and hearings. From 2003-2005, the District revised the *Air Quality Guidelines* to

incorporate new information and to remove outdated air quality data; these revisions did not substantively affect the policies, goals and objectives of the original 1994 version.

Purposes of this Document

- **To provide local planning agencies with a comprehensive set of goals and policies that will improve air quality if adopted in a general plan.**
- **To provide a guide to cities and counties for determining which goals and policies are appropriate in their particular community.**
- **To provide justification and rationale for the goals and policies that will convince decision makers and the public that they are appropriate and necessary.**

A Call for Local Action

The District needs the help of every city and county in the Valley to achieve air quality that meets federal and state standards. Only a cooperative approach can protect the health of the citizens of the Valley and the health of our economy.

The US Environmental Protection Agency (EPA) designates the San Joaquin Valley Air Basin as non-attainment for ozone and fine particulate matter (PM₁₀ and PM_{2.5}). This means that District plans for achieving National Ambient Air Quality Standards (NAAQS) must include stringent emission control measures that are demonstrated to produce air quality attaining the standards by the deadlines specified in the federal Clean Air Act (CAA). If the District's plans fail to meet all requirements, the EPA will take action to exert increasing federal presence in controlling emissions, ranging from sanctions to preparation of a federal plan for attaining ambient standards. Effective local action is needed to ensure that planning for healthy air quality is done in concert with economic development activities.

Local Government's Role

The District's plans to attain state and federal air quality standards rely on local government to implement control measures that reduce emissions associated with transportation facilities. These measures include any program to reduce vehicle trips and miles traveled, to increase average vehicle ridership, or to reduce direct emissions from vehicle activity (e.g., PM₁₀ street sweepers).

Although emissions reductions from these measures typically are not quantified, they do contribute to overall air quality improvements, thereby helping air quality plans to meet their goals. The District recognized that measures to change travel behavior are in many cases best implemented at the local level. This led the District to develop a memorandum of understanding (MOU) with each of the Valley Regional Transportation Planning Agencies (RTPA) to implement control measures.

For local measures to be effective, cities and counties must take actions to implement and support them. The challenge is to persuade San Joaquin Valley residents to drive less. To do that, we must change the way we plan, develop, and manage our communities to make it easier and more attractive for people to use transit, bicycle, or walk.

Cities and counties control the comprehensive planning and development process. As members of transportation authorities and congestion management agencies, local jurisdictions also work together to coordinate land use and transportation programs. The general plans, congestion management programs, and implementation measures they adopt can and should reflect a commitment to clean air.

Despite air pollution controls, air quality can vary from area to area. Land use policies and practices, including planning, zoning, and siting activities, can play a critical role in avoiding incompatible land uses and thus reduce localized air pollution exposure that can result in adverse health impacts, especially for sensitive individuals. For instance, some projects, like highway construction, that are sited very close to homes and public places can result in elevated air pollution exposures. The California Air Resource Board 2005 publication of *Air quality and land use handbook: a community health perspective*, outlines strategies for land use that can help mitigate public health risks.

Why Technology Hasn't Won the Battle

Mobile sources are a substantial portion of the pollutant inventory in the San Joaquin Valley. The following estimates of changes in emissions of the Valley's nonattainment pollutants and precursors from on-road motor vehicles from 2001 to 2010 comes from data from CCOS, the ARB 2004 Almanac, the 2003 PM10 Plan, and the 2004 Extreme Ozone Attainment Demonstration Plan:

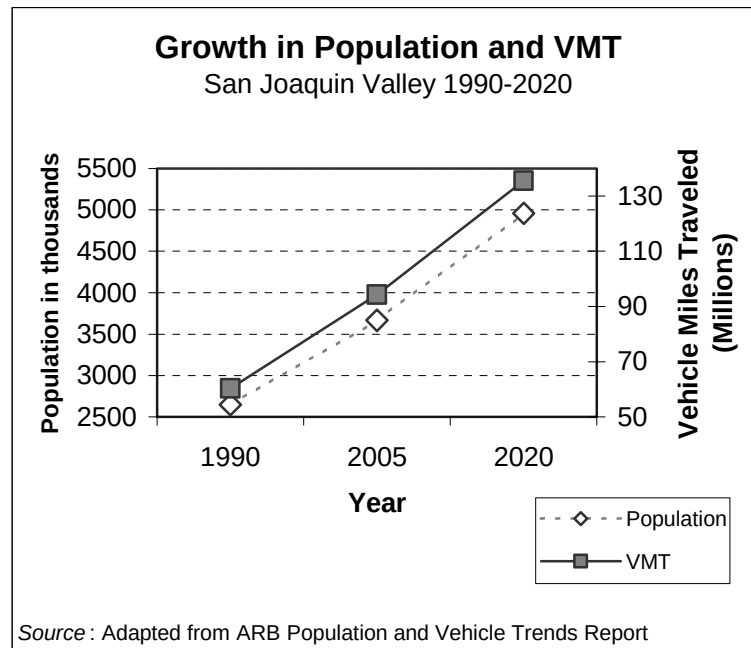
- CO 59%
- PM10 14%
(includes paved and unpaved road dust)
- ROG 50%
- NOx 50%

Although our cars and trucks are getting cleaner as the vehicle fleet turns over, rapid population growth and increases in the amount we use our vehicles can offset a large amount of the

improvements achieved through tailpipe controls and engine technology.

Figure 1-1 illustrates the rapid increases in population and vehicle miles traveled predicted over the next 15 years for the San Joaquin Valley as well as the increases from 1990 to 2005. This growth is overwhelming our hard-won progress and may cause overall mobile source emissions to begin increasing early in the next decade. This is unacceptable considering that the federal CAA mandates us to reduce emissions of ozone precursors by at least three percent per year until air quality standards are attained. Any slack created by increases in motor vehicle emissions must be made up from job-producing stationary sources, or we will face the consequences of federal actions to reduce emissions.

Figure 1-1 San Joaquin Valley Growth



Why Cities and Counties Should Expend the Effort

In 2003, AB 170 added Section 65302.1 to California Government Code. This section requires cities and counties in the San Joaquin Valley to amend appropriate elements of general plans to include data, analysis, comprehensive goals, policies, and feasible implementation strategies to improve air quality no later than one year after the first housing element revisions that occur after January 1, 2004.

Legal obligation is not the only source of motivation. Failure to reduce mobile source emissions will have a number of very significant costs. Of highest importance is the impact on the health of people of the Valley. Without greater progress, too many people will continue to breath air that makes them

ill and shortens their lives. Also of importance is the impact our economy will experience if we fail to comply with state and federal air quality mandates. Economic development and business recruitment will be difficult in an area plagued by unhealthy air quality.

Why Cities and Counties Should Adopt Air Quality Elements or Their Equivalent

- **AB 170 and subsequent changes to California Government Code require cities and counties in the San Joaquin Valley to incorporate air quality elements in their local planning**
- **The current air quality in the Valley adversely affects the health and welfare of the citizens of your community**
- **If we are unsuccessful in implementing long range programs to reduce emissions from mobile sources, job producing stationary sources must fill the gap**
- **If Valley air quality programs apply inadequate effort toward attaining air quality standards, federal sanctions may be imposed that limit stationary source expansion and withhold highway funds**
- **Local government's authority over land use decisions comes with the responsibility to minimize air quality impacts of new development**

Under the federal CAA, the EPA is required to impose automatic sanctions under the following conditions: State failure to submit a complete State Implementation Plan; EPA disapproval of a State Implementation Plan; and State failure to implement its plan. Sanctions must be imposed within 18 to 24 months after a sanction clock is started. The EPA can apply two sanctions: (1) a 2-to-1 emissions offset for newly constructed or modified major sources, which would require new or modified facilities to reduce emissions from other sources equal to twice the amount they project to emit; and (2) a restriction on federally funded highway projects. The first sanction could make most industrial expansion prohibitively expensive in the Valley. The second sanction could seriously delay needed highway improvements and jeopardize the money they provide to the local economy.

To summarize, the District must submit approvable plans to the EPA, and the plans must reach their goals of healthy air quality by the federal CAA deadlines. Failure to do so harms the health of Valley residents, jeopardizes the Valley's economy, and could lead to a loss of local control of the air quality management process.

Air Quality/Transportation Legislation and Local Government

Federal Clean Air Act:

- Requires air quality plans to include measures necessary to achieve National Ambient Air Quality Standards
- Requires all plans, programs, and projects that require federal approval, including transportation plans, to conform to air quality plans
- Requires sanctions if all feasible measures are not expeditiously adopted

Intermodal Surface Transportation Efficiency Act:

- Requires transportation projects to not impact the ability to attain air quality standards
- Requires demonstration of expeditious implementation of TCMs

California Clean Air Act:

- Requires all feasible control measures, including transportation control measures, to reduce emissions
- Provides for indirect source programs in attainment plans
- Contains targets for emission reductions, vehicle miles traveled, and average vehicle ridership

AB 170:

- In adding Section 65302.1 to the Government Code, requires cities to incorporate strategies to improve air quality in their general planning

SB (Senate Bill) 709:

- Adds Chapter 5.7 to Part 3 of Division 26 of the Health and Safety Code, giving the District more responsibility in terms of permitting, fee implementation, and agricultural assistance, but also gives the District the authority to require the use of best available control technology for existing sources, promote cleaner-burning alternative fuels, and encourage and facilitate ridesharing
- Adds Section 9250.16 to the Vehicle Code to allow the District to adopt a surcharge on motor vehicle registration fees in counties within the District

California Government Code Section 65089:

- Requires trip reduction and travel demand management in Congestion Management Programs

Transportation Conformity

Another link to air quality planning is a federal CAA requirement that regional transportation plans must conform to air quality plans. This means that new transportation projects cannot make air quality worse. District State Implementation Plan (SIP) submittals include an emissions inventory and projections for the future emissions based on control measures in the SIP. Projected inventories for mobile source emissions are based on projections of vehicle use made by the RTPAs. If these projections are too high, the District must look for additional emissions reductions from other sources. If the projections are too low and actual vehicle use exceeds projections, none of the Valley Regional Transportation Plans will conform with the SIP and projects in the plans will therefore not receive state or federal funds.

What Cities and Counties Can Do

Persuading people to use alternatives to their car is a difficult task. This task is made harder by the prevalent design of our communities. For the last fifty years or so, we have designed and built our communities for the most efficient use of the automobile at the expense of alternatives to the automobile. The first step in reversing this trend is to ensure that the general plan, which guides the development of our communities, supports walking, bicycling, and transit for more of our transportation needs.

This is where the *Air Quality Guidelines for General Plans* comes in. This document provides a comprehensive set of goals and policies that promote development patterns, site designs, and transportation systems that support alternatives to the automobile. Cities and counties can use this information as a resource during general plan updates. They can select policies appropriate for addressing the issues and concerns of their individual communities. As development occurs in a manner consistent with air quality goals and policies, local government control measures will be more effective and growth in vehicle trips and vehicle miles traveled will be reduced.

Summary of Major Components of the Air Quality Guidelines

The Air Quality Guidelines contains three major and several minor sections. The major sections include (1) an air quality and regulatory setting; (2) a comprehensive list of general plan goals and policies to improve air quality; and (3) an analysis of the air quality benefits of implementing each policy or related group of policies as well as the overall benefits of implementing a comprehensive local air quality program. These components are further described below:

- The Existing Air Quality and Regulatory Setting section explains the air quality regulatory framework, the existing air quality in the San Joaquin

- Valley, and the topographical and meteorological factors affecting air quality. This section could be used in air quality analysis sections of environmental documents.
- The Comprehensive List of General Plan Goals and Policies to Improve Air Quality section covers the full range of air quality issues faced by cities and counties. A main theme of the policies is to link land use, transportation, and air quality planning. A number of the policies, such as policies that promote compact development and efficient infrastructure, have indirect air quality benefits. The main purposes of these policies are to minimize infrastructure costs and to preserve natural or agricultural lands; however, secondary air quality benefits are achieved by reducing vehicle trip lengths and by improving the potential for transit service.
 - The Policy Analysis and Air Quality Benefits section is intended to provide justification for cities and counties to adopt the policies. This section provides available emission reduction estimates and provides the logic behind policies that are not quantifiable. This section also gives examples of programs in operation to illustrate where the policies have been successfully implemented. This section is divided into three components: Suggested Goals and Policies for Separate Air Quality Elements, Chapters, or Sections; Suggested Goals and Policies for Land Use Elements; and Suggested Goals and Policies for Circulation Elements.
 - The document provides a matrix that identifies the policies that are appropriate for each of seven different community types identified in the San Joaquin Valley. The matrix is intended as a guide only. Each city and county will determine the goals and policies appropriate for their community. Also provided are a glossary of terms and an extensive bibliography.

Air Quality Goals and Policies

The Air Quality Guidelines provides a comprehensive set of goals and policies thought to have air quality benefits. The goals and policies were primarily drawn from general plans and air quality elements adopted by jurisdictions in California, including many in the San Joaquin Valley. In many cases, the goals and policies were revised to create a more consistent tone or to adapt to Valley issues. The goals and policies are either specific to air quality or air quality related. Many goals and policies provided are based on well accepted land use planning principles that also have secondary air quality benefits.

The District identified the strategies below, based on internal analysis and comments from cities, counties, and other interested parties, that are needed for an effective local air quality program. The goals and policies presented in this document provide suggested language for carrying out these strategies.

Air Quality Guidelines Strategies

- **A commitment to determine and mitigate project level and cumulative air quality impacts under the California Environmental Quality Act (CEQA)**
- **A commitment to integrate land use plans, transportation plans, and air quality plans**
- **A commitment to plan land uses in ways that support a multi-modal transportation system**
- **A commitment to take local action to support programs that reduce congestion and vehicle trips**
- **A commitment to plan land uses to minimize public exposure to toxic air pollutant emissions from industrial and other sources**
- **A commitment to reduce particulate emissions from sources under local jurisdiction**
- **A commitment of support for District and public utility programs to reduce emissions from energy consumption and area sources (water heaters, barbecues, etc.)**

The specific policy language is not as important as a clear statement of commitment to take action. Implementation of the strategies with actual programs is the real key to air quality improvements. Some jurisdictions may wish to take a general approach and use a small number of policies from the Air Quality Guidelines that state commitments and provide detailed action in the implementation programs. Other jurisdictions may wish to use a larger number of more detailed, specific policies. Each jurisdiction will decide how best to phrase each policy during its own plan development, workshop, and public hearing process.

Potential Air Quality Benefits

In preparing the Air Quality Guidelines, staff and the consultant conducted an extensive review of the literature on the relationship between land use, transportation, and air quality. The results show that a community that comprehensively plans an area so that land uses are supportive of walking, bicycling, and transit can achieve long range trip reductions of 8 to 10 percent on a regional basis and more than 20 percent on a project basis. This is compared to the standard suburban development patterns that are now prevalent and assumes that new development will be served by an efficient transit system. Trip reductions equate roughly to emission reductions.

Program Benefits

- **Lower infrastructure costs (roads, sewer, water)**
- **Lower public service costs (police, fire, road maintenance)**
- **More efficient transit service (higher fare box ratios, better service)**
- **Comprehensive planning costs less and the permit process is streamlined**
- **Improved mobility for non-drivers (elderly, low income individuals, and children)**

Other Program Benefits

Many communities in regions throughout the country and in the Central Valley are attempting to plan their growth in ways that address a number of serious problems, only one of which is air pollution. Increasing traffic congestion, loss of open space and prime farmland, urban sprawl, lack of money to support public infrastructure and services, increasing fuel costs, increased social isolation, and health problems associated with long commute times are concerns of many Valley communities. These communities believe that reliance on the typical patterns of low density urban development will perpetuate these problems. The District agrees and has included a number of goals and policies in the Air Quality Guidelines to promote the concepts of neo-traditional planning and livable places being implemented in these communities. These planning concepts use the strong application of urban design techniques, compact development, and more efficient transportation systems to achieve goals.

Relationship to Other District Programs

Air Quality Guidelines is supportive of several District programs to reduce mobile source and area source emissions. The control measures developed by local government Planning Agencies also emphasize local actions to reduce trips, reduce vehicle miles traveled, and increase average vehicle ridership. Implementation of air quality policies pertaining to land use patterns and transportation systems will enhance the long-range effectiveness of the transportation control measures. The District conducts a thorough review of development projects in its role as a commenting agency under the California Environmental Quality Act (CEQA). The Air Quality Guidelines suggests policies to formalize the District's commenting relationship with cities and counties. The Air Quality Guidelines supports adopted District rules and regulations controlling sources.

The District is developing Indirect Source Rules (ISR). These rules would require new or modified development projects to reduce indirect source

emissions by mitigating emissions through project design, paying a fee to reduce emissions off-site, or a combination of the two. An indirect source is any facility, building, structure, or installation that generates or attracts mobile source activity. The details of how the proposed ISR program could relate to city and county general plans and planning procedures will be considered during its development. Cities and counties that prepare a general plan that provides for multiple forms of transportation with corresponding zoning ordinances will make it easier for developers to meet the requirements of the proposed program. In June 2005, the proposed rule changed the name from ISR to DESIGN, which stands for Decreasing Emissions' Significant Impact from Growth and New development.

How Cities and Counties Can Use the Air Quality Guidelines

The District recognizes that each city and county in the Valley has a unique general plan. Every plan varies somewhat in format, detail, and content. Some plans consist of a single volume while others have separate volumes for each element or logical groups of elements. This uniqueness requires each jurisdiction to determine where and how to integrate air quality goals and policies into its plans

The document will be available on CD-ROM and the Internet to enable planners and officials to extract materials that are appropriate for their general plans and format those materials as they wish. District staff will be available to assist local planning agencies in using this document.

Conclusions

The San Joaquin Valley has a serious air pollution problem that will take the cooperation of land use and transportation planning agencies, transit operators, the development community, the District, and the public to solve. The solution to the problem requires changes in the ways we have traditionally built our communities and constructed our transportation systems. It involves a fundamental shift in priorities from emphasis on mobility for the occupants of private automobiles to a multi-modal system that more efficiently uses scarce resources. It requires a change in attitude from the public to support development patterns and transportation systems that differ from the status quo. Fortunately, the changes are not all painful. Better community design, less traffic congestion, greater sense of community, and cleaner air are changes most people will welcome.

SECTION II

EXISTING AIR QUALITY AND REGULATORY ENVIRONMENT

II. EXISTING AIR QUALITY AND REGULATORY ENVIRONMENT

REGULATORY SETTING

All levels of government have some responsibility for protecting air quality. This section outlines the responsibilities of federal, state, regional, and local government agencies in air quality matters and explain how they interact.

Federal

At the federal level, the Environmental Protection Agency (EPA) has been charged with implementing national air quality programs. The EPA's air quality mandates are drawn primarily from the federal Clean Air Act (CAA). The CAA was first signed the CAA into law in 1963. Congress substantially amended the CAA in 1970, 1977, and 1990.

The EPA deals with global, international, national, and interstate air pollution issues. Their primary role at the state level is one of oversight of state air quality programs. The EPA sets federal standards for vehicle and stationary sources and provides research and guidance in air pollution programs.

The CAA required the EPA to set National Ambient Air Quality Standards (NAAQS) for several problem air pollutants on the basis of human health and welfare criteria. Two types of NAAQS have been established: primary standards, which protect public health, and secondary standards, which protect public welfare (e.g., crops, forests, materials, visibility, etc.). Primary NAAQS have been established for the following air pollutants:

- carbon monoxide (CO)
- ozone (O₃)
- respirable particulate matter (PM₁₀)
- fine particulate matter (PM_{2.5})
- nitrogen dioxide (NO₂)
- sulfur dioxide (SO₂)
- lead (Pb)

All of the above, except carbon monoxide, also have some form of secondary standard. The primary NAAQS standards are intended to protect, within an adequate margin of safety, those persons most susceptible to respiratory distress, such as people suffering from asthma or other illness, the elderly, very young children, or others engaged in strenuous work or exercise.

States are required to develop and implement air pollution control plans designed to achieve and maintain the NAAQS established by the EPA. States may also establish their own standards, provided the state standards are at least as stringent as the NAAQS. California has established California Ambient Air Quality Standards (CAAQS) pursuant to Health and Safety Code Section 39606(b) and its predecessor statutes. To see current federal and state standards, please visit <<http://www.arb.ca.gov/aqs/aqs.htm>>.

The EPA designates areas with air quality not meeting federal standards as “nonattainment.” The federal CAA further classifies nonattainment areas based on the severity of the nonattainment problem, with marginal, moderate, serious, severe, and extreme nonattainment classifications for ozone. Nonattainment classifications for PM range from marginal to serious.

The federal CAA requires areas with air quality violating the NAAQS to prepare an air quality control plan referred to as the State Implementation Plan (SIP). The SIP contains the strategies and control measures that states such as California will use to attain the NAAQS. The federal CAA amendments of 1990 require states containing areas that violate the NAAQS (such as the San Joaquin Valley Air Basin) to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is a living document that is periodically modified to reflect the latest emissions inventories, planning documents, rules, and regulations of Air Basins as reported by the agencies with jurisdiction over them. The EPA reviews SIPs to determine if they conform to the mandates of the federal CAA amendments and will achieve air quality goals when implemented. If the EPA determines a SIP to be inadequate, it may prepare a Federal Implementation Plan (FIP) for the nonattainment area and impose additional control measures.

State

The California Legislature established the California Air Resources Board (ARB) in 1967. The ARB is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California Clean Air Act of 1988.

The California Clean Air Act of 1988 (CCAA) provides a planning framework for attainment of the California Ambient Air Quality Standards (CAAQS). The CCAA classifies nonattainment areas as moderate, serious, severe, and extreme based on severity of violation of state ambient air quality standards. For each class, the CCAA specifies air quality management strategies that must be adopted. For all nonattainment categories, attainment plans are required to demonstrate a five-percent-per-year reduction in nonattainment air pollutants or their precursors, averaged every consecutive three-year period, unless an approved alternative measure of progress is developed. Air districts responsible for air basins with air quality that is in violation of CAAQS

are required to prepare an air quality attainment plan (AQAP) that lays out a program to attain the CCAA mandates.

Other ARB duties include monitoring air quality in conjunction with air monitoring networks maintained by air pollution control districts (APCDs) and air quality management districts (AQMDs), establishing CAAQS (which are more stringent than the NAAQS in many cases), setting emissions standards for new motor vehicles, and reviewing district input for the State Implementation Plans (SIP) required by the federal CAA amendments. A SIP consists of the emissions standards for vehicular sources set by the ARB as well as attainment plans adopted by the APCD or AQMD and approved by the ARB.

Regional

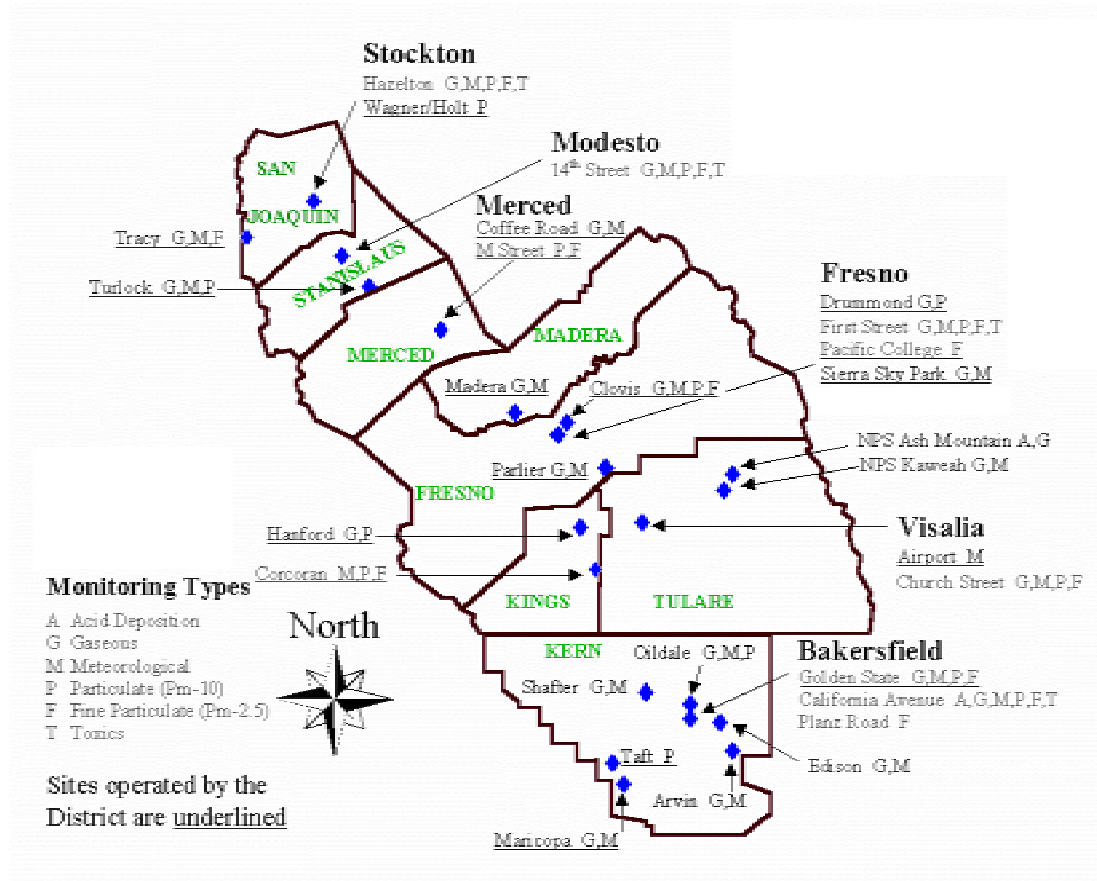
Air pollution does not respect political boundaries. Therefore, many air quality problems are best managed on a regional basis. This was the case for the San Joaquin Valley, where each County operated a local APCD until 1991. The State Legislature then determined that management of the entire air basin by a single agency would be more effective. Air basins are geographic areas sharing a common "air-shed." Most major metropolitan areas in California now fall under the authority of multi-county unified air pollution control districts (UAPCDs) or AQMDs.

Air districts have the primary responsibility for control of air pollution from all sources other than direct motor vehicle emissions, which are the responsibility of the ARB and EPA. Air districts adopt and enforce rules and regulations to achieve state and federal ambient air quality standards and enforce applicable state and federal law.

The San Joaquin Valley Unified Air Pollution Control District (District) has jurisdiction over air quality matters in the San Joaquin Valley Air Basin. The District was formed in 1991. Its headquarters are located in Fresno with regional offices located in Bakersfield in the Southern Region and Modesto in the Northern Region. Figure 2-1 shows the boundaries of the San Joaquin Valley Unified Air District Basin. This map also shows the air monitoring stations that are operating as of June 2005. Note that the eastern portion of Kern County falls outside the San Joaquin Valley Air Basin. Eastern Kern County is within the Mojave Desert Air Basin.

Until the passage of the CCAA, the primary role of county APCDs was controlling stationary sources of pollution, such as industrial processes and equipment. With the passage of the CCAA and federal CAA amendments, air districts were required to implement transportation control measures and were encouraged to adopt indirect source control programs to reduce mobile source emissions. These mandates created the necessity for air districts to

Figure 2-1 San Joaquin Valley Air Basin Monitoring Stations



work closely with cities, counties, and regional transportation planning agencies to develop new programs.

The District entered into a memorandum of understanding with the transportation planning agencies of the eight counties in the San Joaquin Valley Air Basin in 1992. This memorandum of understanding ensures a coordinated approach in the development and implementation of transportation plans throughout the Valley. This action has helped the Regional Transportation Planning Agencies comply with pertinent provisions of the federal and state Clean Air Acts as well as related transportation legislation (such as the Intermodal Surface Transportation Efficiency Act).

The District develops plans and implements control measures in an effort to advance Valley attainment of CAAQS and NAAQS. The District has developed plans to attain state and federal standards for ozone and particulate matter. To view current plans, please visit the District website at www.valleyair.org.

Ozone Plans

The 1994 *Ozone Attainment Demonstration Plan* outlined the District's control strategy for meeting the federal one-hour NAAQS by November 15, 1999. However, the SJVAB did not attain the federal 1-hour ozone standard by November 15, 1999, which led to a series of EPA actions requesting additional rulemaking and plan development activities. In response to District and ARB requests, the EPA eventually classified the SJVAB as extreme nonattainment for the federal 1-hour ozone standard (effective May 17, 2004), which requires attainment of the standard by November 15, 2010. The District's website contains related planning documents and links to EPA actions at http://www.valleyair.org/Air_Quality_Plans/AQ_plans_Ozone_official.htm.

In December 2002, the District's Governing Board adopted the *Amended 2002/2005 Rate of Progress (ROP) Plan for San Joaquin Valley Ozone*. This plan demonstrates that the District's VOC and NO_x emissions reductions meet federal requirements for 2002 and 2005. This plan satisfied all of the EPA's requirements except demonstration of attainment of the federal 1-hr ozone standard. In July 2003, EPA found the motor vehicle emissions budget in this plan to be adequate for transportation conformity purposes. In September 2003, EPA found the *2002/2005 ROP Plan* to be complete.

In 2003 and 2004, the District prepared the *Extreme Ozone Attainment Demonstration Plan (OADP)*. The District Governing Board adopted the *Extreme OADP* on October 8, 2004. On October 28, 2004, the ARB adopted the *Extreme OADP* and transmitted it to EPA by the required November 15, 2004 deadline. The *Extreme OADP* demonstrates attainment of the federal 1-hr ozone standard by November 15, 2010, demonstrates that VOC and NO_x emission reductions in the SJVAB meet federal rate of progress requirements for 2008 and 2010, and fulfills State of California requirements for a triennial progress report on and revision of the District's *1991 Air Quality Attainment Plan*, which is directed at attainment of the California ozone air quality standard.

PM10 Attainment Plans

When the 1990 amendments to the CAA for particulate matter were initially promulgated, the District was designated nonattainment for PM₁₀ and was classified a Moderate Area for PM₁₀. The plan prepared by the District for that classification was unable to demonstrate attainment by the December 31, 1994 deadline. This led to a series of EPA actions requesting additional rule making and plan development activities.

In 2003, the District prepared the *2003 PM10 Plan*, which met the annual 5% requirement and provides for the implementation of BACM, and submitted it

to the EPA in June 2003. The EPA found the plan complete in August 2003 and asked for revisions to make it approvable. The District Governing Board adopted these revisions in December 2003, and EPA issued a final approval of the plan in May 2004 (effective June 2004). The District is in the process of implementing the BACM contained in that plan and is also working on a *2006 PM10 Plan* as specified in EPA's approval notice. On May 19, 2005, the District Governing Board adopted the *2005 Amendments to the 2003 PM10 Plan*, primarily to revise the contingency measure discussion and to update schedules for rule adoption.

Air districts continuously monitor their progress in implementing attainment plans and must periodically report on progress to the ARB and the EPA. They also periodically revise attainment plans to reflect new conditions and requirements in compliance with schedules mandated by the CCAA and the federal CAA amendments. The California Health and Safety Code requires nonattainment districts to prepare reports every three years summarizing progress in meeting the schedules for developing, adopting, and implementing the air pollution control measures contained in each district's plan for attaining the California standards. The California Health and Safety Code also requires districts to review and revise their State air quality attainment plans once every three years, beginning in 1994, to correct for deficiencies in meeting the interim measures of progress and to incorporate new data into the plan. To meet federal CAA requirements, the District submitted all required "Rate of Progress" and "Reasonable Further Progress" plans to show that programs adopted by the District will reduce air pollutant emissions.

Air District Rules, Regulations, and Programs

The District's primary means of implementing air quality plans is by adopting rules and regulations. The California Health and Safety Code authorizes districts to adopt rules and regulations and to pursue civil and criminal penalties for violations. The law allows for fines and civil penalties of up to \$50,000 per day and imprisonment in the county jail for up to one year. The District has adopted rules on sources ranging from architectural coatings (Rule 4601) to Orchard Heaters (Rule 4303) to Rubber Tire Manufacturing (Rule 4681). The District rulebook contains many rules, and more rules are scheduled for development over the next few years. District rules may be found at <www.valleyair.org/rules/1ruleslist.htm>.

The District has adopted several rules and amendments applying to sources traditionally not regulated in the Valley, including wood-burning fireplaces and agricultural practices. Rule 4901 - Residential Wood Burning called for voluntary curtailment of wood burning on "No Burn Days" and prohibited the sale of non-EPA certified wood heaters within the District's jurisdiction (District 1993). Amendments to the rule changed the title to "Wood Burning

Fireplaces and Wood Burning Heaters,” changed the voluntary curtailment to a two-tiered Episodic Curtailment, includes density limits on new construction, and requires non-EPA-certified devices to be removed or rendered inoperable upon sale or transfer of property (District 2002). Rule 4902 - Residential Water Heaters, adopted June 17, 1993, requires new residential water heaters sold in the San Joaquin Valley to meet lower NO_x emission standards.

Among other things, SB 709 added Section 40604 to Part 3 of the California Health and Safety Code in 2003. Section 40604 allows the District to adopt regulations for a schedule of fees for indirect sources that are regulated but do not require permits; these fees would be used to recover the costs of District programs related to these sources. As required by Section 40604, the 2003 *PM₁₀ Plan*, and the *Extreme OADP*, the District is in the rule development process for the Indirect Source Rule (ISR). Specifically, under the ISR program, projects would be required to mitigate indirect sources of emissions (i.e. emissions from new mobile source activity attracted by the project) by using feasible measures to encourage the use of alternative modes of transportation, by paying a mitigation fee to reduce emissions off-site, or by a combination of the two. Any fees collected would be used to fund projects such as buses and fleet vehicle clean fuel conversions, which would reduce emissions proportionally to what was collected. In June 2005, the proposed rule changed the name from ISR to DESIGN, which stands for Decreasing Emissions’ Significant Impact from Growth and New development. The final form of ISR/DESIGN will be determined during the rule development process. Indirect sources are also addressed outside of the rule development and enforcement process through enhanced CEQA participation, in which the District actively reviews and provides comments on CEQA documents prepared by lead agencies and suggests mitigation measures to reduce air quality impacts.

The District has undertaken steps to comply with Assembly Bill (AB) 2061 (Polanco). This bill, which became Section 40728.5 of the California Health and Safety Code, requires assessment of socioeconomic impacts of certain new and modified rules put forth by the District plus a good faith effort to minimize adverse effects to industry and the public. Where required, the District examines its proposed activities for socioeconomic effects.

Legislation such as AB 1807 - Tanner Air Toxics Act (Health and Safety Code Section 39666), AB 2588 - Air Toxics "Hot Spots" Information and Assessment Act, AB 3205 - Toxic Emissions Near Schools (Health and Safety Code Section 42301.6 through 42301.9), SB 1731 - "Hot Spots" Risk Reduction Mandates (which amended AB 2588), and the federal CAA amendments Title III mandates the District to implement a comprehensive toxic air emissions program. AB 2588 and SB 1731 require the District to develop a uniform approach to cataloguing the emissions of 729 toxic

substances in the Valley. Prior to District unification, approaches to the AB 2588 and SB 1731 requirements varied by county. More information on California's Air Toxics Program is available at www.arb.ca.gov/toxics/toxics.htm.

The District has also adopted a number of voluntary air quality programs, including the Smoking Vehicles Program and Spare the Air. The Smoking Vehicles program began as a pilot program in San Joaquin County in spring 1992 and has since expanded to cover the entire Valley. The program gives drivers the opportunity to report vehicles emitting excessive amounts of exhaust smoke. Thanks to public participation in the program, over 30,000 advisory letters were sent to owners of smoking vehicles between 1993 and 2003. Spare the Air is a voluntary, summertime effort aimed at reducing air pollution (specifically ground-level ozone) by encouraging the public to make more air-conscious choices on days when the air quality is forecast to reach unhealthy levels. The District notifies Valley residents via television, radio, newspaper, and at participating worksites in advance of Spare the Air days. Although these programs are voluntary, they provide an important link to local government and the public, and they help reduce emissions from sources over which the District has little or no jurisdiction.

Local

Local government's responsibility for air quality increased significantly with the passage of the CCAA and the federal CAA amendments. Both of these pieces of legislation place new emphasis on reducing motor vehicle trips and vehicle miles traveled at the local level. Although the District is required to address state air quality standards by way of transportation control measures (TCMs) and indirect source programs in its air quality attainment plans, cities and counties, through their Councils of Government, are responsible for most implementation.

Local government responsibilities for air quality are found in four areas: (1) land use planning; (2) reviewing and mitigating the environmental impacts of development projects; (3) developing and maintaining the transportation infrastructure in the community, including transit systems; (4) implementing local air quality programs such as commute-based trip reduction and rideshare. The following provides more detail on these four areas of responsibility.

Land Use Planning

State law places responsibility for land use planning in the hands of city and county governments. With this responsibility comes the authority to approve

development projects. This authority is supported by police power and powers of incorporation.

As part of their duties, cities and counties are required to prepare a "general plan." The general plan is a comprehensive document that sets a community's goals and policies for development over a long period (often 20 years) and designates in general terms where certain land uses will be allowed. The general plan has seven mandatory elements, but any issues can be addressed as the city or county sees fit. Air quality can be addressed within one or more of the mandatory elements, usually the Land Use, Conservation, or Circulation Elements. Section 65302.1 of California Government Code, added by AB 170 in 2003, requires cities and counties in the San Joaquin Valley to amend appropriate elements of general plans to include data, analysis, comprehensive goals, policies, and feasible implementation strategies to improve air quality.

To implement the general plan, cities and counties adopt standards and regulations for all phases of development. These include zoning ordinances that designate type, location, mix of uses, and control features such as building height, setbacks from streets and lot lines, landscaping requirements, parking requirements, etc. Subdivision ordinances set standards for street and lot designs, dedication requirements, and financing of public improvements. The Building Code provides standards for the construction of buildings and includes energy efficiency requirements, structural standards, electrical standards, plumbing standards, and others. These ordinances and standards provide an effective means for implementing design and facility based air quality control measures. More discussion of land use measures that can improve air quality is provided in Section III.

Any significant construction activity requires a building permit issued by the local planning agency or building department. This includes industrial and commercial developments that are regulated as stationary sources by the District. The District only issues "authorities to construct" and "permits to operate" for the equipment, device, or process that emits pollutants. Oversight of the construction of buildings, foundations, and, in some cases, assembly of the polluting equipment (i.e. large above ground storage tanks or a smoke stack) is the responsibility of the planning or building agency. In other words, the local agency regulates the location and construction of industrial facilities, and the District regulates the operation of the equipment and processes within those facilities.

CEQA Review

The California Environmental Quality Act (CEQA) was enacted by the state legislature in 1970 and has been amended on numerous occasions. It applies to government initiated plans, projects, and regulations as well as to

private projects requiring discretionary approval from a state or local agency. The basic purposes of CEQA are to:

1. Inform governmental decision makers and the public about the potential significant effects of proposed activities.
2. Identify ways that environmental damage can be avoided or significantly reduced.
3. Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.
4. Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved (CEQA 15002(a)).

Under CEQA, a local planning agency is designated as the lead agency for most private development projects. CEQA requires the lead agency to conduct an initial study to determine if a project may have a significant adverse impact on the environment. Projects with significant adverse impacts require the lead agency to prepare a report referred to as an Environmental Impact Report (EIR). Projects that will not have a significant effect, or projects that are modified to avoid significant effects, require the lead agency to prepare a Negative Declaration. CEQA allows lead agencies to disapprove a project if necessary to avoid one or more significant effects on the environment. The planning agencies' authority to disapprove projects compels developers to include measures in the project to reduce significant environmental impacts.

Lead agencies are required to consult with and request comments from agencies that exercise authority over resources that may be affected by the project. The District has authority over most air quality issues and has staff assigned to review the air quality impacts of development projects. The District analyzes the project and recommends mitigation measures to reduce air quality impacts. The lead agency may choose to require or not require the measures suggested by the District. However, for EIRs, when lead agencies do not agree with recommendations and objections raised in the comments, they must prepare a written response that provides detailed reasons why specific comments and suggestions were not accepted.

The SJVUAPCD prepared the Guide for Assessing and Mitigating Air Quality Impacts guidance manual on August 20, 1998 (available from the Planning Division, <www.valleyair.org/transportation/ceqa_guidance_documents.htm> or (559) 230-5800). The manual, which has undergone subsequent revisions to insure its applicability over time, was developed to provide guidance for addressing air quality in environmental documents within the District. Specifically, the manual provides criteria and thresholds for determining

whether a project may have significant adverse air quality impacts, specific procedures and modeling protocols for quantifying and analyzing air quality impacts, methods available to mitigate air quality impacts, and information, such as air quality data, regulatory setting, climate, topography, etc, for use in air quality assessments and EIRs that will be updated more frequently.

Transportation Infrastructure

The planning and construction of transportation infrastructure is a highly cooperative effort involving local government, regional transportation planning agencies, the California Department of Transportation, the federal Department of Transportation (DOT), and others. Because of the high cost of building transportation infrastructure, most projects require state or federal funding. Recently enacted state and federal legislation place conditions on jurisdictions that must be met in order to be eligible for funding.

The federal CAA amendments require transportation plans to conform with the air quality goals of the State Implementation Plan (SIP). This means that states must assure that transportation programs do not undermine the attainment of air quality standards. The Regional Transportation Planning Agencies are responsible for making the conformity finding. The Air District's role in this process is one of consultation.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) requires large metropolitan areas to develop congestion management systems that include programs for congestion mitigation and air quality improvement. The act authorized the Congestion Mitigation and Air Quality (CMAQ) Program and provided funding for surface transportation and other related projects that contribute to air quality improvements and reduce congestion. The purpose of the CAA amendments, ISTEA, and the CMAQ program was to use a more inclusive, environmentally sensitive, and multimodal approach to transportation planning to address transportation-related problems. The CMAQ program was reauthorized in 1998 under the Transportation Equity Act for the 21st Century (TEA-21). Through TEA-21, state DOTs, MPOs, and transit agencies had access to funds to invest in projects that reduce criteria air pollutants from transportation-related sources over a period of six years (1998-2003). TEA-21 was extended to May 31, 2005. To view current transportation funding mechanisms, see www.fhwa.dot.gov.

Local Air Quality Programs

The CCAA allows air districts to delegate the implementation of transportation control measures to any local agency as long as the following conditions are met: (1) the agency must submit an implementation plan to the district for approval; (2) the agency must adopt and implement measures at least as

stringent as those in the district's plan; and (3) the district must adopt procedures for reviewing the performance of the local agency in implementing the measures. Some local agencies prefer to maintain local control of these programs to ensure that all local concerns and issues are addressed. Local government's close working relations with the individuals and businesses affected by the programs may generate more public interaction and program support. On the other hand, large businesses with worksites in more than one jurisdiction often prefer dealing with a regional agency so that compliance is uniform.

A transportation control measure in which local government has an important role is in low-emission fleet vehicle programs. Cities and counties often operate the largest vehicle fleets in their jurisdictions. Programs to convert vehicle fleets to cleaner burning fuels have significant air quality benefits and can provide a model to private industry.

AIR QUALITY IN THE SAN JOAQUIN VALLEY

Air Quality Designations and Classifications

The ARB and the EPA have established air pollution standards in an effort to protect human health and welfare. Geographic areas are deemed "attainment" if these standards are met or nonattainment if they are not met. Current (as of June 2005) state and federal designations in the San Joaquin Valley Air Basin for each criteria air pollutant are shown in Table 2-1. For the most current designation information, see <http://www.valleyair.org/aqinfo/attainment.htm>.

Air Pollutant Properties, Effects, Sources, and Extent

The following section summarizes the pollutants of greatest importance in the San Joaquin Valley. It provides a description of the pollutants' physical properties, health and other effects, sources, and the extent of the problems. Detailed discussion of selected air pollutants can be found in the District's Guide for Assessing and Mitigating Air Quality Impacts: Technical Document, at www.valleyair.org/transportation/ceqa_guidance_documents.htm.

In general, primary pollutants are directly emitted into the atmosphere, and secondary pollutants are formed by chemical reactions in the atmosphere. Air pollution in the San Joaquin Valley results from emissions generated in the Valley as well as from emissions and secondary pollutants transported into the Valley. It is thought that the bulk of the Valley's summer and winter air pollution is caused by locally generated emissions. Detailed assessments of

pollutant transport are being conducted for 8-hr ozone plans, due in June 2007.

Table 2-1 SJVUAPCD Designations and Classifications

Pollutant	Designation/Classification	
	Federal Standards	State Standards
Ozone - One hour	No federal standard*	Nonattainment/ severe
Ozone - Eight hour	Nonattainment/serious	No state standard
PM10	Nonattainment/serious	Nonattainment
PM2.5	Nonattainment	No state standard
CO - Fresno Urbanized Area	Attainment	Nonattainment/ Moderate
CO - Remainder of Fresno County	Unclassified/attainment	Attainment
CO - Merced, Madera and Kings Counties	Unclassified/attainment	Unclassified
CO - Kern (SJVAB portion), Tulare, Stanislaus, San Joaquin	Unclassified/attainment	Attainment
Nitrogen Dioxide	Unclassified/attainment	Attainment
Sulfur Dioxide - Kern County (SJVAB portion)	Attainment	Attainment
Sulfur Dioxide - All Other Counties	Unclassified	Attainment
Lead (Particulate)	No designation	Attainment
Hydrogen Sulfide	No federal standard	Unclassified
Sulfates	No federal standard	Attainment
Visibility Reducing Particles	No federal standard	Unclassified
Maps & Tables of the Area Designations for the State and National Ambient Air Quality Standards and Expected Peak Day Concentrations and Designation Values, Air Resources Board, January 1998; Classification letter, ARB Staff, March 16, 1993; ARB Action, November 9, 1994; ARB Action, November 21, 1996 *The federal standard for one hour ozone was revoked as of June 15, 2005.		

Pollutant: Ozone (O₃)

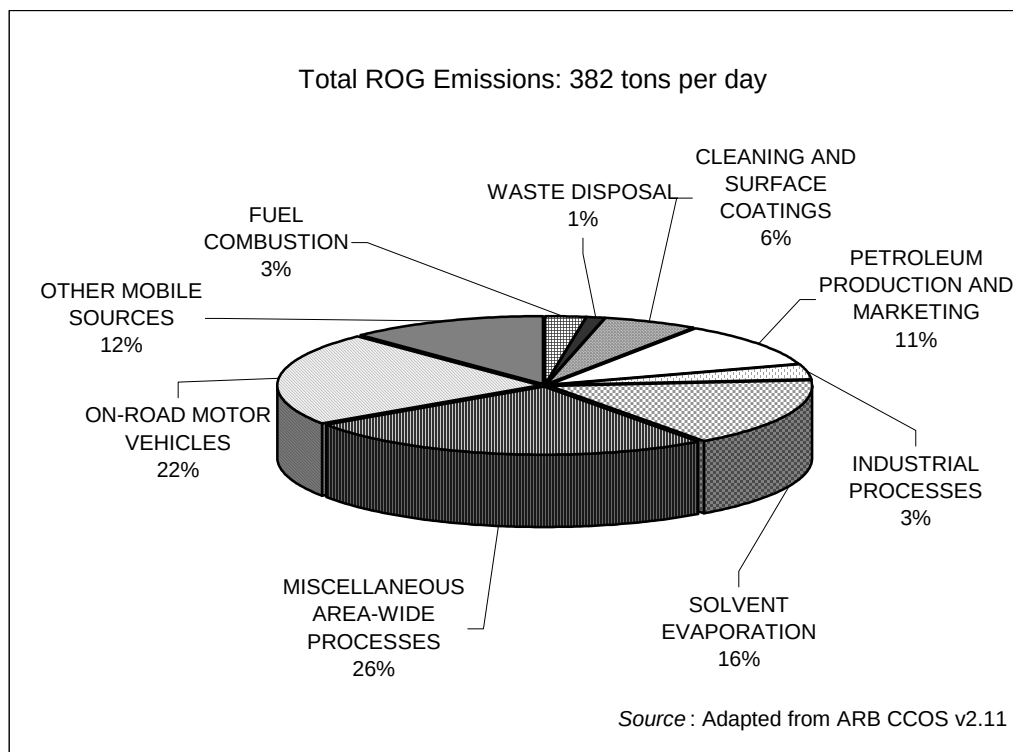
Ozone is formed by a complex series of chemical reactions between reactive organic gases (ROG) and oxides of nitrogen (NO_x) that take place in the presence of sunlight. ROG and NO_x are emitted from fuel combustion, agricultural processes, and industrial processes that are widespread throughout the Valley as well as from natural sources. Recent studies have also linked urban areas with both higher regional temperatures and higher ozone levels (a phenomenon known as the “urban heat island effect”). High concentrations of ground level ozone can adversely affect the human respiratory system and aggravate cardiovascular disease and many respiratory ailments. Ozone also damages natural ecosystems such as forests and foothill communities, agricultural crops, and some man-made materials, such as rubber, paint, and plastics.

Emissions of the ozone precursors NO_x and ROG are decreasing in the San Joaquin Valley Air Basin. Both stationary source and motor vehicle NO_x emissions have been reduced by the adoption of more stringent emission standards. Stricter standards have reduced ROG emissions from motor vehicles since 1980, even though vehicle miles traveled (VMT) have been increasing. Despite these reductions, the Valley is classified as Extreme Nonattainment for 1-hour ozone standards and Serious Nonattainment for 8-hour ozone standards.

Pollutant: Reactive Organic Gases (ROG)

Reactive organic gases (ROG), also known as volatile organic compounds (VOC), are photochemically reactive hydrocarbons that are important for ozone formation. The primary sources of ROG are petroleum transfer and storage, oil and gas production, mobile sources, organic solvent use, farming operations, and miscellaneous processes. No separate health standards exist for ROG as a group. Because some compounds that make up ROG are also toxic, like the carcinogen benzene, they are often evaluated as part of a toxic risk assessment.

Figure 2-2 shows the 2005 ROG inventory for the San Joaquin Valley. The data provided are averages for the entire Valley. Significant variations in the composition and quantity of emissions are found at different locations. For example, Kern County's ROG emissions are dominated by emissions associated with the oil industry while the rest of the Valley's ROG emissions are dominated by mobile sources.

Figure 2-2 Estimated Annual Average Emissions of Reactive Organic Gases, 2005

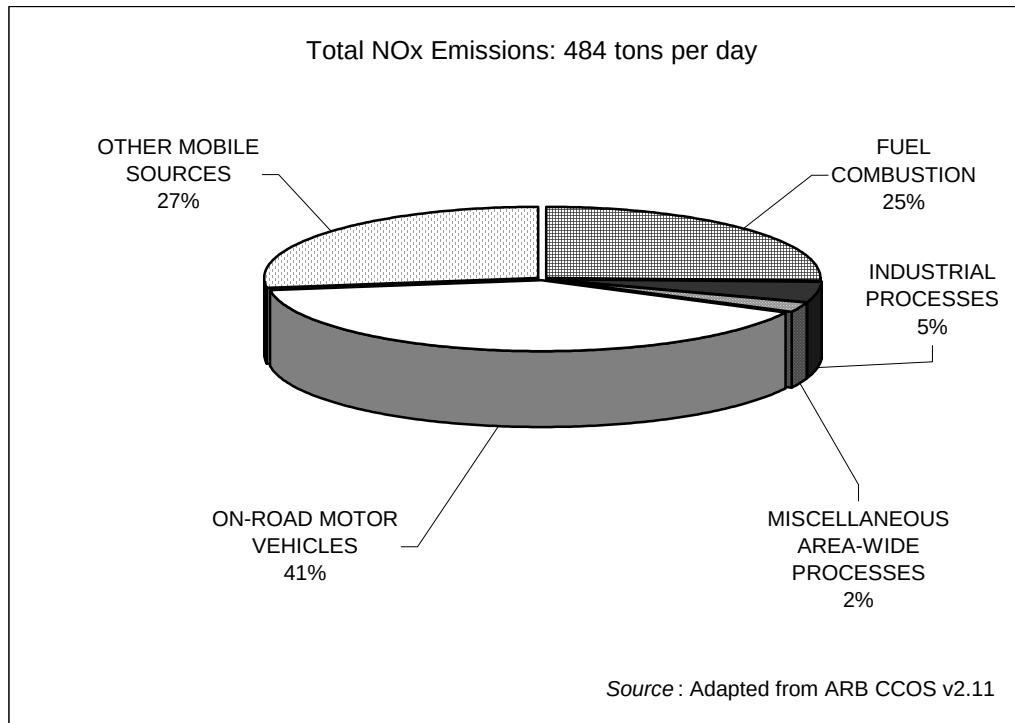
Pollutant: Oxides of Nitrogen (NO_x)

Oxides of Nitrogen (NO_x) are a family of gaseous nitrogen compounds and are precursors to the formation of ozone and particulate matter. The major component of NO_x, nitrogen dioxide (NO₂), is a reddish-brown gas that is toxic at high concentrations. NO_x results primarily from the combustion of fossil fuels under high temperature and pressure.

On-road and off-road motor vehicles and fuel combustion are the major sources of this air pollutant, and they emit approximately 41% (on-road), 27% (off-road), and 25% (fuel combustion) of the total NO_x released in the Valley. Figure 2-3 shows the 2005 NO_x inventory for the Valley.

As indicated in Table 2-1, the San Joaquin Valley Air Basin is in attainment of both state and federal NO₂ standards (NO₂ comprises most NO_x). As a chemical precursor involved in ozone and PM₁₀/PM_{2.5} formation, however, emissions of NO₂ indirectly contribute to high pollutant concentrations in the Valley.

Figure 2-3 Estimated Annual Average Emissions of NO_x, 2005

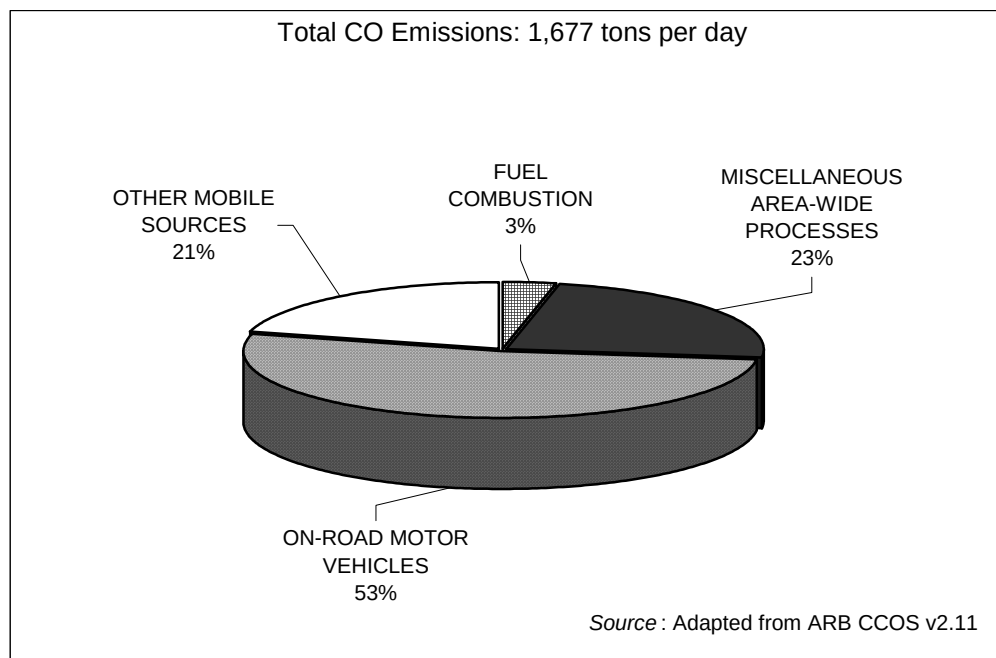


Pollutant: Carbon Monoxide (CO)

Carbon monoxide (CO) is an odorless, colorless gas that is highly toxic. It is formed by the incomplete combustion of fuels and is emitted directly into the air (unlike ozone).

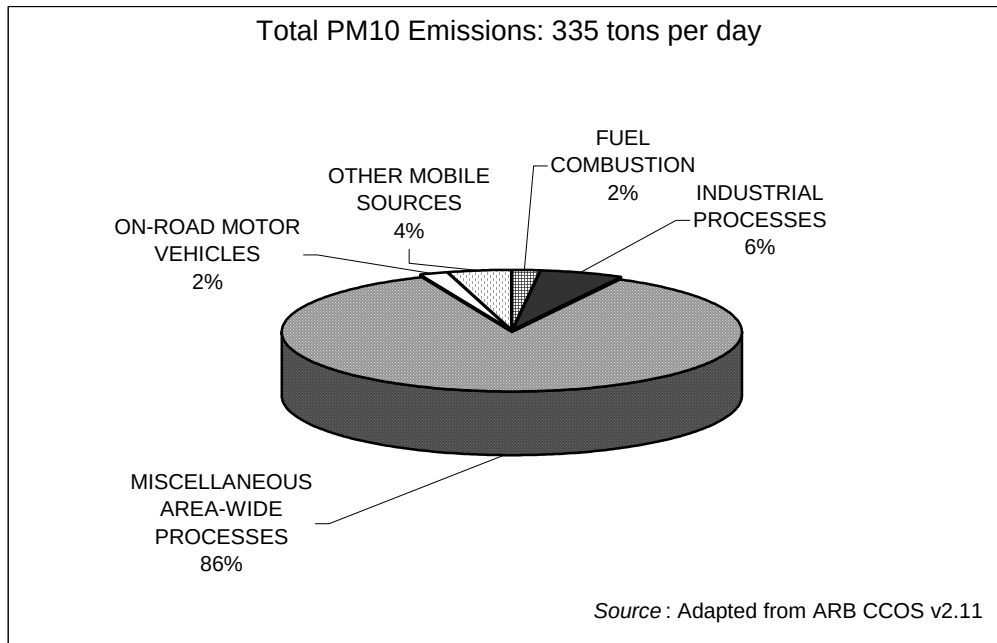
The main source of CO in the San Joaquin Valley is on-road motor vehicles. The emissions inventory for the San Joaquin Valley Air Basin shows that on-road motor vehicles contribute approximately 53% of total CO emissions. Other CO sources in the Valley include other mobile sources, miscellaneous processes, and fuel combustion from stationary sources. Figure 2-4 shows the 2005 CO inventory for the entire San Joaquin Valley.

Because of the local nature of CO problems, the ARB and EPA designate urban areas as CO nonattainment areas instead of the entire basin as with ozone and PM₁₀. Current CO attainment status for state and federal standards is given at www.arb.ca.gov, www.valleyair.org, and www.epa.gov. Emissions of CO are trending downward between 1985 and 2010. Motor vehicles are by far the largest source of CO emissions. Emissions from motor vehicles have been declining since 1985, despite increases in vehicle miles traveled (VMT), with the introduction of new automotive emission controls and fleet turnover.

Figure 2-4 Estimated Annual Average Emissions of CO, 2005**Pollutant: Particulate Matter (PM10 and PM2.5)**

Suspended particulate matter (airborne dust) consists of particles small enough to remain suspended in the air for long periods. Respirable particulate matter (PM10 and PM2.5) includes particulates of 10 microns or less in diameter for PM10 and 2.5 microns or less for PM2.5 -- those that are small enough to be inhaled, pass through the respiratory system, and lodge in the lungs with resultant health effects. Generally speaking, PM2.5 sources tend to be combustion sources like vehicles, power generation, industrial processes, and wood burning, while PM10 sources include these same sources plus roads (28.8%) and farming activities (23.5%). Fugitive windblown dust and other area sources also represent a source of airborne dust in the Valley (15%). Figure 2-5 shows the 2005 direct PM10 inventory for the entire San Joaquin Valley.

Acute and chronic health effects associated with high particulate levels include the aggravation of chronic respiratory diseases, heart and lung disease, and coughing, bronchitis, and respiratory illnesses in children.

Figure 2-5 Estimated Annual Average Emissions of PM₁₀, 2005

PM₁₀ and PM_{2.5} are primary pollutants (emitted directly to the atmosphere) and secondary pollutants (formed in the atmosphere by chemical reactions among precursors). Health-based State and federal PM₁₀ standards are frequently exceeded in all areas of the Valley. PM₁₀ samples are taken over a 24-hour period every sixth day. The state annual standard has been violated every year of monitoring for which data is available (1998-2004). Available PM₁₀ data show some variation during the trend period, but overall, there has been a downward trend. Part of the variation can be attributed to meteorology. Long periods of stagnation during the winter months allow PM₁₀ to accumulate over many days with resulting high concentrations. The maximum annual geometric mean shows a decrease of about 19 percent from 1988 to 2001. The calculated number of days exceeding the state and national 24-hour standards also shows a decrease. There were 300 calculated state standard exceedance days and 40 calculated national standard exceedance days during 1988. During 2001, there were 236 calculated State standard exceedance days and 12 calculated national standard exceedance days.

Pollutant: Sulfur Dioxide (SO₂)

Sulfur dioxide (SO₂) is a colorless, irritating gas with a "rotten egg" smell formed primarily by the combustion of sulfur-containing fossil fuels. Historically, in the late 1970's in Kern County, SO₂ was a pollutant of concern, but with the successful application of regulations, the levels have reduced significantly. In fact, the latest data from the ARB demonstrate that the

highest 1-hour concentration for SO₂ was 0.01 ppm. With the CAAQS being 0.25 ppm, it demonstrates that SO₂ concentrations in the SJVAB are only about 4 percent of the standard. The San Joaquin Valley Air Basin is in attainment of both the federal and California standards. However, like airborne NO_x, suspended SO_x particles contribute to the poor visibility that sometimes occurs in the Valley. These SO_x particles are also a component of PM₁₀. The prevalence of low-sulfur fuel use in Valley has minimized problems from this pollutant.

Pollutant: Lead (Pb)

Lead is a metal that is a natural constituent of air, water, and the biosphere. Lead is neither created nor destroyed in the environment, so it essentially persists forever. The health effects of lead poisoning include loss of appetite, weakness, apathy, and miscarriage; it can also cause lesions of the neuromuscular system, circulatory system, brain, and gastrointestinal tract.

Gasoline-powered automobile engines were a major source of airborne lead (Pb) through the use of leaded fuels. The use of leaded fuel has been mostly phased out, with the result that ambient concentrations of Pb have dropped dramatically.

Lead concentrations were last systematically measured in the San Joaquin Valley Air Basin in 1989, when the average concentrations were approximately five percent of the state lead standard. Though monitoring was discontinued in 1990, lead levels are probably well below applicable standards, and the Air Basin is designated in attainment for lead.

FACTORS AFFECTING THE DISPERSION OF AIR POLLUTANTS

The following discussion summarizes regional factors affecting the dispersion of air pollutants within the SJVAB. Detailed discussion can be found in the District's Guide for Assessing and Mitigating Air Quality Impacts: Technical Document, available at www.valleyair.org/transportation/ceqa_guidance_documents.htm .

Air pollutant emissions overall are fairly constant throughout the year, yet the concentrations of pollutants in the air vary from day to day and even hour to hour. This variability is due to complex interactions of weather, climate, and topography. These factors affect the ability of the atmosphere to disperse pollutants. Conditions that move and mix the atmosphere help disperse pollutants. Conditions that cause the atmosphere to stagnate allow pollutants to concentrate. Several studies have been conducted or are currently being conducted to obtain air quality, meteorological, and emissions information to better understand the formation and fate of various air pollutants in the

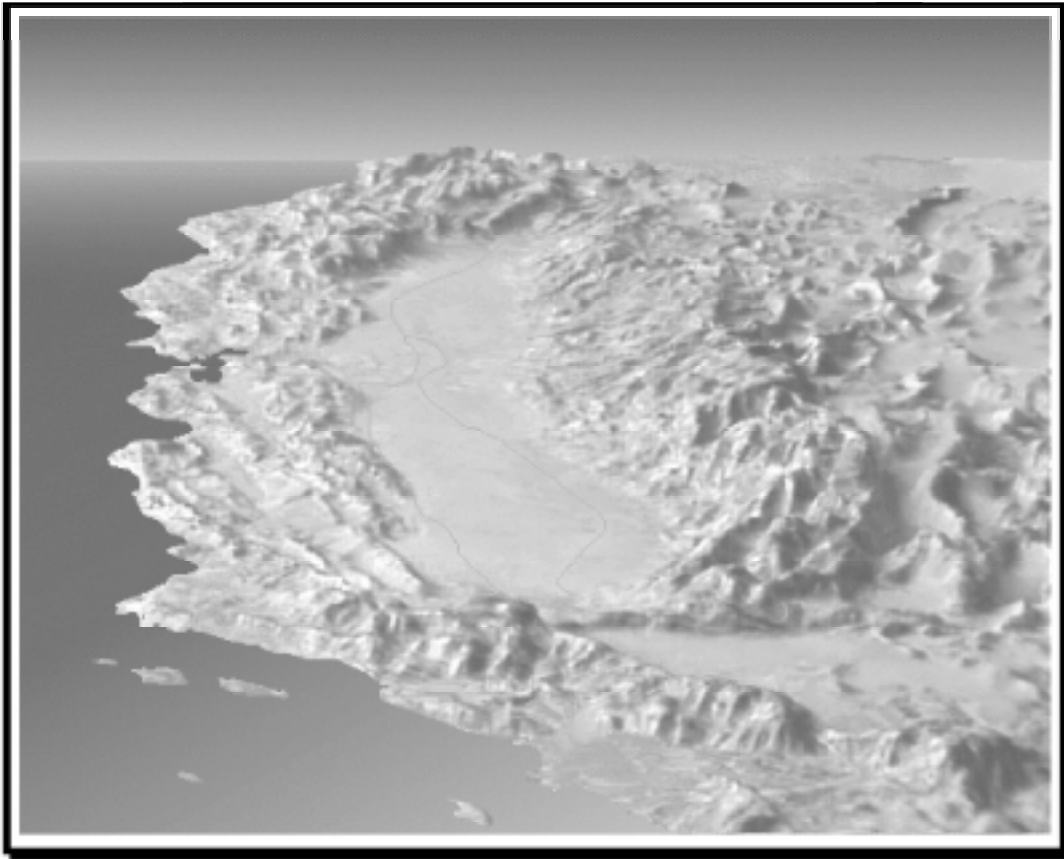
SJVAB. Current studies include the California Regional Particulate Air Quality Study and the Central California Ozone Study.

Local climatological effects, including topography, wind speed and direction, temperature, inversion layers, precipitation, and fog can exacerbate the air quality problem in the SJVAB.

The SJVAB is defined by the Sierra Nevada in the east (8,000 to 14,000 feet in elevation), the Coast Ranges in the west (averaging 3,000 feet in elevation), and the Tehachapi mountains in the south (6,000 to 8,000 feet in elevation). Figure 2-6 provides an aerial view of the San Joaquin Valley and demonstrates the topography and bowl created in the southern end of the San Joaquin Valley.

During the summer, wind speed and direction data indicate that summer wind usually originates at the north end of the San Joaquin Valley and flows in a south-southeasterly direction through the San Joaquin Valley, through Tehachapi pass, into the Southeast Desert Air Basin. In addition, the Altamont Pass also serves as a funnel for pollutant transport from the San Francisco Bay Area Air Basin into the region.

Figure 2-6 Aerial View of the San Joaquin Valley



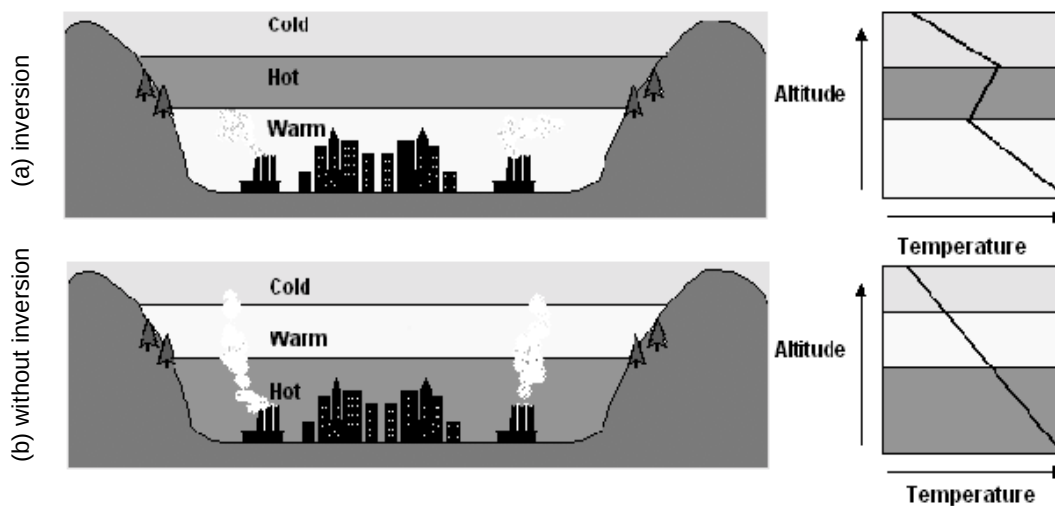
During the winter, wind speed and direction data indicate that wind occasionally originates from the south end of the San Joaquin Valley and flows in a north-northwesterly direction. Also during the winter months, the San Joaquin Valley experiences light, variable winds (less than 10 mph). Low wind speeds, combined with low inversion layers in the winter, create a climate conducive to high CO and PM10 concentrations.

The SJVAB has an “inland Mediterranean” climate averaging over 260 sunny days per year. The valley floor is characterized by warm, dry summers and cooler winters. For the entire San Joaquin Valley, high daily temperature readings in summer average 95°F. Temperatures below freezing are unusual. Average high temperatures in the winter are in the 50s, but highs in the 30s and 40s can occur on days with persistent fog and low cloudiness. The average daily low temperature is 45°F.

The vertical dispersion of air pollutants in the San Joaquin Valley is limited by the presence of persistent temperature inversions. Solar energy heats up the Earth's surface, which in turn radiates heat and warms the lower atmosphere (Figure 2-7(b)). Therefore, as altitude increases, the air temperature usually decreases due to increasing distance from the source of heat. A reversal of this atmospheric state, where the air temperature increases with height, is termed an inversion. Figure 2-7(a) depicts a typical temperature inversion. Inversions can exist at the surface or at any height above the ground.

Precipitation and fog tend to reduce or limit some pollutant concentrations. Ozone needs sunlight for its formation, and clouds and fog block the required radiation. CO is slightly water-soluble, so precipitation and fog tends to “reduce” CO concentrations in the atmosphere. PM10 is somewhat “washed” from the atmosphere with precipitation.

Figure 2-7 Vertical dispersion, with and without temperature inversion



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SECTION III

MOBILE SOURCES – BACKGROUND INFORMATION

III. MOBILE SOURCES – BACKGROUND INFORMATION

The Mobile Source Problem

Mobile sources include vehicles such as cars, trucks, buses, agricultural equipment, and trains. Together, these sources generate over 53% of all ozone precursors (nitrogen oxides (NO_x) and reactive organic gas (hydrocarbons ROG) or volatile organic compounds (VOC)) and over 73% of all carbon monoxide emissions in the San Joaquin Valley California. The ARB has identified mobile source emissions as the leading cause of urban air pollution (ARB 2002). In addition, more than 34% of San Joaquin Valley PM₁₀ emissions are attributed to motor vehicles and the roads they use (ARB 2005). Thus, mobile source emissions are a large portion of total air pollutant emissions and provide the greatest opportunity for reducing emissions.

ARB and EPA Programs

The ARB and the EPA have primary jurisdiction over the regulation of mobile source emissions. The ARB has developed a comprehensive motor vehicle emissions control program for California that is more stringent than the federal requirements. Some of the major elements of this program include stringent certification and emissions standards that will decrease ROG and NO_x emissions.

The ARB anticipates substantial additional emissions reductions as a greater percentage of zero-emission vehicles (ZEV), partial zero-emission vehicles (PZEV), and advanced technology partial zero-emission vehicles (AT PZEV) are introduced into the vehicular fleet mix. Though ZEV regulations have been modified over time, the core requirement remains with revisions to allow for manufacturer flexibility. Other important components of the ARB motor vehicle emissions control program include in-use compliance, inspection and maintenance, emissions warranties, and clean and reformulated fuel regulations for nonattainment areas. Similar motor vehicle emissions programs are being implemented for off-road vehicles and engines as well as heavy-duty diesels (ARB 1993, California SIP 2003).

Growth in Trips and Vehicle Miles Traveled

As indicated in Figure 3-1, engines and fuels are becoming cleaner, but people are driving more. This increased vehicle usage offsets the benefits of cleaner vehicles. The increase in vehicle miles traveled (VMT) is partly due to the increase in population, but the VMT increase is also due to an increase in the miles driven per person. Figure 3-2 shows that VMT is increasing at a

faster rate than that of the population. The projected population growth for the Valley from 1990 to 2020 is 87.5%, but the projected increase in VMT for the Valley over the same time period is 124.7%.

Figure 3-1 U.S. trends in vehicle emissions and miles traveled

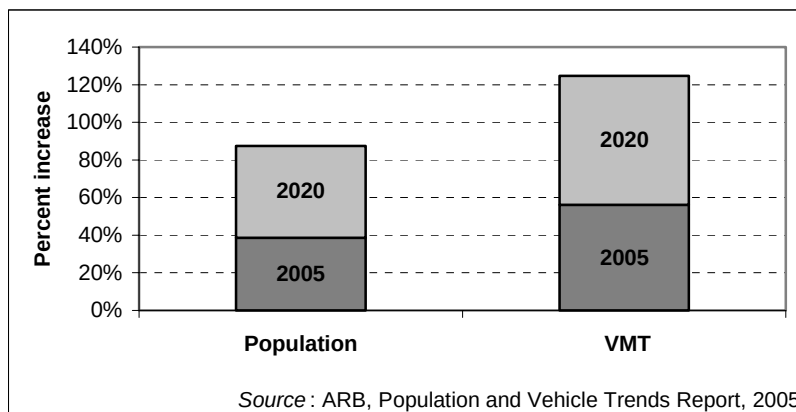
Source: EPA 2001



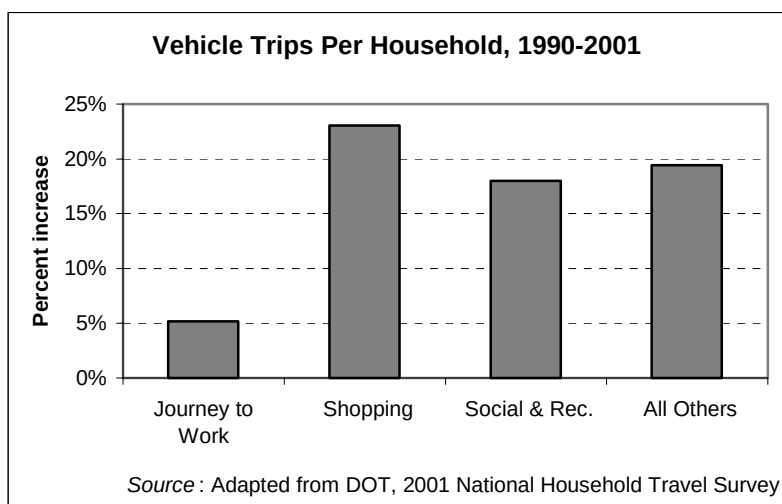
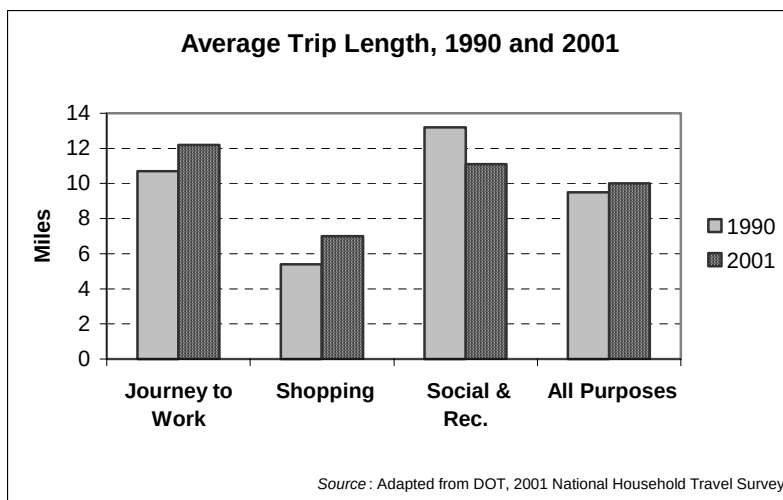
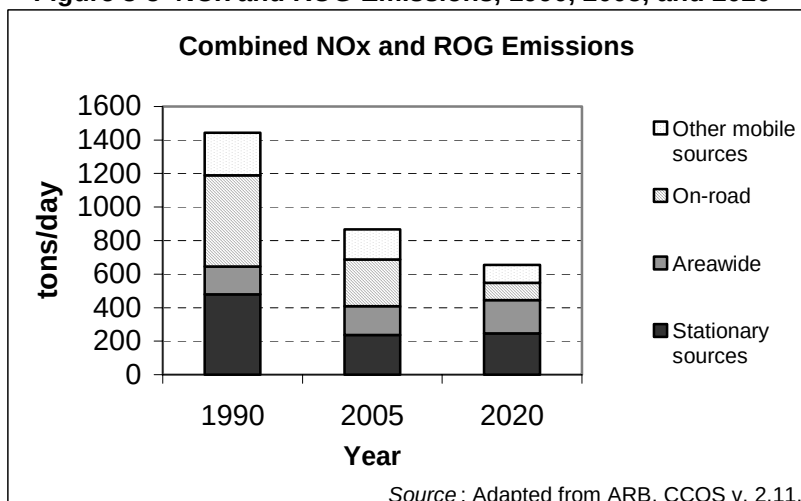
Figure 3-3 illustrates the change in average annual vehicle trips per household between 1990 and 2001. The number of work trips per household has remained almost stable since 1990, yet trips for social & recreational purposes increased by 18 percent between 1990 and 2001, households took 23 percent more shopping trips, and other trips increased by 19 percent. These personal trips are becoming an important target of programs to reduce vehicle trips. Not only are people taking more trips, but the trips tend to be longer, as seen in Figure 3-4. With the exception of the social & recreation category, all categories experienced an increase in trip length from 1990 to 2001. The result of more trips and longer trips is a VMT growth that outpaces population growth.

Despite increases in VMT, overall emissions are decreasing. California's strict vehicle emissions standards have played an important role in the statewide reductions in emissions. However, Figure 3-5 shows that on-road vehicles will still be a notable source of emissions of ozone precursors.

Figure 3-2 Growth Projections for the San Joaquin Valley, 1990-2020



Source: ARB, Population and Vehicle Trends Report, 2005

Figure 3-3 Change in Average Annual Vehicle Trips per Household by Trip Purpose**Figure 3-4 Average Trip Length by Trip Purpose****Figure 3-5 NOx and ROG Emissions, 1990, 2005, and 2020**

TRANSPORTATION CONTROL MEASURES

The alarming growth in VMT and its implications for California's ability to attain state and federal air quality standards led the legislature to address this problem in the California Clean Air Act (CCAA). The CCAA requires severe ozone nonattainment areas to take local action to reduce mobile source emissions. The District was required to include transportation control measures in attainment plans for "severe" areas to "substantially reduce the rate of increase in passenger vehicle trips and miles traveled per trip," (Health and Safety Code (HS) 40918). The CCAA defines transportation control measures as "any strategy to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions" (HS 40717(g)).

In response to the CCAA requirements, the District included a number of transportation control measures (TCMs) in the *1991 Air Quality Attainment Plan* and provided updates in the required Triennial Progress Report and Plan Revision. In federal plans prepared and adopted by the District, the Regional Transportation Planning Agencies (RTPAs) conducted an extensive process to identify and implement reasonably available control measures (RACM) for the San Joaquin Valley. Table 3-1 contains a summary of these control measures.

Market-Based Transportation Measures

There is considerable interest by regulatory agencies and potentially regulated interest groups in developing mobile source programs that rely on market-based measures to change travel behavior. Market-based programs place a cost on using a motor vehicle that may have been previously unaccounted for or subsidized in some way. Market-based measures include gas taxes, vehicle registration fees based on emissions and miles traveled, parking charges and limits, and toll roads. Congestion pricing has been effectively applied in London's Congestion Charge, Singapore's Area Pricing, Rome's Zonal Charge, and truck road user charges in Switzerland, Germany, and England. California's HOT (High Occupancy Toll) Lanes, which are used on SR-91 in L.A. and I-15 in San Diego, use electronic tolling that changes the price according to the congestion of the road.

Programs like these provide an economic disincentive for people to use their car and make the people who continue to drive pay more for the privilege of polluting the air. Positive incentives can be provided in the form of tax incentives for the purchase of low or zero emission vehicles and in employer-based programs such as cash incentives for ridesharing, transit subsidies, and parking cash outs. Another incentive is based on time advantages. For example, the faster speeds possible in High Occupancy Vehicle Lanes

Table 3-1 Local Actions for Implementing TCMs

Programs for Improved Public Transit
Regional express bus services, transit to airport, examine potential to accelerate application of retrofit of diesel-powered buses, changes to mass transit alternatives, expansion of public transit services, add new Park-and-Ride facilities on an as needed basis, free transit during selected special events, provide additional parking at transit centers
Employer-Based Transportation Management Plans, Including Incentives
Commuter Choice Program to provide benefits to employees who commute by methods other than driving alone, cash allowances in lieu of a parking space, charging for parking spaces, rideshare incentives, preferential parking for carpools, telecommuting, alternative work hours, tax breaks for employers
Traffic Flow Improvement Programs That Achieve Emission Reductions
Fixed lanes for buses and carpools where appropriate, "Intelligent Transportation Systems," synchronized traffic signals, adaptive traffic signals, restrict or remove on-street parking, changeable lane assignments, bus pullouts in curbs, roving tow truck patrols, exclude highway and arterial maintenance on ozone action days, remove unwarranted stop signs and signals, ban left turns, prohibit lane closures during peak hours
Programs to Limit or Restrict Vehicle Use in Downtown Areas or Other Areas of Emission Concentration
Increasing residential and commercial density in areas near transit, establish urban growth boundaries, cash incentives to foster jobs/housing balance, trip reduction- and transit-oriented development, sustainable development
Programs to Limit Portions of Road Surfaces or Certain Sections of the Metropolitan Area to the Use of Non-motorized Vehicles or Pedestrian Use
Establish auto-free zones and pedestrian malls, encouragement of pedestrian travel, close certain roads at certain times for non-motorized traffic, provide financial incentives to purchase bicycles, pedestrian and bicycle overpasses where safety dictates
Programs to Control Extended Idling of Vehicles
Turning off engines while stalled in traffic, discourage drive-thrus in new development
Land Use/Development Alternatives
Encouraging land use patterns which support public transit and other alternative modes of transportation and are designed to reduce travel distances, evaluate the air quality impacts of new development and mitigate any adverse impacts
Existing Local Government Control Measures
The CMAQ program for funding traffic flow improvements, TEA to fund bicycles projects, Tax codes make it possible for employees to pay for transit and alternative commute modes with pre-tax dollars, FTA Section 5311 and TDA funds to fund transit service improvements

(HOVs) due to lower congestion provide a time incentive for people to carpool or to use transit.

Market-based strategy is built on the idea that markets match supply with demand. Increasing consumer choices with a supply of transportation options while setting a higher price for driving alone by way of parking fees, tolls, etc. could help increase the demand for other transportation alternatives and lower the drive-alone rate. Similarly, increasing the number of more environmentally friendly vehicles on the market and providing monetary (i.e. tax) and non-monetary (i.e. use of HOV lanes) incentives can encourage demand for these kinds of vehicles.

Market-based measures are appealing because they place the responsibility for traffic congestion and air pollution on the vehicle user instead of on a third party such as a developer or business owner. Some indirect source and air quality mitigation programs charge the developer an impact fee based on project impacts. The developer or business owner passes on these costs to vehicle users in the form of higher home prices and higher prices for goods and services. However, these costs are not visible to the individual, so they have no influence on travel behavior except to the extent that the vehicle owners have less money to use for transportation. Under both market-based and fee-based programs, money collected is used to in some way offset traffic and air quality impacts.

There are several concerns with using market-based measures. The impacts of measures that increase the cost of driving fall most heavily on the poorest members of society. This will be especially true in areas where adequate alternatives to the personal car are not readily available. Another problem is elasticity of demand for motor vehicle use. The cost of persuading a significant number of people not to use their cars and, instead, use alternative modes is not known and could be quite high. Finally, the economic disincentives amount to user fees that will reduce funds available for personal spending and economic growth.

If market-based measures are adopted, the link between land use, transportation, and air quality becomes even more important. If the land use patterns and transportation infrastructure are constructed in ways that are supportive of alternatives to the single occupant motor vehicle, affordable options will be available for those priced out of the market. If the transportation options are convenient and time competitive, less incentives and disincentives should be needed to change people's travel behavior, thereby reducing potential economic disruptions.

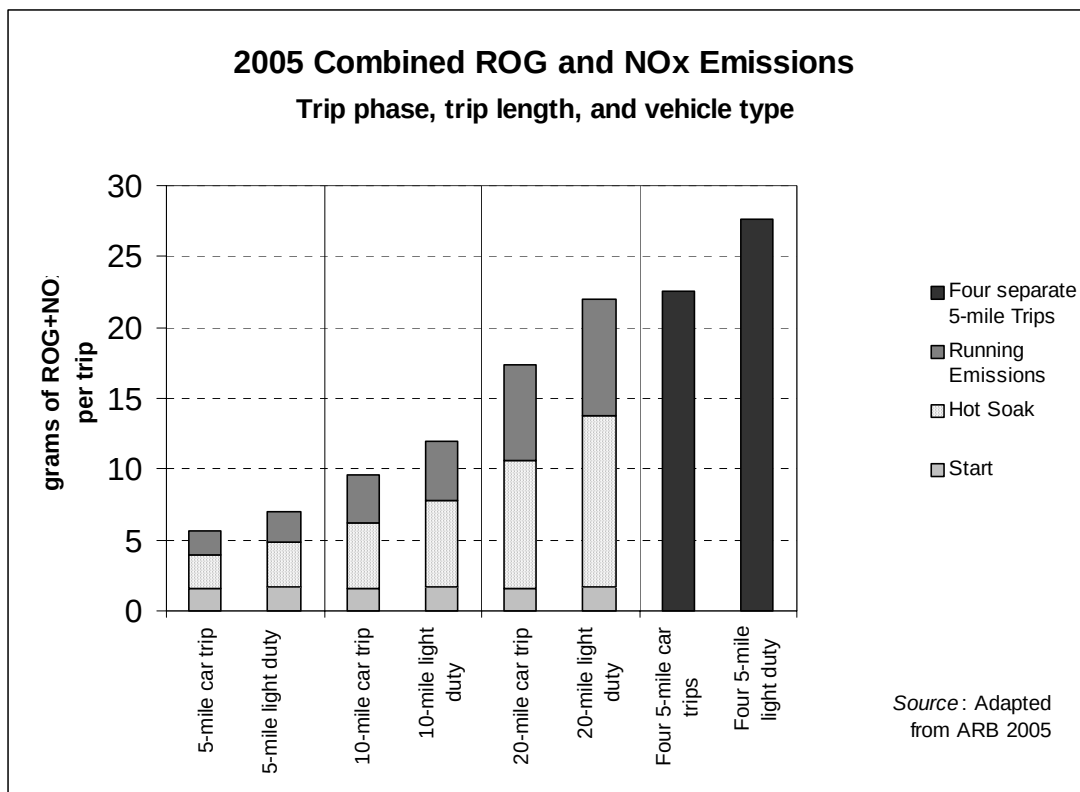
MOTOR VEHICLE OPERATING CHARACTERISTICS

A good understanding of how vehicle operation affects air pollution is important for developing effective programs to minimize mobile source emissions. Vehicles powered exclusively by internal combustion engines emit different levels of air pollution during three distinct phases of a vehicular trip: the cold start mode, the hot stabilized mode, and the hot soak evaporative mode. Cold start emissions occur during the first few minutes of a trip, when the vehicle engine and the catalytic converter are operating cold. The efficiency of the combustion process and the catalytic converter during this stage is low, and relatively high levels of pollution are emitted for each mile driven. During the hot stabilized mode (the period after the engine warms up), relatively low levels of pollution are emitted for each mile driven. The hot soak, or evaporative, emissions occur after the vehicle is parked as the heat remaining in the engine forces gasoline in the carburetor or fuel system to evaporate into the air. Figure 3-6 shows how ROG and NO_x emissions vary by trip length for passenger cars and light-duty vehicles. The information in Figure 3-6 shows the benefits of a number of trip practices: car-pooling and alternative modes of transportation, shorter trips, and trip linking.

The total exhaust emissions from a trip are dependent upon the trip length, the speed of a trip, and the "time-in-mode" characteristics of the trip. The implication of this emissions pattern is that once a vehicle has been started and driven for a few minutes, much of the damage to air quality has already been done. Therefore, reducing the overall number of trips generated is very important to reducing mobile source emissions and improving air quality in the Valley. Car-pooling can reduce the number of trips generated, as can using public transit, bicycling, and walking.

Although the rate of release drops over time, the total emissions released over longer trips is still greater than the total emissions released over shorter trips. So if a region's VMT rises, its overall vehicular air pollutant emissions will likely rise as well. Therefore, goals and planning policies that reduce overall vehicle miles traveled will reduce air pollutant emissions. Proximity of services and accessibility to alternative modes of travel are two key factors influencing trip length and overall VMT for a region. As shown by Figure 3-6, longer trips emit more ROG and NO_x than do shorter trips.

Figure 3-6 Estimated 2005 Emissions by Trip, Average Vehicles with Catalyst (25 mph)



Another important concept is "trip linkage." Trips are considered "linked" if the second trip begins (i.e., the engine is started) while the engine is still hot from the first trip -- generally up to an hour after the first trip has ended. Research has shown that the longer a vehicle's engine is shut off, the more emissions are produced when it is started again (California Air Resources Board 1997). Therefore, linking two or more trips can substantially reduce the overall air pollutant emissions when compared to trips that are not linked. Figure 3-6 shows that four separate five-mile trips emit more ROG and NO_x than does one 20-mile trip. Providing activity centers with a variety of uses close together can increase the changes that trips will be linked.

THE LAND USE, TRANSPORTATION, AIR QUALITY LINK – A HISTORIAL PERSPECTIVE

The patterns of land uses found in a community are directly tied to the prevalent form of transportation available at the time the area was developed. Urban areas established before the age of the automobile were often developed around a railroad station with most residential and commercial uses located within walking distance of the station. Western cities in the 1800s often made their main streets wide enough to turn around a horse drawn wagon. Cities that grew rapidly in the early 1900s often grew around trolley or streetcar routes. Most of the larger cities in the San Joaquin Valley had streetcar systems until the 1930s and 1940s (illustrated in Figure 3-7). Most residential areas were within walking distance of public transportation. Neighborhood markets and other services were often within walking distance of most residences. Major commercial services were located downtown.

**Figure 3-7 San Joaquin Valley
Trolleys, Mid-1920s**

Source: Laval Photo/Fresno Bee



After World War II, automobile ownership became much more widespread as our country experienced unprecedented economic growth and prosperity. With the majority of people no longer dependent on public transportation, new residential development could go anywhere a car could go. Streetcar systems were dismantled. The federal government began the Interstate Highway System and provided federal funding for state and local road building projects. The gasoline supply seemed infinite and traffic congestion could be minimized if adequate capacity were constructed.

Several innovations in land use appeared in the 1950s and 1960s that further emphasized automobile travel over other modes of transportation. Suburban shopping malls were developed in the larger Valley cities, seriously debilitating downtown commercial areas. Parking lots began to be placed prominently in front of new commercial development. Grocery stores expanded into supermarkets located in relatively large shopping centers, effectively killing the neighborhood grocery and other small businesses. The practice of using cul-de-sacs in subdivision designs and limiting access from major arterial and collector streets into residential subdivisions further separated residences from frequently needed goods and services. The two-

car garage was placed prominently in front of the house. Individual lot sizes and home sizes increased along with prosperity. Apartment complexes tended to be large footprint developments separated by a block wall from neighboring uses.

As traffic and associated noise and air pollution increased during the 1970s, the solution was to build sound walls between residences and major arterials and between traffic generating commercial areas and residences, further separating these land uses. These walled communities and separated uses created privacy, but only at the expense of social interaction and a sense of place. People could go from their garage to work or shopping without ever setting foot in their neighborhood.

We are now exceeding 50 years of automobile-oriented development in the San Joaquin Valley. With population more than doubling since 1950, the development that has occurred during the period since 1950 now constitutes the majority of development here. What was the outcome of this choice to rely on the automobile? The personal automobile now accounts for the vast majority of our daily trips. (U.S. Department of Transportation 1999). Some sections of the state highway system are near capacity. Traveling across town in some cities is becoming increasingly difficult as the local road network exceeds capacity at key intersections. Most parents must act as chauffeurs for their children, shuttling them from school, to little league, to fast food, or to day care. Most destinations are perceived as unsafe for children to walk or to bicycle.

The orientation to the automobile is not without benefits. We enjoy having quiet residential neighborhoods undisturbed by commercial uses. We want industrial employment sites to be well away from our homes. Many people live in rural and mountain areas and commute to work in the cities, taking advantage of the scenery and slower life style. These would not be possible without an excellent street and highway system and widespread automobile ownership. Because of these benefits and our overwhelming reliance on the automobile, land use patterns and transportation systems must continue to allow people to efficiently use their cars, but also must provide an environment where walking, bicycling, and transit use are practical, safe, and enjoyable alternatives for meeting our mobility needs.

MOBILE/INDIRECT SOURCE CONTROL STRATEGIES

Mobile and indirect source control strategies that can be implemented at the local level concentrate on increasing the use of alternate, less polluting forms of transportation and on eliminating the need for vehicle trips.

The following discussion of land use strategies to improve air quality is taken directly from the ARB's publication, *Land Use - Air Quality Linkage* (ARB 1997).

Optimum Land Use Strategies for Air Quality

Land uses that enable people to walk, bike, or to use transit, rather than to rely primarily on their cars for mobility, tend to be better for air quality. Strategies that provide access to and support multi-modal transportation systems can help reduce automobile use and resulting emissions. These are available on both the community (or metropolitan) and local (district or neighborhood) levels. This section describes several such strategies and summarizes available data on their potential benefits in reducing vehicle travel and supporting convenient alternatives. The types of strategies suggested include:

Community-Level Strategies

- Enhanced activity centers, including downtowns, employment and shopping centers, and transit “nodes”
- Concentrated development, especially within walking distance of transit service

Neighborhood-Level Strategies

- Mixed land uses, including housing, shopping and employment
- Interconnected street networks
- Traditional Neighborhood Design
- Transit-Oriented Development

Land use decisions for the areas around transit corridors are critical due to the fixed nature of rail transit and the limited land supply near stops. Such decisions need to be made with a long-term view, as they will last for many years to come and can actually impede the development of subsequent, more transit-supportive projects in the future.

Land use strategies to support alternative travel modes and reduce automobile use are available on both the community (or metropolitan) and local (neighborhood) levels. These are listed and briefly discussed in the following sections.

Community Strategies

Less costly land prices in fringe areas of most metropolitan areas have helped to disperse development patterns and reduce overall regional

densities. This pattern of growth has generally resulted in longer travel distances and increased reliance on vehicles for personal mobility (Sullivan 1990).

A study of land use and transit conditions that lead to high rates of public transportation use by urban residents found the following factors to be most important:

- Higher downtown density and larger downtown size
- Proximity of residential uses to concentrations of non-residential uses
- Higher residential densities
- Better transit service (Pushkarev and Zupan 1977)

Enhanced Central Business Districts

A strong central business district (CBD) that includes substantial amounts of both employment and housing has historically had the best quality transit service and the highest rates of transit use, especially in pre-World War II cities (JHK & Assoc. 1995). Transit use tends to be higher at downtown sites for many reasons, including: there are a concentrated number of land uses located within walking distance of transit stations (such as jobs, shops, public facilities and retail services), higher parking costs, traffic congestion, limited parking availability, better access to transit at both trip ends, and high-quality transit service (JHK & Assoc. 1995).

A study of the New York metropolitan area identified similar connections between certain land uses and a successful transit system that serves a large number of people. This study also found that a strong central business district rather than a highly dispersed employment pattern, such as is occurring in many suburban areas, is a crucial ingredient in creating and supporting a strong transit system, increasing transit usage rates, and decreasing personal vehicle travel (Pushkarev and Zupan, 1977).

A nationwide survey (Equitable Real Estate Investment Management Company 1996) of real estate investment companies conducted in the 1990s found that "Cities that work typically stand at the hubs of diversified mass transportation networks - subways, buses, suburban railroads - which funnel people in and out and offer sane suburban commuting alternatives to the car. Not only can city dwellers walk or take public transportation to work; they can find a market or a place to eat around the corner."

Generally, the large number of jobs and businesses found within the central business districts of major US cities are concentrated within fairly limited areas. In contrast, housing is generally in short supply in downtown US city locations; while cities outside the US boast greater amounts of downtown city housing (Newman and Kenworthy 1990). Because of the relative lack of

downtown housing, many cities in the US have lower levels of activities after business hours and on weekends. This can result in increased crime, a reduction in downtown economic viability, and a reduction in the use and support of transit systems.

Cities with sufficient amounts of quality housing in the downtown and surrounding neighborhoods often have safer, vibrant, and more economically viable central cities. Housing in the vicinity of the downtown area can simplify commuting for people who work nearby (Jacobs 1961). Residents who live in downtown areas are more likely to utilize public transit during non-commute times of the day and evening, which helps to support more efficient transit systems (Snohomish County Transit Authority 1989).

A survey of real estate investors found that having central business districts with attractive residential areas is sound from a business perspective (Newman and Kenworthy 1990): "Downtowns without attractive, close-in residential areas have frequently deteriorated into shells -- the so-called '9-to-5' cities. Meanwhile, certain traditional cities with strong residential fundamentals are more than holding their own: Manhattan, Chicago, San Francisco, Boston, and Washington D.C. Thriving residential communities rooted in and around business districts are the key to preserving 24-hour environments... we believe the premier investment opportunities will be available in the nation's 24-hour cities. These markets, whether urban or suburban, are places where people can comfortably and securely live, work and shop."

Compact Development

Transit use generally increases in areas with higher overall residential and non-residential density (Snohomish County; JHK & Assoc; County of Sacramento). Concentrated land uses tend to reduce personal travel in several ways:

- Activities located spatially closer together reduce travel distances
- Higher densities provide a larger number of potential transit riders and support a more efficient transportation system
- Activities located closer together facilitate mode shifts from automobiles to walking, biking, and transit

Higher levels of transit service are more feasible in areas with higher densities of residences, employees, and services, especially if the land uses are clustered in proximity to transit stations and corridors. High residential density by itself will do little to support transit use if there are no significant destinations (Pushkarev and Zupan, 1977).

The Institute of Transportation Engineers (ITE) has suggested the following general guidelines for minimum densities of residential development and intensities of non-residential floor area needed to support various types and levels of transit service (ITE 1997). These densities are listed in Table 3-2.

Table 3-2 Densities to Support Various Levels of Transit Service

Type of Transit	Residential* (du/acre)	Non-Residential (mill. sq. ft.)
Minimum level of local bus service (@ one bus per hour)	4 to 5	5 to 8
Intermediate level of local bus service (@ one bus per 1/2 hr)	7	8 to 20
Light rail transit with feeder buses	9 and above	35 to 50

* (average number of dwelling units [du] per acre)

Residential Density

Large areas of low density housing generally cannot justify or support effective levels of transit service. As noted by the ITE and others, the minimum density threshold for minimal local bus service to residential areas is between four and seven dwelling units per acre. At or above eight dwelling units per acre, bus service may be improved to one-half hour from one-hour headways, if this density is clustered and/or maintained over a large enough area to provide sufficient ridership.

Clusters of medium-density residential areas with an average 7-15 dwelling unit per acre can generally support frequent local bus service. If such densities are maintained over a large enough area, with good pedestrian accessibility, then light rail transit service may also be feasible (Snohomish 1989). Heavy rail transit, such as the Bay Area Rapid Transit District (BART) and Cal Train in the San Francisco Bay Area, is generally appropriate for linking major concentrated urban areas.

The relationships between different land uses and people's travel behavior have been explored in several studies. A 1990 study comparing travel behaviors in several neighborhoods located in the S.F. Bay Area concluded that for each doubling of density, the average VMT per person each year is reduced by 25 to 30 percent. The neighborhoods studied included varying amounts of services and jobs, were located at different distances from the central business district, and had a wide range of public transit service (Holtzclaw 1990).

A region-wide travel survey conducted in the San Francisco Bay Area also concluded that there is a definite relationship between overall population density and increased transit availability and use (DKS 1981).

A worldwide study of urban density, travel patterns, and transportation facilities in 32 major cities concluded that there is a significant relationship between overall urban density and the provision and use of transit, walking, and other alternative modes of travel, and away from automobiles. The researchers found that for each doubling of density in cities throughout the world, the average per capita consumption of transportation fuel is reduced between 25 to 30 percent. This reduction is attributed to higher rates of transit usage, with walking and bicycling playing lesser though important roles (Kenworthy and Newman, 1990).

Employment Density

The location, size and concentration of different employment activities are also significant factors in determining the type and level of transit service that can be efficiently provided and its eventual rate of use.

Employment sites scattered over a large area often attract enough vehicles to create significant traffic congestion, but usually do not generate enough transit riders to sustain convenient levels of transit service. In contrast, industrial facilities or offices with more closely spaced buildings that are connected by direct pedestrian routes and served by convenient transit can result in increased use of alternative modes of travel.

A study in the Seattle area concluded that transit ridership increases significantly when the density of jobs exceeds 50 employees per acre in centers that provide at least 10,000 jobs (Seattle Metro 1987). A typical threshold for providing good local bus service to employment areas is between 50 to 60 employees per acre (Pushkarev and Zupan 1977).

Industrial or office parks with closely spaced buildings connected by pedestrian routes and served by convenient transit can increase the use of alternative modes of travel and reduce reliance on automobiles. Conversely, employment sites scattered over large areas often attract enough traffic to create significant traffic congestion, but usually do not generate enough transit riders to sustain good, convenient transit service.

Clustered Activity Centers

It is important that higher-density development be located appropriately to take advantage of transit, and that adequate pedestrian facilities be provided. Otherwise, these higher densities will result in unsatisfactory levels of traffic and congestion. If a variety of activities, such as shops, other services,

offices, other employment sites, and residences are clustered, they can become lively "activity centers." A network of such centers, or "nodes," can be linked to other similar centers and to the central business district by a transit network. Activity centers served by transit located in suburban areas can also provide accessibility to transit service for surrounding residential areas.

Activity centers or nodes are sometimes referred to as "Urban Villages" or "Suburban Village Centers." They can significantly enhance the efficiency of transit service and promote pedestrian activity by increasing the number of people with access to transit services. In some cases, the concentration or "intensity" of employment and other activity centers can have an even more significant influence on levels of transit provision and use than can the density of residential areas (Urban Land Institute, 1993).

A study of travel behavior at five major regional shopping centers in California was recently completed for the Air Resources Board. The researchers concluded that the location of the shopping centers within the metropolitan area, the density and mixture of surrounding land uses, and proximity to high quality regional transit systems are the most important factors in explaining significant variations in the way people travel (JHK & Assoc., 1993).

This study found high levels of transit and pedestrian travel at malls located in urban areas surrounded by intense mixed-use development and accessible to a regional transit system. In comparison, shopping centers located in low density suburban areas with limited transit service and few pedestrian facilities had much higher automobile travel rates than their more urban counterparts.

Over 60 percent of the 300 customers surveyed at Horton Plaza, a major shopping center in the downtown area of San Diego, traveled there by transit or on foot. In comparison, only 5 percent of the customers at a comparable suburban center with only limited bus service and poor pedestrian accessibility, traveled to and from the shopping center by bus or on foot. Another conclusion of this study is that land use and transit factors are potentially much more important in reducing vehicle trips than a number of transportation control measures (TCMs) that were also tested at each of the five sites. The researcher evaluated ten TCMs appropriate for major regional shopping centers, and found that they would reduce vehicle travel at the centers by only about 5 to 7 percent, even if several measures were combined (JHK & Assoc., 1993).

A study of five alternative land use and transportation scenarios in the Seattle, Washington metropolitan area concluded that establishing a number of fairly concentrated suburban activity centers connected by transit could

eventually result in lower levels of VMT and traffic congestion, increased transit use, and less air pollution than the continuation of existing land use patterns. Each new sub-center would include a variety of high intensity activities and denser residential areas (Puget Sound Council of Governments, 1990).

Neighborhood Strategies

Neighborhood strategies are site specific measures that can be applied to existing as well as new development or redevelopment projects. Combined with overall community or regional strategies, they can help reduce driving rates and associated vehicle emissions.

Focused Infill and Renewal

The infill, redevelopment, and reuse of vacant or under-utilized parcels within existing urban areas can help to decrease vehicle traffic, reduce walking distances, and support better transit systems. Such strategies also have other benefits: lower infrastructure costs, more efficient delivery of services, increased economic viability of cities, and reduced conversion of agricultural land and open spaces to urban or suburban development.

Infill and redevelopment that is located within walking distance of transit service has greater potential to shift travel away from personal vehicles. The design, quality, mixture, and compatibility of residential and other types of infill projects can help increase their acceptability to neighboring residents and businesses, especially in the case of higher-density infill and redevelopment projects. There are several communities that have successfully used design guidelines, redevelopment agency efforts, "main street projects," and historic preservation programs to produce good quality, higher-density infill development projects (JHK & Assoc. 1995).

Jobs-Housing Balance

The term "jobs-housing balance" refers to programs that attempt to attract employers to locate in housing-rich areas, and to encourage the provision of housing at prices affordable to the people working in the community. If residential areas are located far from major employment centers, longer commute distances, increased traffic congestion, and significant vehicle emissions usually result.

Between 80 to 100% of the new jobs created in the US during the past two decades were situated in the suburbs of metropolitan areas (Urban Land Institute 1993). This has played a factor in the average commute distance and related vehicle travel increasing by 36% between 1983 and 1990 (US Department of Transportation 1999).

Several analyses of historic urban trends have found that imbalances in the ratio of jobs and housing tend to eventually resolve themselves over time as more jobs move closer to suburban residential districts. In cases of extreme imbalances in the jobs/housing relationship, policies and programs to increase the number of jobs or housing units may help to accelerate this process.

Neighborhood Assessment Program

The ARB Neighborhood Assessment Program (NAP) provides a method of developing guidelines based on consistent, uniform, and science-based evaluations of air pollution impacts and reduction strategies at the neighborhood scale. Information is available at <http://www.arb.ca.gov/ch/programs/nap/nap.htm>.

Mixed-Use Developments

Mixed-use development allows compatible land uses, such as shops, offices, and housing to locate closer together and thus decreases travel distances between them. Mixed-use development, if properly designed and implemented, can reduce VMT and trips on-site as well as help increase transit ridership, especially during the off-peak (non-commute) periods.

For example, a mixed-use area containing restaurants, a museum, a theater and retail stores has a greater potential to generate walking, bus, and rail ridership than an area with retail stores alone. Adding housing to the mix of uses can improve the situation substantially (US DOT 1999). Regardless of how people arrive at a mixed-use area, they will be able to make many trips by walking; such trip linkages would not be as feasible in a single-purpose area (Snohomish County Transit Authority 1989).

Mid-day trips from work for lunch or to run errands can also be influenced by mixed-use strategies. In typical single-use office parks, only 3 to 8 percent of such trips are currently walking trips. In comparison, in mixed-use areas with good pedestrian accessibility, 20 to 30 percent of mid-day travel from offices are made by walking (Unterman 1984).

A study analyzing 27 large suburban employment sites found that for every 10 percent increase in floor space for retail and commercial uses, the presence of retail services would increase transit and ridesharing use by about 3 percent (Cervero 1993). In addition, the Institute of Transportation Engineers have recommended reducing estimates of peak hour commute traffic generation by 2.5 percent for mixed-use employment developments (ITE 1989, cited in Cervero 1993).

A study was conducted for a proposed suburban "village center-style" development in the San Joaquin Valley. Consultants estimated that this project would produce about one-third less vehicle travel per household, on average, than the vehicle travel that would ordinarily occur in a typical single-use, low-density suburban housing tract. It also projected that suburban "villages" could reduce the number of automobile trips by about 13 percent per household when compared to the typical suburban development pattern (Fehr & Peers 1992).

An ARB-funded research project analyzed the travel behavior of residents in different types of residential neighborhoods. Results indicated that differences in site characteristics do affect travel behavior, in particular the number of walking trips. Residents of higher density neighborhoods with a high mix of land uses travel more frequently by walking, bicycling, and transit, and trips tend to be shorter. Household income was found to be much less important in determining residents' travel mode choices than the site characteristics of the neighborhood and availability and level of transit service (Kitamura, ARB, 1993).

Interconnected Street Patterns

During the past 30 years, the typical street circulation pattern in developing suburban areas has consisted of a hierarchy of local streets leading to collectors and then to major arterials that interconnect sections a community to each other and to freeways.

Collector and arterial streets, which often provide the only connections between different sections of suburban communities, tend to be quite wide to allow vehicles to travel faster. The typical suburban circulation pattern decreases the number of available routes between trip origin and destination points and places many vehicles on major streets and at signaled intersections during peak hours. This type of circulation pattern often results in much higher levels of traffic congestion, especially during peak periods.

Wide streets with fast-moving traffic are difficult and often dangerous for pedestrians and bicyclists to cross or share with vehicles. Such thoroughfares become significant barriers to walking or bicycling and thus tend to encourage the use of vehicles, even for very short trips.

In contrast to the typical suburban street hierarchy, an interconnected street pattern provides multiple routes to destinations, reducing the distance between two points. Interconnected street patterns are often found in many older neighborhoods, downtowns, and small communities. They have numerous advantages over typical hierarchical suburban-style patterns:

1. They provide numerous route choices instead of focusing traffic into several wide arterials
2. They offer more direct routes for pedestrians and bicyclists as well as cars
3. They can help to slow vehicle speeds

Slower vehicle speeds help create a much safer street environment for pedestrians and bicyclists to share. Slower speeds are also quieter. Overall vehicle travel times in integrated street patterns are comparable to the faster-moving arterials due to shorter distances between various origin and destination points. A study conducted by the American Society of Civil Engineers concluded that gridded street patterns can reduce VMT by up to 57 percent within the neighborhood or subdivision, primarily due to more direct routing between locations, while two other studies found that interconnected street networks can reduce VMT to 10 to 15 percent (Stone and Johnson 1992 and McNally and Ryan 1993, cited in Cervero 1993). One study found that travel times for vehicles were projected to be very similar to those found in typical hierarchical circulation patterns (Kulash 1990), while another study found that it would take 8% less time to travel on a local “neo-traditional” network than in a typical suburban area.

Traffic Calming

“Traffic calming” is a method for designing or redesigning streets to be more pedestrian friendly. These measures include: installing traffic islands and “roundabouts,” restricting some roads to through automobile (but not pedestrian and bicycle) travel, creating rougher road surfaces at pedestrian crossings, narrowing streets, planting street trees, and installing pedestrian furniture. These measures have been installed in several communities, including portions of Sacramento, California and Portland, Oregon.

Traffic-calmed streets are designed to reduce vehicle speeds, which makes them safer for residents, pedestrians and children. The implementation of a traffic calming program in parts of Berlin, Germany helped to reduce the number of fatal pedestrian-related accidents in those areas by 57% (Local Government Commission January 1996). Residents of traffic-calmed streets can also be less likely to become victims of crime: neighborhoods in Dayton, Ohio and Atherton, California have experienced a 50% reduction in crime after the implementation of a traffic calming program and related measures (Local Government Commission January 1996).

Traditional Neighborhood Development

Traditional Neighborhood Development (TND), also known as “neo-traditional” development, is a development strategy that emphasizes pedestrian accessibility and the orientation of houses towards narrower, tree-

lined, gridded or integrated streets. One primary goal of TND is to create a land use pattern that makes it easier for residents to walk between their houses, jobs, and commercial services through the combination of mixed uses and interconnected street patterns to minimize travel distances. TND incorporates a small downtown or "town center," within walking distance of homes and a higher overall density than in typical suburban neighborhoods. "Most housing units are located within a five to ten minute walk of the town center, where commercial services and offices are concentrated" (Bookout 1992).

Single-family houses are placed on somewhat smaller lots, with front porches closer to the sidewalk and garages typically placed behind the houses, often along alleyways. "Granny flats," or second units, are sometimes built above the garages. A larger number of townhouse and other multi-family units are provided to meet the objective of locating residences within one-quarter mile (walking distance) of the town center.

Another benefit of this type of development can be that "residents feel they are part of a community, not just dwellers in a subdivision." Several "Neo-Traditional"-style developments have been built during the past several years.

A survey of 620 homeowners in 4 such neighborhoods revealed a high level of satisfaction with their new residences: an overwhelming majority, 84 percent, said they prefer their neo-traditional community over a more traditional suburb, even if they could have purchased the same house for the same price elsewhere. Nearly 70 percent said that they like the shallower front yards with houses closer to the street, more than 60 percent favored the narrower streets, and 80 percent enjoyed their front porches. People also said they like to walk and leave their cars at home and use mass transit when they are given the opportunity to do so (Sacramento Bee 1993).

A study of travel in traditional New England Neighborhoods found that these neighborhoods generate an average of 50 percent fewer vehicles per day than households in typical suburban areas (White Mountain Survey 1991, cited in Cervero 1993). Another study found that residents of mixed-use neighborhoods are at least three times as likely to walk to a store, nearby restaurant, or a local park than are residents of a traditional suburban neighborhood (Cervero September 1995). Finally, researchers found a 10 percent reduction in auto trips for non-work travel in a traditional neighborhood compared to a standard suburban area (Cervero and Radisch July 1995).

Transit-Oriented Development

Similar to traditional neighborhood development, but typically incorporating somewhat higher densities, the Transit-Oriented Development (TOD) is a

development strategy that can provide another alternative to typical suburban growth patterns. The TOD concept incorporates an intentional orientation to transit and pedestrian travel, clusters retail services and other uses in a "town center," and provides a range of housing densities. "TODs," can help minimize the negative effects of new growth such as traffic congestion and air pollution.

A "TOD" can be described as:

A mixed-use community within an average 1/4 mile walking distance of a transit stop and core commercial area. The design, configuration, and mix of uses emphasize a pedestrian-oriented environment and reinforces the use of office, open space, and public uses within comfortable walking distance, making it convenient for residents and employees to travel by transit, bicycle or foot, as well as by car (Sacramento Co. 1991).

Transit-Oriented Development is receiving serious attention in California. Over 9,000 "transit-based" housing units were built in the San Francisco Bay Area between 1985 and 1995 (The San Francisco Chronicle 1997). In San Diego, the "Uptown District" was built to include a commercial center with retail shops, restaurants, a major supermarket, and 310 housing units, while in Mountain View, "The Crossings" features 540 single and multi-family housing units, a supermarket, several retail shops, and a daycare center, all clustered near a Cal Train commuter rail station within an 18 acre site.

Figure 3-8 illustrates the TOD concept. A core commercial area is surrounded by high-density residential and public uses. The multi-use building situates housing and retail in close proximity on the transit route in a pedestrian-friendly area. Low and medium density residential uses are provided in the surrounding "secondary residential" areas.

Concerns with Land Use Strategies

The land use patterns and site designs described above are believed to be feasible and economically beneficial by many planners and researchers; however, others have expressed concerns over changing the present way of developing our communities. Concerns are primarily expressed over two areas. First, will travel

Figure 3-8 Transit-Oriented, Multi-use Building

Source: Local Government Commission



behavior actually change if the new patterns are built? Second, are the proposed residential and commercial products marketable?

The reduced trips predicted for transit and pedestrian-oriented developments are based on changes in travel behavior. Although we know that such things as cost, convenience, safety, prestige, and conscience can influence travel behavior, there is always a degree of uncertainty over how much change will occur. Changing land use patterns and transportation systems influence people to use alternative modes by increasing their convenience, safety, and prestige. However, other strategies may be needed to see significant results. Market-based transportation control measures generally increase the cost of using a single occupant motor vehicle, creating an incentive to use alternative modes of transportation. Public education programs focus on the individual's responsibility for causing air pollution and show people how changes in their travel behavior can help clean the air. It will probably take all three strategies to significantly change travel behavior.

The land use strategies are a departure from patterns and designs that have been successfully marketed in recent years. Changing from a product that is successful to one that is unknown involves risks. Developers and banks are reluctant to increase their risks and may be unwilling to proceed with pedestrian and transit-oriented design projects. To address this concern, we must provide developers with examples of successful projects that have been built elsewhere. Once a few projects are successfully built locally, developers and lenders will have confidence that the product is viable in this area.

Many of the land use strategies propose higher overall development densities. One reason many people have moved to the San Joaquin Valley in recent years is to buy the affordable single family home on a large lot that is no longer available in other areas of California. The new patterns attempt to counteract the negatives of increased densities with better designs, more attractive neighborhood amenities, community interaction, and a sense of place. Just increasing the density without changes in land use pattern and design can result in unattractive, claustrophobic neighborhoods with little privacy or social interaction.

Some of the design strategies call for increased investment in pedestrian, bicycle, and transit amenities like sidewalks, street trees, bicycle paths, and transit facilities. There is concern that these amenities will not be used and will waste money. This concern is based on the belief that people will not change their travel behavior even if the options are more convenient and attractive. Many communities are now requiring amenities because they believe they improve their town's appearance and livability and because they are concerned with the safety and mobility of non-drivers. Having these amenities in place will provide attractive options for those forced out of their

cars by higher costs and for those who reduce their driving just to do their part in improving air quality.

Table 3-3 summarizes the factors addressed in the goals and policies of the model air quality element to increase the use of transit, bicycling, and walking to meet our transportation needs.

Table 3-3 Summary of Factors Increasing Transit, Bicycle, and Pedestrian Travel

Type of Travel	Factors
TRANSIT	
Density	Housing - Higher densities near transit facilities bring more potential transit-users within walking distance. Jobs - Higher jobs density increases the number of potential transit commuters near a transit route. Increases viability of retail and service businesses near employment centers.
Land use - street and lot design	Provide direct pedestrian access to transit; avoid circuitous routes.
Transit facility design	Provide well lighted, visually appealing waiting areas that provide reasonable protection from the elements.
Mix of land uses	A mix of office, retail and services at a destination allows lunch trips and errands to be accomplished without a car.
Level of transit subsidy	High transit subsidies enable systems to keep fares low and to provide a level of service greater than would otherwise be possible. Greater frequency of service increases ridership.
Frequency of service	Greater frequency of service allows commuters to arrive and leave the employment site closer to their working hours.
Parking at destination	Places that charge for parking or have a shortage of parking experience higher transit ridership.
Level of congestion en route	High congestion is an advantage for fixed rail transit. In most cases buses are affected by congestion to the same extent as automobile drivers. Areas where high occupancy vehicle lanes are feasible are an exception.
Time comparison to auto trip	Trips by bus often are much slower than by private automobile. Adding direct routes and express buses can reduce the disparity and attract riders.
BICYCLE	
Comprehensive bikeway plan	Interconnected system of bikeways and routes throughout the urban area increases the potential to commute by bicycle.
Roadway improvements	Roads have adequate shoulder to separate bicyclists from motorists Traffic signals can be actuated by the cyclist without dismounting Curb cuts are at a minimum to avoid conflicts as motorists enter and exit driveways
Lower speed limits	Lower speeds tend to reduce danger to cyclists and increase use.

Table 3-3 Summary of Factors Increasing Transit, Bicycle, and Pedestrian Travel (cont.)

Type of Travel	Factors
Bicycle facilities at the destination	Showers and lockers are provided so cyclists can maintain a professional appearance at the work place.
Density near shops and services	Locating higher densities closest to commercial uses increases the number of people within walking distance of these services.
Activity centers	Creating centers of activity can provide a more interesting multi-use destination for pedestrians.
Pedestrian amenities	Providing pedestrian amenities makes walking an interesting and comfortable alternative. Some common examples are: • Sidewalks and paths • Street trees • Narrow streets and shorter corner radii • Buildings front on streets • Parks and Plazas

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SECTION IV

POLICY ANALYSIS AND AIR QUALITY BENEFITS

IV. POLICY ANALYSIS AND AIR QUALITY BENEFITS

Introduction

No later than one year after the first housing revisions to take place after January 1, 2004, cities and counties in the San Joaquin Valley Air Basin are required to amend their general plans to include goals, policies, and feasible implementation strategies to improve air quality, and these amendments should be submitted to the District at least 45 days prior to the adoption of those amendments (California Government Code Section 65302.1). The District has 30 days to return comments and advice. Cities and counties are encouraged to use the ideas presented in this section to develop their own goals and policies in their general plan amendments. Goals and policies in this section have direct and indirect air quality benefits, and they address a very broad range of planning and air quality issues facing the San Joaquin Valley. The list of goals and policies is extensive, but it is not intended to cover all possible policy solutions to air quality problems. The policy language is in no way mandatory. Cities and counties are encouraged to use the ideas presented here to develop their own goals and policies in their general plans.

This section is divided into three components. The first component consists of goals and policies suitable for use in separate air quality elements, chapters, or sections of the general plan. The second component contains goals and policies for use primarily in land use elements. The third component provides goals and policies that may be used in circulation elements. Goals and policies from the last two components could be used in a separate air quality element, but cities and counties should be alert for potential inconsistencies with existing land use and circulation elements.

Section Format

- Suggested Goals and Policies for Separate Air Quality Elements, Chapters, or Sections
- Suggested Goals and Policies for Land Use Elements
- Suggested Goals and Policies for Circulation Elements

The supporting information for the goals and policies is provided under four headings: Implementation Strategies, Air Quality Benefits, Programs in Operation, and Resources. A description of each of these areas is provided below.

Implementation strategies provide guidance and ideas for implementing the goals and policies presented in the Air Quality Guidelines. They are intended to clarify the intent of the specific policy and in some cases provide specific implementation examples.

The Air Quality Benefits sections provide the rationale for the goals and policies. Where available, reductions in air pollutant emissions or vehicle use that may be achieved by implementing the policies are provided. In many cases, groups of policies are part of the same strategy such as transit/pedestrian-oriented design. For those policies, specific reductions are provided for the policy promoting the adoption of the strategy. The policies that support or enhance the strategy refer back to the strategy policy. It should be noted, however, that a complete foundation for every policy on the basis of existing information is not possible at this time. For these policies, an explanation of the theory behind the proposed measure is provided. The information included under Air Quality Benefits has been assembled from a review of existing technical reports, studies, surveys and data published by various public agencies and private researchers. No original studies were conducted for this report.

Format for Goals and Policies Sections

• Issues	Statement of the problem to be addressed
• Goals	Overall outcome desired
• Objectives	Specific outcome desired
• Policies	Statement of direction or commitment to take action
• Implementation Strategies	Action ideas to carry out policies
• Air Quality Benefits	Benefits in terms of trip reduction or emissions reduction
• Programs in Operation	Examples of existing programs implementing the policies
• Resources	Where to go for more information

The last two sections provide examples and resources that planners can draw on when developing an air quality program. The Programs in Operation sections provide examples where similar programs or policies have been

adopted or implemented. The Resource sections provide references where more detailed information may be obtained and provide points of contact at agencies that have adopted similar programs.

Immediately following the goals and policies is a section describing the overall air quality benefits possible with adoption and aggressive implementation of air quality policies in the general plan. It provides a brief description of the results of research on the effect of land use patterns on motor vehicle use. Also provided is an estimate of "before AQE implementation" and "after AQE implementation" emissions inventories for one Valley county. This information is provided as a tool to aid local jurisdictions in illustrating the potential benefits of adopting an air quality element.

The Air Quality Guidelines should be viewed as a flexible resource upon which to justify and implement air quality goals and policies. The District will periodically update the Guidelines as new information and control technologies emerge. It is the District's belief, however, that the information, materials, and tools contained in the Guidelines provide sufficient grounds to encourage the adoption of appropriate air quality goals and policies that can help a city or county meet the air quality requirements of AB 170 and California Government Code Section 65302.1.

Groups of policies include lists of additional resources that may be useful in developing and implementing land use policies. One resource that applies generally to all the policies in this section is the EPA's 2001 document, *Improving Air Quality Through Land Use Activities*, available at <http://www.epa.gov/otaq/transp/trancont/r01001.pdf>. This guidance describes links between EPA policies and land use activities that encourage travel patterns and choices that reduce vehicle miles of travel and, consequently, reduce emissions from motor vehicles in communities. Five characteristics of urban form that influence travel and air quality are summarized below. Another general resource is the ARB's *Air Quality and Land Use Handbook: A Community Health Perspective*, which was adopted in April 2005 and is available online at <http://www.arb.ca.gov/ch/aqhandbook.htm>. In this guidance document, ARB recommends siting distances between sources of pollution, like high traffic area and refineries, and sensitive land uses based on data showing that the localized air pollution exposures can be reduced by as much as 80% with the recommended separation.

Appendix A provides a separate list of each goal, objective, and policy without the implementation strategies and air quality benefits. This appendix is intended for those wishing to view or to use only the air quality goals and policies.

SUGGESTED GOALS AND POLICIES FOR SEPARATE AIR QUALITY ELEMENTS, CHAPTERS, OR SECTIONS

The goals and policies in this section are those most appropriate to include in a separate air quality element, chapter, or section. These are air quality specific policies that most cities or counties can use without major modifications to their existing general plan elements.

Principles for Air Quality Elements, Chapters, or Sections

The Air District strongly encourages cities and counties of the San Joaquin Valley to:

- Determine air quality impacts of development proposed in their jurisdiction and mitigate those impacts to the maximum extent feasible
- Cooperate with the District, neighboring jurisdictions, and other agencies to reduce air quality impacts
- Ensure that land use and transportation plans are fully integrated and consider air quality
- Work to educate the public on land use, transportation, and air quality issues
- Implement air quality programs for public facilities and operations that are a model for the private sector
- Develop programs and take actions to implement Transportation Control Measures
- Plan land uses to avoid industrial/residential air pollution conflicts
- Reduce PM₁₀ emissions from sources under their jurisdiction or control
- Develop programs to reduce emissions from residential and commercial area sources such as woodburning, energy use, and other and equipment use

COMMUNICATION, COOPERATION, AND COORDINATION

Issue:

Air pollution is a complex problem. All levels of government are responsible for solving some portion of the problem. Often, the responsibilities of one level of government overlap with another. In order to develop effective programs and reduce pollution emissions, effective communication, cooperation, and coordination are vital.

Goal 1: **Effective communication, cooperation, and coordination in developing and operating community and regional air quality programs.**

ENVIRONMENTAL ASSESSMENT

Issue:

The environmental assessment process required under the California Environmental Quality Act (CEQA) is by far the most important tool for local government to communicate with other agencies and the public on the air quality impacts of development within a community. Strong and consistent application of CEQA can make a significant difference in project level air quality impacts.

Objective 1a To accurately determine and fairly mitigate the local and regional air quality impacts of projects proposed in this City/County.

Policy 1 The City/County of _____ shall determine project air quality impacts using analysis methods and significance thresholds recommended by the District.

Note: The District has prepared guidelines that provide standard criteria for determining significant environmental effects, that provide a uniform method of calculating project emissions, and that will provide standard mitigation measures to reduce air quality impacts. The District now has adopted thresholds of significance and recommends analysis methods described in the District guidance manual, Guide for Assessing and Mitigating Air Quality Impacts.

Projects analyzed in sufficient detail to determine air quality impacts in an EIR (Environmental Impact Report) or negative declaration could be exempt from further analysis during subsequent discretionary approvals such as zone changes or subdivision maps. For projects where insufficient details were known at the time the EIR was prepared, the analysis should be focused on specific impacts not previously addressed.

Implementation Strategy:

Ensure that development projects are submitted to the District for CEQA comments and review of air quality analysis.

Train staff planners preparing CEQA documents on how to use the Guide for Assessing and Mitigating Air Quality Impacts guidance manual.

- Policy 2** The City/County of _____ shall ensure that air quality impacts identified during CEQA review are consistently and fairly mitigated.

Implementation Strategy:

Require projects to comply with appropriate mitigation measures recommended by the District and described in its Guide for Assessing and Mitigating Air Quality Impacts guidance manual or with alternative mitigation measures proposed by the applicant and approved by the District.

- Policy 3** The City/County of _____ shall ensure all air quality mitigation measures are feasible, implementable, and cost effective.

Implementation Strategy:

Consult with the District regarding the effectiveness of mitigation measures proposed by the applicant. When using measures from the District list of suggested measures, consider site-specific factors that may make a measure infeasible.

- Policy 4** The City/County of _____ shall identify the cumulative transportation and air quality impacts of all general plan amendments approved during the previous year.

Note: This may be in form of the Annual General Plan Status Report recommended by the Governor's Office of Planning and Research in the General Plan Guidelines. This information will assist the District in predicting long term indirect source impacts and could also be used in the mandatory report required by the Congestion Management Program.

Implementation Strategy:

Develop a system that tracks changes in land use by traffic analysis zone. Work with the District to perform air emissions modeling on the cumulative land use changes.

- Policy 5** The City/County of _____ shall reduce the air quality impacts of development projects that may be insignificant by themselves, but cumulatively are significant.

Implementation Strategy:

Small residential and commercial projects usually do not cause significant air quality impacts, but when a number of small, unrelated projects are developed in an area, they produce a cumulative impact. These impacts may be addressed in specific plans that set development standards and require mitigation for the plan area. They may also be addressed by local ordinances that institutionalize mitigation measures, making them applicable to all projects regardless of size.

- Policy 6** The City/County of _____ shall encourage innovative mitigation measures to reduce air quality impacts by coordinating with the District, project applicants, and other interested parties.

Implementation Strategy:

Innovative measures can be identified during a pre-application consultation process and during city/county staff/applicant negotiation over CEQA mitigation.

Air Quality Benefits:

The policies in this section address the requirements of CEQA to identify and reduce the environmental impacts of development projects. By implementing these policies, cities and counties will be fulfilling their responsibilities for determining short term and long-term air quality impacts and for using all feasible measures to reduce those impacts. Reducing air quality impacts means finding ways for projects to cause less pollutant emissions, and that is the primary goal of the Air Quality Guidelines.

CEQA allows each jurisdiction to determine within certain guidelines what is a "significant environmental effect" and what is "feasible mitigation." This has led to situations where one jurisdiction requires an EIR and substantial mitigation while a neighboring jurisdiction requires limited environmental review and limited mitigation for a similar project. If all jurisdictions implement Policies 1 and 2, it would create a level playing field for jurisdictions throughout the San Joaquin Valley. Air quality issues created locally have a regional effect, and air pollution does not respect political boundaries. Policies 1 and 2 would ensure that all projects would be subject to the same air quality analysis requirements and would mitigate project emissions to the

same extent. By raising all projects to the same high standard, it would ensure that jurisdictions within the region are not using less-stringent standards. Where jurisdictions are using less-stringent standards, there is the potential to emit more pollutants due to their lax standards. Consequently, fewer pollutants would be emitted when all projects use the same high standards.

The purpose of Policy 3 is to ensure that all mitigation measures are appropriate. To do this, the lead agency must consider the individual circumstances of each project site when requiring mitigation. An example of an inappropriate mitigation measure would be one requiring a bus shelter for a project not on an existing or planned bus route. The primary benefits of this policy are economic. Resources wasted on ineffective mitigation measures are resources lost for use on measures that are effective in reducing emissions.

Air pollution is a regional problem that is affected by the cumulative land use decisions of every city and county in the San Joaquin Valley. Policy 4 would enable a local jurisdiction to more accurately predict the cumulative air quality impacts of general plan build out, and would allow the District to predict impacts for the entire Valley. This information is vital for determining the emission reductions that will be needed to attain state and federal air quality standards.

Policy 5 is intended to encourage cities and counties to mitigate emissions from small sources that are minor when looked at in isolation, but become large when examined cumulatively. It is usually easier to mitigate emissions from larger projects because of economies of scale; however, small projects can provide on-site measures that will encourage people to use alternatives to motor vehicles and to reduce area-wide source emissions. The implementation of mitigation measures through local or county ordinances would require that mitigation measures be implemented regardless of whether the project contributes insignificant air quality impacts. This would ensure that all mitigation is applied to all projects regardless of project size and minimizes air quality impacts.

Policy 6 recognizes that the person or business affected by a mitigation measure is often best at identifying the most cost effective solutions. By allowing the developer to propose new and innovative solutions, you tap creativity driven by the developer's economic self-interest. Further, soliciting the input of interested parties will help to create a dialogue between all parties and identify mitigation measures that may have been overlooked. Once new mitigation measures are proven, their use throughout the air basin will improve air quality and reduce compliance costs.

Programs in Operation:

Numerous air districts within the state have developed environmental guidance manuals that provide guidance in the determination of significance of air quality impacts, establish emissions thresholds for project review, and set project analysis requirements to comply with CEQA. Examples of air districts that have environmental guidance manuals include the Bay Area Air Quality Management District (BAAQMD), Sacramento Metropolitan Air Quality Management District (SMAQMD), and the South Coast Air Quality Management District (SCAQMD).

The District has implemented an enhanced CEQA review program. The District has assigned staff to comment on discretionary development projects with the potential for significant adverse air quality impacts submitted by cities and counties. They have developed a list of suggested air quality measures for use by lead agencies. The District adopted the *Guide for Assessing and Mitigating Air Quality Impacts (GAMAQI)* guidance manual on August 20, 1998 and has undergone subsequent revisions. The document provides guidance for addressing air quality in environmental documents within the District. District staff also reviews air quality analyses for accuracy.

Resources:

District maintains CEQA staff at to comment on environmental documents and to answer air quality questions. The phone number is (559) 230-5800.

The District's *Guide for Assessing and Mitigating Air Quality Impacts (GAMAQI)* provides guidance to local government, project applicants, and consultants in analyzing air quality impacts of development projects and in meeting the requirements of the CEQA review process. Guidance in determining significance of air quality impacts, emissions thresholds for project review, project analysis requirements to comply with CEQA, and recommended mitigation measures to help minimize air quality impacts are included within the *GAMAQI*. The *GAMAQI* is available from the District at (559) 230-5800 and www.valleyair.org/transportation/ceqa_guidance_documents.htm.

COORDINATION/COOPERATION

Issue:

Coordination and cooperation are embraced by all, but we seldom achieve effective coordination and cooperation in government programs. Competitive and adversarial relationships common between many cities and counties and with outside agencies have proven counterproductive. Working together for a

common interest can multiply the resources available to accomplish air quality goals.

Objective 1b To coordinate local air quality programs with regional programs and those of neighboring jurisdictions.

Policy 7 The City/County of _____ shall work with neighboring jurisdictions and affected agencies to address cross-jurisdictional and regional transportation and air quality issues.

Note: The term neighboring jurisdiction generally refers to the county or to cities sharing a sphere of influence boundary. The extent of regional impact and consultation depends on the scope of the project.

Implementation Strategies:

Create an environment that allows and encourages staff members to keep up with activities in neighboring jurisdictions and regional agencies. This may be accomplished by sending representatives to appropriate meetings, by contacting counterparts in other agencies when developing programs, and, most importantly, by active participation in regional programs.

Planning agencies should develop internal procedures to ensure that all affected jurisdictions and agencies are notified of development proposals in accordance with state law. When another agency notifies your agency of a pending project, you should be examining air quality related issues, such as the following:

- *Congestion on roads in your jurisdiction from increased traffic caused by the project*
- *Effects on the viability of transit and pedestrian-oriented developments in your area (i.e., approval of a low density development on the same transit corridor as your transit-oriented development could reduce the ability of the transit provider to provide reasonable headways)*
- *Failure of the other jurisdiction to require the construction of a segment of a bikeway planned in the regional bikeway plan*
- *Proposed circulation amendments that may restrict traffic flow to or from your jurisdiction or that increase urban sprawl*

- *Proposed project may preclude or minimize the effectiveness of transit and pedestrian-oriented development/programs*

Policy 8 The City/County of _____ shall consult with the District during CEQA review for discretionary projects with the potential for causing adverse air quality impacts.

Note: The District will meet with project proponents to conduct a pre-application review to discuss air quality review/mitigation requirements when requested.

Implementation Strategy:

Ensure that the District is on the distribution list for all CEQA documents.

Conduct a pre-application air quality review to identify issues or problems that might require redesigning or major alterations of the project. The District may also review formal air quality impact analyses submitted by the applicant for adequacy. This will ensure that the environmental document bases its conclusions on accurate information.

Policy 9 The City/County of _____ shall coordinate with other jurisdictions and other regional agencies in the San Joaquin Valley to establish parallel air quality programs and implementation measures (trip reduction ordinances, indirect source programs, etc.).

Implementation Strategy:

Work with the Councils of Governments on programs implementing transportation control measures to reduce vehicle trips (VT) and vehicle miles traveled (VMT).

Work with the County or neighboring cities and counties to ensure programs are complimentary.

Be involved in the rule development process. Provide representation on air quality steering and advisory committees.

Discussion: This policy seeks to promote a level playing field for all jurisdictions in the Valley. Also, large regional employers prefer uniform programs so compliance is the same at all employment sites.

- Policy 10** The City/County of _____ shall work to reach an equitable tax sharing arrangement with the city/county to avoid the fiscalization of land use decisions.

Implementation Strategy:

Develop a joint powers agreement or other legal instrument to provide an incentive for counties to discourage urban commercial development in unincorporated areas and promote urban infill and redevelopment projects.

- Policy 11** The City/County of _____ shall support investment in cost-effective multi-use modeling and geographic information system technology.

Implementation Strategies:

Join a GIS users group. Identify systems being developed by other agencies that coincide with your agencies needs and propose a joint venture. Participate in Valley-wide GIS projects.

Air Quality Benefits:

The policies included under Objective 1b recognize that air quality problems are both local and regional, and that that air pollution does not respect political boundaries. These policies highlight the need for cross-jurisdictional planning and environmental review of proposed developments to ensure that each jurisdiction has before it all materials necessary to make responsible planning decisions. Intercity/county coordination and cooperation of planning efforts will streamline the region-wide air quality improvement efforts of the District, as well as the regional efforts of other agencies that may indirectly affect air quality in the Valley.

Policies 7 through 9 provide a general framework encouraging coordination between jurisdictions within the region and between the jurisdictions and the District. Coordination between the regional jurisdictions and the District will ensure all are working toward the same goal of minimizing air quality impacts and that the actions of one jurisdiction does not negatively affect the air quality in another jurisdiction or negate the air quality benefits made by another jurisdiction.

Policy 10 provides a commitment for cities and counties to cooperate in developing tax-sharing arrangements to reduce the temptation of approving discontinuous commercial development in unincorporated areas. The loss of revenues from other sources due to Proposition 13, economic recessions,

and state funding cutbacks have led to extreme competition for sales tax dollars between cities and counties. This competition can lead to urban sprawl, increased vehicle miles traveled, and the inability to provide efficient transit service. By minimizing commercial development within unincorporated areas and promoting urban infill and redevelopment projects, VT and VMT are reduced. In addition, transit, pedestrian, and bike modes of transportation are more accessible and feasible in concentrated development projects, further reducing VT and VMT.

Adoption of Policy 11 would enable a systematic, jurisdiction-wide approach to determining the quantitative impacts of a particular land use, transportation, or air quality planning decision. Geographic Information Systems (GIS) facilitate a jurisdiction-wide approach and can serve as a clearinghouse on information regarding all proposed projects in the jurisdiction's sphere of influence.

GISs help accurately forecast potential impacts on public infrastructure and thereby avoid constructing excess capacity in roads, sewers and water systems. They can also ensure that new development projects contribute a fair amount to the cost of new infrastructure. Air quality benefits are derived from the enhanced ability to determine long-term air quality impacts of development and the appropriate mitigation to reduce impacts.

Cooperation and coordination reduce emissions by allowing air quality programs to be implemented more rapidly and by creating more effective programs. Air quality impacts that are identified during the project review process can be mitigated to reduce pollutant emissions.

Programs in Operation:

The District has staff available to meet with applicants, consultants, and city/county staff to discuss air quality analysis and mitigation requirements for CEQA documents. This can be at the pre-application phase or at any time during the CEQA process. Similar programs are in effect in most larger air districts, such as Ventura County, the Bay Area Air Quality Management District (BAAQMD), the Sacramento Metropolitan Air Quality Management District (SMAQMD), and the South Coast Air Quality Management District (SCAQMD).

Kern County and the City of Bakersfield jointly adopted a general plan for the Bakersfield Metropolitan Area. Procedures and memoranda of understanding were developed for joint adoption of general plan amendments and for plan implementation.

The Councils of Governments in the San Joaquin Valley have entered into a memorandum of understanding to implement valley-wide transportation control measures.

Jurisdictions throughout the nation are implementing GIS. As GIS hardware and software has become less expensive and easier to use, even small cities are finding that GIS is viable. Many jurisdictions and individual agencies are pursuing GIS in the Valley. Assessors Offices, Planning Departments, School Districts, Public Utilities, and others are developing systems or have systems in place. The San Joaquin Valley Geographic Information Systems Council and Interdisciplinary Spatial Information Systems Center provide GIS data for the Valley region.

Statewide, there are many resources available for GIS information. Data are available from the California GIS Council, California Bureau of Land Management, California Spatial Information Library, California Environmental Information Catalog, and the California Environmental Resources Evaluation System. Each of these resources are available online and provide links to other data sources.

Resources:

City of Bakersfield Consolidated Plan 2005, City of Bakersfield Department of Economic and Community Development, Planning Division.
<<http://www.ci.bakersfield.ca.us/edcd/library/ConPlan2005/toc.htm>>.

South Coast Air Quality Management District (SCAQMD). Information on obtaining the CEQA Air Quality Handbook is available from the SCAQMD at <<http://www.aqmd.gov/ceqa/hdbk.html>>. The SCAQMD is developing the "Air Quality Analysis Guidance Handbook" to replace the CEQA Air Quality Handbook.

San Joaquin Valley Geographic Information Systems Council,
<<http://www.sjvgis.org>>.

Interdisciplinary Spatial Information Systems Center,
<<http://www.isis.csufresno.edu>>.

California GIS Council, <<http://www.gis.ca.gov/council/index.epl>>.

California Bureau of Land Management, <<http://www.ca.blm.gov/gis>>.

California Spatial Information Library, <<http://www.gis.ca.gov/index.epl>>.

California Environmental Information Catalog, <<http://ceres.ca.gov>>.

California Environmental Resources Evaluation System,
<<http://gis.ca.gov/catalog>>.

INTEGRATED PLANNING

Issue:

In the past, transportation planning emphasized the construction of new roadway capacity to reduce congestion and to meet the needs of planned development. Air quality legislation now mandates all transportation plans to consider air quality. This new emphasis requires our land use and transportation plans to create patterns of development and transportation infrastructure that reduce the need for new capacity and improve air quality.

Objective 1c To integrate land use planning, transportation planning, and air quality planning to make the most efficient use of public resources and to create a healthier and more livable environment.

Policy 12 The City/County of _____ shall consider air quality when planning the land uses and transportation systems to accommodate the expected growth in this community.

Implementation Strategy:

Develop coordinated land use and transportation plans to meet federal, state, and local air quality requirements.

Ensure that land uses proposed in general plan updates and general plan amendments are supported by a multi-modal transportation system and that the land uses themselves support the development of the transportation system.

Policy 13 All City/County submittals of transportation improvement projects to be included in regional transportation plans (RTP, RTIP, CMP, etc.) shall be consistent with the air quality goals and policies of the General Plan.

Implementation Strategies:

Analyze project submittals for consistency. Examples of inconsistent projects are a road widening project that does not consider transit, bicycling, and pedestrian needs along the route or an intersection signalization project that does not involve the installation of signal actuators that can be activated by bicyclists or pedestrians.

Discussion: This policy attempts to tie the regional transportation planning process back to the general plan. The concept behind this policy is that projects funded by the RTIP and other processes have a profound impact on where development will take place and what its composition will be. The city or county should not assume that transportation facilities needed to support general plan build-out will be built unless they are included in the RTP.

- Policy 14** The City/County of _____ shall consult with transit providers to determine project impacts on long range transit plans and ensure that impacts are mitigated.

Implementation Strategy:

Work with transit providers to develop long range transit plans based on land use plans supportive of future transit service.

Consult with transit providers during the CEQA process to determine the fiscal impacts of development projects on the transit system and develop funding sources to mitigate those impacts.

- Policy 15** The City/County of _____ shall work with the Housing Authority, transit providers, and developers to encourage the construction of low income housing developments that use transit-oriented and pedestrian-oriented design principles.

Implementation Strategy:

Assign a lead agency to pursue grants for planning and constructing a low-income transit-oriented development. Community development departments are logical candidates for this task.

Potential funding sources for project design and construction are Federal Highway funds, transit funds, and housing program funds. Local government would primarily be involved in locating the best project site and in streamlining and assisting in the permit process.

- Policy 16** The City/County of _____ shall work with Caltrans and the Regional Transportation Planning Agency to minimize

the air quality, mobility, and social impacts of large scale transportation projects on existing neighborhoods.

Implementation Strategies:

Use existing rail right of ways where feasible.

Provide safe pedestrian and bicycle connections between neighborhoods and shopping areas when they become separated by new rail or freeway projects.

Air Quality Benefits:

Policies in this section emphasize a commitment to truly integrate the transportation requirements planned in the Circulation Element and the land uses planned in the Land Use Element with air quality policies presented in this document. Integrated planning leads to transportation systems that support all modes of transportation and land use patterns that encourage the use of alternative modes. Effective implementation of a fully integrated plan can achieve trip reductions on the order of 10 to 23 percent (ARB 1993) and commensurate air quality benefits.

Projects such as those proposed by Policy 15 would allow people who can least afford car ownership with reasonable options to meet their mobility needs. Providing access to transit will increase employment options for low-income residents and could lead to the retirement of high emitting older vehicles. It is estimated that mixed-use and higher density strategies can achieve a 10 to 30 percent reduction in per-household vehicle travel and related emissions at the neighborhood or community level, while multi-modal transportation systems can reduce regional vehicle travel and associated emissions by 5 to 15 percent (ARB 1997). Further, a combination of TOD and high levels of transit service can increase the use of transit within a neighborhood by 20 to 40 percent (Caltrans 2002).

Policy 16 recognizes that major transportation projects can severely impact existing development. Measures to maintain neighborhood links can minimize increases in trips and vehicle miles traveled.

Programs in Operation:

The State of Oregon Land, Conservation, and Development Commission adopted a Transportation Planning Rule. This rule mandates local governments to consider air quality and mobility in land use decisions and requires local jurisdictions to adopt ordinances to make new development more bicycle, pedestrian, and transit friendly (SDAPCD 1998). The goal of the Transportation Planning Rule is to “promote the development of safe,

convenient and economic transportation systems that are designed to reduce reliance on the automobile so that the air pollution, traffic and other livability problems faced by urban areas in other parts of the country might be avoided...containing urban development; reducing the cost of public services; protecting farm and forest land; reducing air, water, and noise pollution; conserving energy, and reducing emissions of greenhouse gases that contribute to global climate change.”

The San Diego Association of Governments has sponsored seminars and workshops, such as “Building Livable Communities,” in coordination with cities and neighborhoods in the region. The League of Women Voters and the San Diego Section of the American Planning Association have held similar workshops on an occasional basis.

In 2002, Caltrans released the results of the “Statewide Transit-Oriented Development Study,” which is available at <http://www.dot.ca.gov/hq/MassTrans/tod.htm>. The study defines, describes, and examines the implementation of transit-oriented development.

The Federal Highways administration (FHWA) funded Transportation, Community, and System Preservation (TCSP) project, “Creating Transportation Option in the San Joaquin Valley Through Improved Land Use Patterns,” built on previous work of the Growth Alternatives Alliance. The project promoted principles of efficient land use in urban areas, livable communities emphasizing pedestrian and transit-oriented design, and protecting productive farmland. Accomplishments of the TCSP project include smart growth publications, Smart Growth Zoning Code and livable communities workshops held at many San Joaquin Valley locations.

EDUCATION

Issue:

Without the understanding and support of the general public, local air quality programs cannot be expected to achieve the desired results. Programs to educate the public on air quality issues are a vital component of a successful air quality program.

Objective 1d To educate the public on the impact of individual transportation, lifestyle, and land use decisions on air quality.

Policy 17 The City/County of _____ shall work to improve the public's understanding of the land use, transportation, and air quality link.

Implementation Strategy:

Planning agencies should assist in educating developers and the public on the benefits of pedestrian and transit friendly development and should participate in local programs that can reduce vehicle trips and miles traveled.

Methods of educating developers and the public on the benefits of pedestrian and transit friendly development include conducting public meetings, workshops, seminars, and providing consultation opportunities for developers. In addition, it is recommended that planning agencies, working with the ARB, District, and the local school districts, develop educational materials regarding air quality, the impact of air quality on people, plants, and animals, and measures that help to improve air quality. These materials would be presented within the curriculum of the local school districts.

Policy 18 The City/County of _____ shall encourage local public and private groups that provide air quality education programs.

Implementation Strategy:

Form a community-wide public/private air quality organization to promote education programs.

Work with the Farm Bureau, the University of California Extension Studies, and farm organizations on educational programs.

Air Quality Benefits:

Public education can be an effective tool for implementing air quality programs. More importantly, public education can lead to changes in travel behavior and mode choice decisions that reduce emissions and improve air quality.

The theory behind air quality public education programs is that if each individual is made aware of the air quality impacts of his/her activities, then that individual is more likely to choose the option that pollutes less. The Bay Area Air Quality Management District credits its high profile "Spare the Air" campaign with reducing NO_x levels by 1.776 tons per day on "Spare the Air" days. In addition, the campaign has reduced ROG by 1.86 tons and PM₁₀ by 0.4 tons (Globe Research & Analysis 2003).

Cities and counties can educate developers and the public on land use patterns and site designs that reduce motor vehicle trips and improve air quality. Planning agencies can provide developers, engineers, and designers with information that promotes transit, pedestrian, and bicycle friendly designs. Planning agencies can participate in the professional development programs of associations such as the California Council of Civil Engineers, the American Planning Association, and the Building Industry Association. By working directly with the people designing the projects, air quality design principles are more likely to be incorporated into the projects submitted to cities and counties.

Programs in Operation:

The District conducts extensive air quality public information programs in the Valley. The programs cover the Valley's air quality issues, the sources of pollution, and District air quality rules and regulations. They also focus on what individuals can do to improve air quality. The media used in outreach efforts include brochures (both English- and Spanish-language), news releases to Valley-wide media outlets, public service announcements on radio and television, a Clean Air Kids Calendar, a speakers bureau that is available to speak on an array of air pollution topics, and information on the District's website. The District has prepared brochures on specific rule implementation, such as residential woodburning and trip reduction, and has developed Spare the Air, a program designed to inform employers and the public about air quality in the Valley and how the public can help to improve it. The District places a special focus on youth education through the development of special materials and presentations aimed at students in grades K-12.

In April of 1998, the Growth Alternatives Alliance, a consortium made of the Fresno Business Council, American Farmland Trust, Fresno County Farm Bureau, Building Industry Association of the San Joaquin Valley, and Fresno Chamber of Commerce, published *A Landscape of Choice: Strategies for Improving Patterns of Community Growth*. The Alliance is committed to protecting vital natural resources, improving the quality of life, and supporting the growth of better communities within Fresno County.

Resources:

The District employs a Public Information staff to administer the District's public education program. District staff is available to assist cities and counties with starting their programs. The Public Information staff may be reached at (559) 230-5800 at the District's central office.

Spare the Air, the District's program to inform and educate the public regarding air quality and pollution prevention is available online at <http://www.valleyair.org/sta/staidx.htm>.

A Landscape of Choice: Strategies for Improving Patterns of Community Growth. Available from the American Farmland Trust, 1949 Fifth Street, Suite #101 Davis, CA 95616. Available online at <<http://www.farmlandinfo.org>>. A follow-up publication, *Livable Neighborhood Development – Implementation Guideline to a Landscape of Choice*, provides more specific strategies. Both are available from the Fresno Business Council at Fig Garden Financial Center, 5250 N. Palm, Suite 300, Fresno, CA 93704-2217. <<http://www.fresnobc.org>>.

Rideshare programs are operating throughout the Valley. These programs encourage all methods of reducing motor vehicle trips, not just ridesharing.

PUBLIC FACILITIES/OPERATIONS

Issues:

City and county governments are often the largest employers in a jurisdiction, and they often operate large vehicle fleets. Local governments should take a leadership role in implementing employer-based trip reduction and fleet operator programs to reduce their own emissions and to provide a model for the private sector.

Objective 1e For public facilities and operations to provide a model for the private sector in implementing air quality programs.

Policy 19 City/County Departments shall take the lead in implementing innovative employer-based trip reduction programs for their employees.

Implementation Strategy:

Ensure that employment contracts negotiated with unions are flexible and allow workers to participate in programs that reduce commute trips.

City/County Departments should work to encourage and implement trip reduction programs to reduce staff commute trips. Examples of trip reduction programs include:

- *Department-sponsored carpooling efforts and rideshare programs*
- *Reimbursement or subsidizing of transit costs for employees*
- *Incentives for employees who use alternative means of transportation (biking, walking, carpooling, etc.)*
- *Preferred parking locations for carpool/rideshare users*

- Policy 20** City/County fleet vehicle operators shall replace or convert conventional fuel vehicles with clean fuel vehicles as rapidly as feasible.

Implementation Strategy:

Budget for clean fuel vehicles in long range capital expenditure plans.

Participate in the San Joaquin Valley Clean Cities Coalition to identify fleet vehicle purchase opportunities and shared infrastructure investment opportunities.

Incorporate infrastructure to facilitate the conversion to and use of clean-fuel vehicles. For example, locate L/CNG refueling stations for clean fuel vehicles in convenient and multiple locations to enable convenient and easy refuel of vehicles.

- Policy 21** The City/County of _____ shall support the use of teleconferencing in lieu of employee travel to conferences and meetings when feasible.

Implementation Strategy:

With the expansion of technology capabilities, teleconferencing is a readily available and accessible option for many agencies, companies, and individuals. Video and web-based conferencing options are also viable means of meeting and conferencing. Interested public agencies should invest in infrastructure that would allow for telephone, video, and web-based conferencing options. Possible alternatives include the development of a multi-user teleconferencing center, installation of telephone, video, and web-based conferencing technology at existing facilities, and the upgrade of equipment at City/County offices. Use commercial teleconferencing facilities if they are cost competitive considering travel costs and employee time savings.

- Policy 22** The City/County of _____ shall encourage departments to set up telecommuting programs as part of their trip reduction strategies.

Implementation Strategy:

Identify positions where telecommuting is feasible. Start a pilot program for the most promising positions with employee volunteers.

Air Quality Benefits:

Policy 19 would encourage City/County Departments to implement innovative trip reduction programs. By encouraging employees to use alternative means of transportation, the number of commute trips generated by City/County workers could be reduced, which would have a beneficial impact on regional air quality.

Policy 20 encourages public vehicle fleet operators to retrofit or replace their conventionally fueled vehicles with cleaner burning fuel systems and vehicles. EPA data suggests that vehicles powered by compressed natural gas (CNG) emit 90 to 97% less carbon monoxide (CO), 25% less carbon dioxide (CO₂), 35 to 60% less oxides of nitrogen (NO_x), and 50 to 75% less non-methane hydrocarbon emissions relative to conventional gasoline-powered vehicles, and little to no particulate matter (EPA 2002). Providing infrastructure to conveniently refuel and park clean fuel vehicles will provide incentives for the continued use of these vehicles.

The development of telephone, video, and web-based conferencing technology, as encouraged by Policy 21, would enable government employees and other users to avoid motor vehicle and air travel to meetings. State of the art telephone, video, and web-based conferencing technology can provide two-way, interactive video, audio, and data transmission. Although this technology cannot totally replace face-to-face meetings, it can be effective for many meetings. Telephone, video, and web-based conferencing technology can be very cost-effective for organizations that travel frequently to the same destinations. Money saved from travel expenses can pay the cost of the equipment and any associated charges.

Policy 22 encourages local government agencies to develop telecommuting programs. Telecommuting can be quite effective in reducing vehicle trips and miles traveled by some categories of public employees. Employees could work at home or at a neighborhood telecommuting center. Programs could allow employees to work full time or part time at the remote work site depending on the needs of the job. Because of the relatively short commute distances for most Valley public employees, one would expect limited use of telecommuting centers. Telecommuting centers are most appropriate to serve areas with many long distance commuters and areas with serious traffic congestion. See also the air quality benefits associated with Policy 24.

Programs in Operation:

The District has purchased and plans to continue purchasing hybrid electric-gasoline vehicles, which are considered super ultra low emission vehicles (SULEVs) and advanced technology partial zero emissions vehicles (ATPZEVs), as part of its fleet.

The Los Angeles County Metropolitan Transportation Authority (MTA) is the third largest bus fleet in the nation, and it currently has the largest compressed natural gas (CNG) fleet in the nation with over 1,900 CNG buses in operation, representing over 80% of MTA's fleet. The Golden Empire Transit District (GET) in the Bakersfield Metropolitan area has an active fleet of 79 buses, of which 41 are powered by compressed natural gas, as of 2004.

The U.S. Department of Energy honored the City of Fresno with the City Fleet of the Year award as part of the 2005 Clean Cities National partner Awards program in May 2005. Fresno built a liquefied natural gas (LNG) fueling station and replaced 69 refuse-hauling diesel trucks with LNG-fueled trucks, bring the city in compliance with state regulations five years ahead of schedule.

With the expansion of technology capabilities, teleconferencing is a readily available and accessible option for many agencies, companies, and individuals. Pacific Bell has installed video teleconferencing equipment in several of their major offices in California. Employees in their Fresno office have been able to eliminate some of their trips to Sacramento for staff meetings by teleconferencing.

The District has installed a video teleconferencing system that has been in use for many years. The system has proven successful in saving both money and time, as well as greatly reducing vehicle miles traveled by staff and meeting attendees.

The California State University system has teleconferencing facilities at several campuses, including Sacramento, Bakersfield, Chico, Stanislaus, and Fresno.

Several California cities as well as cities in other states are experimenting with telecommuting to reduce vehicle trips. Telecommuting centers have been established in Ontario, Thousand Oaks, Sherman Oaks, Van Nuys, suburbs of Sacramento, Long Beach, Modesto, San Bernardino, and other cities in California.

Resources:

“Telecommuting - A Handbook to Help You Set Up a Program at Your Company,” is an extensive guide to telecommuting prepared by the California Department of Transportation in cooperation with the U.S. Department of Transportation, Federal Highway Administration. A list of the primary author’s other publications on telecommuting can be found at <http://www.joannepratt.com/publications.htm>. Local rideshare agencies can provide additional information on implementing telecommuting programs.

Canadian Telework Association/InnoVisions Canada maintains a website with extensive information and guidance regarding telecommuting. Their website is <http://www.ivc.ca>.

CONGESTION MANAGEMENT/TRANSPORTATION CONTROL MEASURES

Issue:

State and federal legislation requires local governments to include strategies to increase the efficiency of transportation infrastructure and to reduce vehicle trips in their transportation plans. Cities and counties can support these strategies by requiring developers to include infrastructure that reduces congestion or trips.

Goal 2: **Reduce traffic congestion and vehicle trips through more efficient infrastructure and support for trip reduction programs.**

Issue:

Transportation control measures (TCMs) are most effective when infrastructure is in place that supports alternative transportation modes. This would include community-wide transportation improvements and on-site improvements at individual worksites and businesses.

Objective 2a To ensure that new development provides the facilities and programs that improve the effectiveness of transportation control measures and congestion management programs.

Policy 23 The City/County of _____ shall consider measures to increase the capacity of the existing road network prior to constructing more capacity (additional lanes, new freeways, etc.).

Implementation Strategies:

Measures that may be included in local and regional transportation plans and capital improvement plans that may increase the capacity and reduce congestion on existing roads include the following:

- *Establish an integrated and synchronized traffic signal network for major thoroughfares to assure smooth-flowing traffic through intersections and to minimize congestion through maintenance of stable traffic flow at intersections*
- *Convert congested streets to one-way couplets where feasible*
- *Modify intersections using turn restrictions, channelization, etc. where necessary and feasible*
- *Redirect truck traffic during peak hours*
- *Construct bus turnouts to remove buses from traveled lanes during passenger loading and unloading*
- *Use freeway ramp metering to promote smoother traffic flow*

Policy 24 The City/County of _____ shall work with employers and developers to provide employees and residents with attractive, affordable transportation alternatives.

Implementation Strategies:

Through zoning ordinance or other means, require new development to provide on-site facilities that encourage employees to use alternative transportation modes as air quality and transportation mitigation measures. Some examples include:

- *Showers and lockers provided in office buildings*
- *Safe and secure bicycle parking areas*
- *On-site employee cafeterias and eating areas*
- *Convenient access to transit waiting areas from offices*

The city or county can provide reduced parking requirements as an incentive for projects to incorporate measures proven to reduce employee commute trips or customer trips.

Some methods employers may use to encourage trip reduction and increased Average Vehicle Ridership include rideshare matching, transit subsidies, vanpool subsidies, flexible work schedules, compressed work weeks, telecommuting, shuttle services, parking management, guaranteed ride home, and

provide preferential or subsidized parking for ride-sharing vehicles.

Reduce parking for businesses that implement strong trip reduction programs.

Encourage employers to provide preferential or subsidized parking for ride-sharing vehicles.

Developers can provide the land use patterns and site designs that increase commuters' ability to walk, bicycle, or use transit to get to work.

Policy 25 The City/County of _____ shall work to establish public/private partnerships to develop satellite and neighborhood work centers for telecommuting.

Note: This policy is best suited for communities with significant numbers of information based workers who currently commute long distances for employment.

Implementation Strategies:

Develop public/private partnerships with long distance commuter-based major employers. Telecommuting centers are generally compatible with mixed-use, pedestrian-oriented, and transit-oriented neighborhood commercial areas.

Identify and provide information and incentives for employer development and participation in telecommuting programs.

Policy 26 The City/County of _____ shall encourage the development of state of the art communication infrastructure linked to the rest of the world.

Implementation Strategies:

Support changes to the State Uniform Building Code to require new homes and businesses to be wired with fiber-optic cables or to require wiring conduits with easy access and adequate capacity to allow for efficient retrofitting. Encourage the development of video-teleconferencing facilities.

Air Quality Benefits:

The policies in this section are intended to provide support for local congestion management and transportation control measure programs. Congestion management programs (CMP) are mandated by state law for urbanized counties with metropolitan areas with 50,000 or more residents. Transportation control measures (TCMs) are required for the San Joaquin Valley by the CCAA and were a part of the mobile source strategy in the District's 1991 Air Quality Attainment Plan. Since their development, these TCMs have been further evaluated and refined by the District. A more detailed description of congestion management programs and the TCM program planned for the San Joaquin Valley is provided in Section III.

TCMs are strategies to reduce emissions by reducing motor vehicle trips, vehicle miles traveled, and idling. They accomplish this by encouraging people to drive less. The ability and willingness of people to drive less is highly dependent on cost, convenience, and comfort of the alternatives to driving alone. Policies throughout this document encourage new development to be constructed in ways that encourage the use of alternative modes of travel. The policies in this section provide some specific actions that can enhance the long-range effectiveness of TCMs.

One of the purposes of congestion management programs is to improve system efficiency by implementing measures that will increase the capacity of the existing system with a minimum of capital improvements. Adopting Policy 23 would place a similar provision in the general plan. The intent of the policy is to make the most efficient use of existing transportation infrastructure by reducing travel demand and by improving traffic flow.

Policy 24 provides a basis for improving transportation options from new and existing development. One way to improve these options would be to provide infrastructure that encourages people to use alternative modes of transportation or to rideshare. This infrastructure could be required as CEQA mitigation or by local ordinance. Providing infrastructure such as cafeterias, showers, lockers, bike lockers, transit shelters, pedestrian amenities, etc. is much easier at the time of initial construction than it is to retrofit them later. Although providing this type of infrastructure does not guarantee that people will change their travel habits, it does eliminate many of the negative factors people consider when choosing their mode of travel.

Policy 25 encourages cities and counties to form public/private partnerships to provide telecommuting centers to mitigate transportation and air quality impacts. Telecommuting centers provide office space in a neighborhood or at a remote site so that employees can avoid commuting to the main office. The main air quality benefits of these centers are due to reduced vehicle miles traveled and reduced congestion en route to the main worksite. In addition to

the air quality benefits, employees can improve their quality of life by increasing time available for their families. Employers can benefit from reduced facility costs and increased productivity (Caltrans). When telecommuting centers are near to residential development, some employees will be within walking or bicycling distance of work and will have a greater potential to use transit to get to work.

Policy 25 is intended for areas where significant numbers of long distance commuters are expected to reside. These areas can provide enough potential users of the centers to make them feasible. As telecommunication technology improves, more jobs will have the potential to be performed at locations remote from the main office. This will result in greater reliance on telecommuting and fewer trips and miles traveled.

A comparison of the travel behavior and personal vehicle emissions of participants in the State of California Telecommuting Pilot Project, first planned in 1985 and finalized in 1990, indicated a 27% reduction in the number of personal vehicle trips, a 77% decrease in vehicle-miles traveled (VMT), and 39% (and 4%) decreases in the number of cold (and hot) engine starts. These decreases in travel translate into emissions reductions of: 48% for Total Organic Gases (TOG), 64% for Carbon Monoxide (CO), 69% for Nitrogen Oxides (NO_x), and 78% for Particulate Matter (PM). An analysis of the number of trips and VMT partitioned into commute-related and non-commute-related purposes revealed that non-commute trips increased by 0.5 trips per person-day on average, and non-commute VMT decreased by 5.3 miles (Institute of Transportation Studies, 1996).

Telecommunications technologies are changing the way we work, shop, and conduct personal business. Information is becoming decentralized. This eliminates the need for people to position themselves close to a large mainframe computer or paper files at a centralized location to work. Services such as video rental may become obsolete as technologies offering movies and shows on demand increase in popularity and become more affordable. These technologies eliminate many needs to travel and so eliminate the motor vehicle emissions associated with that travel. Policy 26 is a commitment on the part of local government to bring state of the art telecommunications capabilities to their communities.

Local government can encourage the installation of fiber-optic cable in homes and businesses. Fiber optics are necessary to carry the massive amounts of information required to achieve true interactive voice, data, and image transmission. By placing this capability in the homes and businesses being constructed today, it will be just a matter of turning on a switch rather than a total rewiring effort.

As with most of the other policies in this document, the air quality benefits are long term and incremental. Most transportation control measures apply to existing activities and businesses. This means that when TCMs are initially adopted, the businesses and activities affected will receive limited benefit from new infrastructure. However, as new development proceeds, an increasing percentage of businesses and activities will benefit.

One of the primary intents of air quality elements or policies is to increase the effectiveness of TCMs. Developing land use patterns and transportation infrastructure supportive of alternative modes of transportation can make a dramatic difference in the success of the Transportation Control Measure Program. The District *Amended 2002 and 2005 Rate of Progress Plans for San Joaquin Valley Ozone* estimates that TCMs will be responsible for reducing NO_x emissions by 1.5 tons per day (District 2002).

Programs in Operation:

TCMs have been implemented by many local jurisdictions in the San Francisco Bay area and Los Angeles area. The most common measures are employer based commute trip reduction programs. Transportation system measures to reduce congestion, such as signal synchronization and channeling of traffic, are accomplished in most cities and counties in the Valley and other metropolitan areas of California.

In September 1997, the Guaranteed Ride Home program started in Ventura County, providing rides home to persons who use public transit, carpool, or vanpool to get to work or to a job training program in Ventura County who have an emergency, childcare problem, or unanticipated overtime. The program was created to encourage persons to use the bus, train, a carpool, or vanpool by providing a safety net for a ride home in case of emergency. Persons registered in the program will have a free taxi ride or rental car provided, depending on the distance involved. There is no fee for the service to either the individual or employer. Over the first two years, 8,500 individuals and 140 employers have registered, and 260 free rides (226 taxi rides, 34 car rentals) have been provided (American Public Transportation Association, American Public Transit Association 1999).

Since 1993, the Los Angeles County's Telecommuting Program has provided more than 5,000 county employees an alternative way of working without the long commute to work. The home-based telecommuting program allows employees to work from their homes, and the program currently accounts for 98 percent of the county's teleworkers. The telework exchange program option places telecommuters at near-home workstations in other county or city offices. Two telebusiness centers provide a total of 60 workstations for use by public and private employees who live in the Antelope Valley and wish to eliminate the two-hour drive to downtown Los Angeles. The centers have

become self-funded through usage fees charged to client telecommuters or their employees, and facility exchange agreements allow participants to utilize stations at no cost. The county also allows for emergency or short-term telecommuting in the event of natural disasters or public transit strikes (Beardslee 1997).

Resources:

Cities and counties can obtain information about TCMs and congestion management program requirements from their Regional Transportation Planning Agency and from the District, Mobile and Transportation Section.

Ventura County Guaranteed Ride Home Program, Ventura County Transportation Commission (VCTC) 950 County Square Drive Suite 207, Ventura, CA 93003. <<http://www.goventura.org/home/index.asp?page=9>>.

Los Angeles County's Telecommuting Program, Chief Administrative Office – Office of Workplace Programs, Los Angeles County, 500 W. Temple St., Rm. 526, Los Angeles, CA 90012.

TOXIC AND HAZARDOUS EMISSIONS

Issues:

Past siting decisions for industrial and residential development have created conflicts where none should have existed, raising public concern over exposure to toxic and hazardous emissions. Providing appropriate areas for all types of development can minimize conflicts and promote economic growth.

Goal 3: **Minimize exposure of the public to toxic air pollutant emissions and noxious odors from industrial, manufacturing, and processing facilities.**

Objective 3a To provide adequate sites for industrial development while minimizing the health risks to people resulting from industrial toxic or hazardous air pollutant emissions.

Policy 27 The City/County of _____ shall require residential development projects and projects categorized as sensitive receptors to be located an adequate distance from existing and potential sources toxic emissions such as freeways, major arterials, industrial sites, and hazardous material locations.

Note: This policy is intended to protect existing residential development and other sensitive receptors from conflicts with new industrial development. The types of businesses that are categorized as point sources are often incompatible with residential uses for a number of reasons, including noise, truck traffic, visual concerns, and air quality. These are not the types of businesses encouraged for mixed-use developments or for commercial/office activity centers where we would expect more people to walk to work. The policy recognizes that businesses that are point sources are vital to the economy of the San Joaquin Valley and will be built, but that cities and counties must use care in planning their sites to avoid conflicts.

Implementation Strategies:

Consult with the District to identify sources of toxic air emissions and determine the need for and requirements of a health risk assessment for the proposed development. Consult with project proponents during the pre-application review process to avoid inappropriate uses at affected sites and during the environmental review process for general plan amendments and general plan updates.

Use District stationary source and air toxics location data in a geographic information system. A valley-wide GIS system that could contain this information is being considered now in the early planning phase.

Policy 28 The City/County of _____ shall require new air pollution point sources such as, but not limited to, industrial, manufacturing, and processing facilities to be located an adequate distance from residential areas and other sensitive receptors.

Implementation Strategies:

Require project proponents to prepare health risk assessments in accordance with District recommended procedures as part of environmental review when the proposed industrial process has associated air toxic emissions that have been designated by the state as a toxic air contaminant or, similarly, by the federal government as a hazardous air pollutant.

Designate adequate industrial land in areas downwind and well separated from sensitive uses. Designate non-sensitive land

uses for areas surrounding industrial sites. Protect vacant industrial sites from encroachment by residential or other sensitive uses through appropriate zoning.

Air Quality Benefits:

The policies in this section focus on adequately separating people from industrial processes that emit toxic and hazardous emissions. Although the best way to reduce exposure to these emissions is through source reduction, that program is the responsibility of the District. The role of cities and counties is to plan the arrangement of land uses to minimize exposure. If properly implemented, the policies in this section will help minimize the health risks associated with exposure to toxic air contaminant and hazardous air contaminant pollutant emissions.

Although emissions of criteria pollutants are not reduced by the policies in this section, the real and perceived benefits to the community can be significant. The public often places higher importance on the potential for industrial toxic emissions to cause small increases in the risk of cancer and birth defects than it does on the long term chronic effects of high ozone, CO, PM10, and PM2.5 levels. The policies in this section, if properly implemented, will help minimize the health risks associated with exposure to toxic air contaminant and hazardous air pollutant emissions.

Land use decisions can also raise or lower the potential for acute toxic incidents from accidental chemical spills and gas releases. Industries using and storing extremely hazardous materials should also be located well away from concentrations of people. Programs to manage hazardous materials and to reduce the potential of acute toxic incidents are usually the responsibility of local fire departments.

By protecting industry from encroachment by residential development, local government can help to foster economic growth. Proper planning can avoid industrial/residential conflicts, reducing the potential for litigation and nuisance complaints. This can help communities to retain or attract industrial development.

Programs in Operation:

The District has implemented a comprehensive toxics program. The District's mandates are from AB 1807 Tanner Air Toxics Act, AB 2588 Air Toxics "Hot Spots" Information and Assessment Act, AB 3205 Toxic Emissions Near Schools, SB 1731 "Hot Spots" Risk Reduction Mandates, the Federal Clean Air Act Amendments Title III, and other laws. These bills require inventories, public notification, health risk assessments, and risk reduction under certain circumstances.

The District's Public Notification Procedures Document, mandated by AB 2588, includes procedures that place requirements on certain sources of toxic emissions and on the District. Facilities with theoretical risks greater than specified significance thresholds for which there are no receptors within the impacted area at the present time are deemed potentially significant. An example is an existing chemical manufacturing plant with no development nearby. Under the notification procedures, the District will notify all landowners and land use agencies within the impacted area that there is a source of toxic emissions in the vicinity. This will allow decision makers to take this information into account when making land use decisions involving new sensitive uses. The procedures also require the operator of a potentially significant source to notify the District within 60 days after a receptor locates within the area impacted by the source. An example is the construction of a residential subdivision near an existing source of toxic emissions like a refinery or a chemical plant. This triggers requirements for the toxic source to submit emissions data, prepare a health risk assessment, and for facilities that pose a significant risk to implement measures to reduce emissions.

Through the District's internal referral process, District CEQA staff may send development projects that have potential toxic emissions to Toxic Assessment staff for review and comment. The Toxics Assessment staff may identify projects that require health risk assessments and other actions mandated by state and federal law.

Resources:

The District's Air Toxics Program can provide information regarding this program. (559) 230-5900. <<http://www.valleyair.org>>.

The ARB's *Air Quality and Land Use Handbook: A Community Health Perspective*, was adopted in April 2005 and is available online at <<http://www.arb.ca.gov/ch/aqhandbook.htm>>. It provides suggested siting distances between sensitive land uses and sources of toxic air contaminants.

FUGITIVE DUST/PM10

Issues:

Levels of PM10 (particulate matter less than 10 microns in diameter) exceed state and federal health based standards. The San Joaquin Valley is classified as a serious nonattainment area for PM10 under the federal criteria. Because of this classification, the District is subject to a series of federal mandates aimed at achieving the federal ambient air quality standards. These include adoption of contingency measures and implementation of Best

Available Control Measures (BACM). Control efforts for sources under the jurisdiction of cities and counties can significantly reduce these emissions. The District adopted the *2003 PM10 Plan* on June 19, 2003 to meet federal requirements. The *2003 PM10 Plan* was amended on December 18, 2003 and May 19, 2005, and the District is currently working on the *2006 PM10 Plan*, due to the EPA March 31, 2006.

Goal 4: **Reduce particulate emissions from sources under the jurisdiction of the city/county.**

Objective 4a To reduce emissions of PM10 and other particulates with local control potential.

Policy 29 The City/County of _____ shall work with the District to reduce particulate emissions from construction, grading, excavation, and demolition to the maximum extent feasible.

Implementation Strategies:

The City/County should include PM10 control measures as conditions of approval for subdivision maps, site plans, and grading permits. This will assist in implementing and enforcing the District's fugitive dust regulation (Regulation VIII, Fugitive PM10 Prohibitions). District rules implementing Regulation VIII were amended in 2001 and again in 2004; see <http://www.valleyair.org/rules/1ruleslist.htm#reg8> for the current version.

The City/County should inform developers of the requirements of the District's Regulation VIII when they apply for a grading permit. Coordinate fugitive dust enforcement actions with the District.

Use strategies to minimize soil disturbances including:

- *Minimize vegetation removal required for fire prevention to the extent compatible with public safety considerations. Utilize alternatives to discing, such as mowing, to the extent feasible. Where vegetation removal is required for aesthetic or property maintenance purposes, encourage or require alternatives to discing*
- *Strongly encourage subdivision designs and site planning which uses landform grading in hillside areas and minimizes grading*

- *Condition grading permits to require that graded areas be stabilized from the completion of grading to commencement of construction*

Policy 30 The City/County of _____ shall require all access roads, driveways, and parking areas serving new commercial and industrial development to be constructed with materials that minimize particulate emissions and are appropriate to the scale and intensity of use.

Implementation Strategy:

Include paving requirements as part of the development standards of the Zoning Ordinance or Subdivision Ordinance.

Policy 31 The City/County of _____ shall reduce PM10 emissions from City/County maintained roads to the maximum extent feasible.

Implementation Strategies:

Develop plans and funding sources to pave heavily used unpaved roads.

Develop a street cleaning program aimed at removing heavy silt loadings from roadways that result from sources such as storm water runoff and construction sites.

Pave shoulders and pave or landscape medians. Curb and gutter installation may provide additional benefits where paving is contiguous to the curb.

Air Quality Benefits:

Relatively simple measures can reduce PM10 emissions from construction activities by 20 to 74 percent. Periodically applying water to construction sites can reduce PM10 emissions by 50 percent. (Monterey Bay Unified Air Pollution Control District (MBUAPCD) 2002). Planting and maintaining vegetation in disturbed areas as soon as possible can greatly reduce PM10 emissions between 5 and 99%, based on planting plan (MBUAPCD 2002). Paving dirt roads and parking areas is very expensive, but is also very effective. The US EPA estimates that paving construction roads and access roads can reduce PM10 emissions by over 90 percent.

The MBUAPCD has summarized the effectiveness of various PM₁₀ control measures. Table 4-1 provides a summary of this information.

Because of the San Joaquin Valley air basin's classification as a serious nonattainment area, the District prepared a *Serious PM₁₀ Nonattainment Area Plan*. The plan included more stringent Best Available Control Measures (BACM). The District adopted a *2003 PM₁₀ Plan* on June 19, 2003. The air quality goals, projections, and BACM of the *2003 PM₁₀ Plan* are based upon the progress of previous PM₁₀ plans, updated PM₁₀ emissions inventories, and current state and federal standards.

The District estimates that the paving of unpaved surfaces (Policy 30) can reduce PM₁₀ emissions from this source by up to 90% (District 1991). Because the paving of all unpaved roads in the Valley is infeasible, Policy 31 is directed at roads that would likely receive heavy vehicular use. Other dust control measures for unpaved roads are also available, including preventing soil transport from areas adjacent to paved roadways by installing curbing or automatic truck and wheel washers, applying water, mechanical stabilization (i.e., compaction), chemical stabilization, limiting speeds or vehicular weight, and covering of unpaved roadways with gravel.

Policy 31 also requires cities and counties to reduce PM₁₀ emissions from paved roadways. One way this can be accomplished is via a street sweeping/cleaning program. Street sweeping in places with high silt loadings can be effective. District Regulation VIII (Fugitive PM₁₀ Prohibitions) contains requirements for local jurisdictions to pave unpaved public roads and unpaved shoulders, street-sweeping program requirements, and post-event street clean-up guidelines (See Rule 8061, Paved and Unpaved Roads). Local jurisdictions should expeditiously implement these requirements and are encouraged to implement similar or superior programs appropriate for their areas of responsibility. The SCAQMD South Coast Air Quality Management District (SCAQMD) has an adopted rule that requires the inclusion of alternative fueled street sweepers (see SCAQMD Rule 1186.1, Less Polluting Sweepers). As technology improves and new street sweeper models are certified as PM₁₀-efficient, local jurisdictions should work closely with the District to determine the best method and equipment.

Cities and counties play a crucial role in obtaining PM₁₀ reductions. PM₁₀ measures may be required as CEQA mitigation, and mitigation measures are usually monitored by local agencies. Most local roads are under the jurisdiction of local governments, so programs to reduce emissions from paved and unpaved roads will be the responsibility of local governments. Control of PM₁₀ emissions from construction activities can be most effectively enforced when the District and local jurisdictions work cooperatively.

Table 4-1 Sample Mitigation for Construction Activities and Emission Reduction Efficiencies

Mitigation Measures	Source Category	Effectiveness	Source
Water all active construction sites at least twice daily. Frequency should be based on the type of operation, soil, and wind exposure.	Fugitive emissions from active, unpaved construction areas	50%	U.S. EPA, "AP-42, Vol. I." Pg 11.2.4-1.
Prohibit all grading activities during periods of high wind (over 15 mph).	Grading emissions	Reduces potential for exceedance	SCAQMD, "SIP for PM10 in the Coachella Valley" 1990. Pg 5-15
Apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least four consecutive days).	Wind erosion from inactive areas	Up to 80%	U.S. EPA, "AP-42, Vol. I." Pg. 11.2.4-1.
Apply non-toxic binders (e.g., latex acrylic copolymer) to exposed areas after cut and fill operations	Wind erosion from inactive areas	Up to 80%	U.S. EPA, "AP-42, Vol. I." Pg. 11.2.4-1.
Haul trucks shall maintain at least 2'0" of freeboard.	Spills from haul trucks	90%	MBUAPCD
Cover all trucks hauling dirt, sand, or loose materials.	Spills from haul trucks	90%	MBUAPCD
Plant tree windbreaks on the windward perimeter of construction projects if adjacent to open land	Wind erosion from inactive areas	4% (15% for mature trees)	SCAQMD, "SIP for PM10 in the Coachella Valley" 1990. Pg 5-15
Plant vegetative ground cover in disturbed areas as soon as possible.	Wind erosion from inactive areas	5%-99% (based on planting plan)	SCAQMD, "SIP for PM10 in the Coachella Valley" 1990. Pg 5-15
Cover inactive storage piles.	Wind erosion from storage piles	Up to 90%	U.S. EPA "AP-42, Vol. I." Page 11.2.3-4)
Install wheel washers at the entrance to construction sites for all exiting trucks.	On-road entrained PM10	50%	SCAQMD, "SIP for PM10 in the Coachella Valley" 1990. Pg 4-11
Pave all roads at construction sites.	On-road entrained PM10	90%	SCAQMD, "SIP for PM10 in the Coachella Valley" 1990. Pg 4-12
Post a publicly visible sign with the telephone number and person to contact regarding dust complaints. This person shall respond and take corrective action within 48 hours.	All emissions	Minimizes nuisance levels	MBUAPCD
Limit the area under construction at any one time.	Fugitive emissions from active, unpaved construction areas	71 lb/acre/day	MBUAPCD based on U.S. EPA "AP-42," Vol. I
Note: These effectiveness estimates are not additive within a source category (i.e., the benefit of 2 or more mitigation measures that address the same source of emissions would not be the sum of both measures). Source: Monterey Bay Unified Air Pollution Control District 2002.			

Disturbed, non-stabilized farmland coupled with wind events has resulted in severe episodes of blowing dust that have reduced visibility to zero along Valley highways. Programs to stabilize disturbed farmland, for example, through the planting of ground cover, could greatly reduce the possibility of tragic accidents on our highways, reduce the spread of valley fever spores, and prevent exceedances of PM10. On-field agricultural uses are not subject to the requirements of the District's Regulation VIII but are subject to Rule 4550, the District's Conservation Management Practice (CMP) Program, which is one of the key control strategies in the 2003 PM10 Plan.

Rule 4550 was designed to reduce fugitive PM10 emissions from agricultural operations, both on and off fields. Rule 4550 contains the administrative procedures for implementing CMPs in the San Joaquin Valley Air Basin. Rule 3190 provides a mechanism to allow the District to collect fees from the affected agricultural sources to offset the District's administrative and compliance costs of the CMP Program. The CMPs available for grower implementation are included in a CMP list and are described in a CMP Handbook made available to the affected sources.

Programs in Operation:

Most jurisdictions in the San Joaquin Valley now require some level of dust/PM10 control. Some cities have adopted dust control ordinances. Some cities and counties condition grading permits with dust control measures. A number of cities and counties require dust/PM10 control as CEQA mitigation.

Resources:

The District, Planning Department, PM10 Section can provide copies of draft PM10 Rules and further information on PM10 control measures. These can be found at <http://www.valleyair.org/Air_Quality_Plans/AQ_plans_PM.htm>. The Planning Department can be reached at (559) 230-5800.

ENERGY

Issues:

Natural gas burning appliances used for space heating, water heating, and cooking are a sizable source of NOx emissions. Our consumption of electricity also causes pollutant emissions from the operation of power plants fueled by fossil fuels. Local efforts to reduce energy consumption can save consumers money and improve air quality. Furthermore, according to the California Energy Commission, transportation represents about 50 percent of the total energy use statewide (California) (Caltrans 2002 and CEC 2001). California's 22 million automobiles consume more than 13 billion gallons of

gasoline. If current trends continue, gasoline use is projected to increase by approximately 40% from 2000 to 2020 (Caltrans 2002 and CEC 2000).

Goal 5: Reduce emissions related to energy consumption and area sources.

Issue:

Simple and cost-effective designs, technologies, and methods are available to achieve energy savings and reduce air pollutant emissions.

Objective 5a To encourage the use of energy conservation features and low-emission equipment for all new residential and commercial development.

Policy 32 The City/County of _____ shall work with the local energy providers and developers on voluntary incentive-based programs to encourage the use of energy efficient designs and equipment.

Implementation Strategies:

Encourage the incorporation of energy conservation features in the design of all new construction and the installation of conservation devices in existing developments.

Encourage energy audits of existing structures, identifying levels of existing energy use and potential conservation measures.

Encourage the use of passive design concepts that make use of the natural climate to increase energy efficiency.

Encourage new development not to preclude the use of solar energy systems by uses and buildings on adjacent properties.

Incorporate the most energy-efficient design consistent with a reasonable rate of return and the recognition of the environmental benefits of energy conservation for all local government facilities and equipment.

Perform an energy audit of existing public buildings within five years and retrofit where cost-effective.

Develop an energy management system for public buildings.

- Policy 33** The City/County of _____ shall cooperate with the local building industry, utilities and the District to promote enhanced energy conservation standards for new construction.

Implementation Strategy:

Work with the California Energy Commission (CEC) and local utilities to identify areas of the existing state standards that can be enhanced most cost-effectively.

- Policy 34** The City/County of _____ shall encourage new residential, commercial, and industrial development to reduce air quality impacts from area sources and from energy consumption.

Note: Area sources include small stationary equipment such as water heaters, fireplaces, barbecues, and gardening equipment. These sources are small individually, but collectively they are significant because of their large numbers and widespread use.

Implementation Strategies:

Support the use of weatherization programs for existing residential units and businesses.

Examine the possibility of requiring the installation of supplemental solar water heaters for new residential units.

Support future District incentives and regulations to reduce emissions from swimming pool heaters.

Encourage the use of solar water and pool heaters, and energy efficient lighting.

Encourage developers to orient housing units and landscape building sites to maximize solar heating and cooling.

Encourage the installation of energy efficient fireplaces and wood stoves in lieu of normal open-hearth fireplaces.

Provide natural gas lines or electrical outlets to backyards to encourage the use of natural gas or electric barbecues, and electric gardening equipment.

Support the use of electric vehicles, such as golf carts, where appropriate. Provide electric recharge facilities for electric vehicles.

Air Quality Benefits:

Local programs to increase energy efficiency can reduce demand for electricity by 10 to 40 percent beyond levels expected from state mandated programs (CEC 1993). Reducing the demand for electricity will reduce pollutant emissions from fossil fuel power plants. Reducing home and commercial uses of natural gas for space and water heating will reduce NO_x emissions by an amount proportional to the energy savings.

Local programs can target both new and existing development. Programs targeted at retrofitting existing residences and businesses can achieve the greatest reductions in energy use. This is because 75 percent of the homes built in California were built prior to adoption of efficiency standards. Programs to go beyond state energy efficiency standards or to better enforce the existing standards for new construction can improve energy efficiency by 11 percent or more (CEC 1993).

Energy conservation also provides economic benefits to the community. Every dollar not spent by local residents on energy is available for spending on other goods and services in the community.

Recent improvements in electric powered gardening equipment provide inexpensive and less-polluting alternatives to gasoline-powered equipment. Using a gasoline-powered mower for one hour emits as much pollution as 40 late-model cars operating for the same period of time. New electric models are cordless and rechargeable and are easier to operate and maintain than gasoline powered equipment. The ARB estimates that using electric powered mowers instead of gasoline mowers decreases emissions 70-fold even after taking into account the electric power plant emissions (Green Consumer 1993).

Lighting is the single largest component of commercial energy consumption. The EPA estimates that if energy-efficient lighting were used wherever cost-effective, then electricity consumption nationwide would be reduced 10%, and power plant emissions of air pollutants such as SO₂ and NO_x would be reduced by 4 to 7%.

Programs in Operation:

The Pacific Gas & Electric Company (PG&E) has several commercial new construction energy efficiency programs available to owners, developers and contractors. For example, Savings by Design pays cash incentives to

commercial, industrial, and agricultural customers to encourage energy-efficient design and construction.

Resources:

The California Energy Commission's Energy Aware Planning Guide provides an extensive discussion of local programs to reduce energy consumption and related air pollution. It includes general plan policy language, implementation ideas, environmental benefits, programs in operation, and resources. It is available at <http://www.energy.ca.gov/reports/energy_aware_guide.html>.

California Energy Commission, Energy Efficiency and Demand Analysis Division, 1516 9th Street, MS-25, Sacramento, CA 95814.
<<http://www.energy.ca.gov/efficiency/index.html>>

IDEAS Program Manager, City of San Jose, Office of Environmental Management, 777 N. First Street, Suite 450, San Jose, CA 95112.

Information on PG&E incentive programs may be obtained from local PG&E offices, <<http://www.pge.com/biz/rebates/>>.

SUGGESTED GOALS AND POLICIES FOR LAND USE ELEMENTS

This section provides policies that are best suited for the land use element of the general plan. These policies, if adopted, would affect the future development patterns of the community and as such require close examination by each community to determine their acceptability. If a jurisdiction decides to use these policies in a separate air quality element, care should be exercised to avoid conflicts with the land use element. Cities and counties in the San Joaquin Valley are required by California Government Code to include air quality considerations in the development of their General Plans. In general, to encourage land use strategies that promote alternatives to single occupancy vehicle travel, local governments may use zoning and subdivision regulations, monetary incentives (tax breaks, impact fee adjustments), or non-monetary incentives (such as accelerated permit processing or reduced parking requirements).

Principles for Land Use Planning for Improved Air Quality

The Air District strongly encourages cities and counties of San Joaquin Valley to:

- Plan land use patterns that will encourage people to walk, bicycle, or use public transit for a significant number of their daily trips
 - Use comprehensive community plans and specific plans to ensure development is cohesive and well connected by alternative transportation modes
 - Adopt transit-oriented or pedestrian-oriented design guidelines and designate areas appropriate for these designs in the general plan
 - Encourage higher density development in proximity to frequently used services and transportation facilities
- Develop in a compact, efficient form to minimize vehicle miles traveled and to improve the effectiveness of alternatives to the automobile
 - Use the control of public services to direct growth to the most appropriate locations
 - Encourage infill of vacant land and redevelopment sites
- Promote project site designs and subdivision street and lot designs that encourage walking, bicycling, and transit use
 - Adopt design guidelines and standards promoting designs that encourage alternative transportation modes
 - Require certain sites to be designed to allow convenient access by transit, bicycle, and walking.

LAND USE, TRANSPORTATION AND AIR QUALITY

Issue:

Motor vehicle use has historically been a major cause of exceedances of state and federal ozone and carbon monoxide standards in the San Joaquin Valley. The land use pattern and transportation system developed over the last 50 years has led to ever increasing vehicle trips and vehicle miles traveled. New ways of developing the land and meeting our mobility needs are necessary to reverse this trend and to improve our air quality.

Goal 6: Reduce motor vehicle trips and vehicle miles traveled and increase average vehicle ridership (AVR).

Note: Policies in this section are divided into two main categories: land use and transportation infrastructure. Land use policies show a commitment to design future development in ways that encourage alternative modes of transportation and make the most efficient use of land available for development to reduce trips and miles traveled. Transportation infrastructure policies demonstrate the commitment to design and construct our transportation system in ways that promote the use of alternative transportation modes.

LAND USE: LAND USE PATTERN

The term "land use pattern" refers to the distribution of land uses in a geographic area. It includes factors such as the density of population, housing, and jobs, and the mix of uses (proximity of housing, commercial, industrial, public facilities to one another). The general plan represents the community's vision of its future land use pattern.

Issues:

Existing land use patterns in most urban areas in the San Joaquin Valley are not conducive to walking, cycling, and transit use. Many office developments have low employment densities and are often isolated from commercial services, forcing people to drive rather than walk to restaurants during the lunch hour or to complete errands. High-density residential projects often have little if any commercial development nearby or discourage pedestrian access to commercial uses with block walls and large parking lots. The most common single-family lot size of 6,000 to 10,000 square feet leads to population densities too low to support frequent and direct transit service. The predominant suburban development patterns force all local trips for

shopping, recreation, school, as well as commute trips onto the arterial street system. This leads to ever wider, more congested arterial streets that in turn discourage people from walking or cycling to even nearby destinations.

Objective 6a To create a land use pattern that will encourage people to walk, bicycle, or use public transit for a significant number of their daily trips.

Policy 35 The City/County of _____ shall consider air quality and mobility when reviewing any proposed change to the land use pattern of this community.

Implementation Strategy:

Incorporate the review of air quality and mobility issues in the discretionary review process. This step could be part of the CEQA process established by the jurisdiction.

Identify areas best suited to development in terms of air quality and transportation impacts and direct growth to those areas.

Air Quality Benefits:

Adopting this policy provides a strong commitment to air quality. Placing a high priority on air quality can ensure that the following policies are strongly enforced.

Programs in Operation:

The CEQA process requires that air quality be address during the environmental review. California Government Code Section 65302.1 requires cities and counties in the San Joaquin Valley to amend appropriate elements of general plans to include data and analysis, comprehensive goals, policies, and feasible implementation strategies to improve air quality no later than one year after the first housing element revisions that occur after January 1, 2004. The next revision for Fresno and Kern Counties is June 30, 2008. The next revision for Stanislaus, San Joaquin, Merced, Kings, Tulare, and Madera Counties is June 20, 2009.

Policy 36 The City/County of _____ shall encourage projects proposing pedestrian or transit-oriented designs (TOD) at suitable locations. A TOD is defined as a

“Moderate to higher-density development, located within an easy walk of a major transit stop,

generally with a mix of residential, employment and shopping opportunities designed for pedestrians without excluding the auto. TOD can be new construction or redevelopment of one or more buildings whose design and orientation facilitate transit use." (Caltrans 2002)

Implementation Strategies:

Develop Transit/Pedestrian-Oriented Design Guidelines. Identify and designate appropriate sites for this development pattern during general plan updates and when developers propose general plan amendments.

Prepare a specific plan or community plan for new development areas. Incorporate design guidelines and standards into the specific plan.

Note: Implementation of this policy would be a major part of a comprehensive land use, transportation, and air quality strategy. Most of the following land use policies support the concepts and principles of transit and pedestrian-oriented design.

Resources:

County of Sacramento, Transit-Oriented Design Guidelines, Sacramento County Planning and Community Development Department, 827 7th Street, Room 240, Sacramento, CA 95814.

City of San Diego, Transit-Oriented Design Guidelines, City of San Diego, Planning Department

San Diego Air Pollution Control District Tools for Reducing Vehicle Trips Through Land Use Design: Increasing Bicycling, Walking, and Transit Use in the San Diego Region. This document provides guidance and resource for municipalities, citizen groups, and planning practitioners to use in reducing vehicle trips and preserving other scarce resources through the land use planning process. Available from the San Diego Air Pollution Control District, 9150 Chesapeake Avenue, San Diego, CA 92123.

The San Bernardino document referred to above can be purchased from The Planning Center, 1300 Dove Street, Suite 100, Newport Beach, CA 92660.

Policy 37 The City/County of _____ shall work to preserve and enhance existing neighborhoods and commercial districts having transit and pedestrian-oriented designs.

Implementation Strategy:

Pursue redevelopment projects to improve the image of pedestrian-oriented neighborhoods and shopping districts (pedestrian amenities, street trees, transit facilities, etc.).

Air Quality Benefits:

A comprehensive transit/pedestrian-oriented program achieves air quality benefits by creating an environment conducive to the use of alternative modes of transportation. It is estimated that mixed-use and higher density strategies can achieve a 10 to 30 percent reduction in per-household vehicle travel and related emissions at the neighborhood or community level, while multi-modal transportation systems can reduce regional vehicle travel and associated emissions by 5 to 15 percent (ARB 1997). A Further, a combination of TOD and high levels of transit service can increase the use of transit within a neighborhood by 20 to 40% (Caltrans 2002). In addition, as these strategies are implemented throughout a community, potential reductions in site-specific travel also become greater. A fully implemented transit/pedestrian-oriented policy combines all the strategies listed by the ARB and could be expected to achieve similar reductions. More discussion on land use factors affecting choice of travel mode is provided in Section III.

Programs in Operation:

Within San Diego, the Uptown District is a pedestrian-oriented, mixed-use development combining a 140,000 square foot retail/office center, a 3,000 square foot community center, and 320 attached multi-family residential units.

The County of San Bernardino in cooperation with a number of cities within that County have prepared a document entitled Land Use, Transportation and Air Quality, A Manual for Planning Practitioners, San Bernardino Air Quality Plan. This document provides design examples and development principles for reducing mobile source emissions. The document is organized by development density and provides trip reducing tools and applications for each density.

The San Diego Air Pollution Control District has prepared a document entitled Tools for Reducing Vehicle Trips Through Land Use Design: Increasing Bicycling, Walking, and Transit Use in the San Diego Region. This document provides guidance and resource for municipalities, citizen groups, and

planning practitioners to use in reducing vehicle trips and preserving other scarce resources through the land use planning process.

Local Government Commission in partnership with the District has prepared Visual Tools to Encourage Compact Development and Walkable Streets in the San Joaquin Valley. The tools are two interactive visual presentations to increase the awareness of San Joaquin Valley local government staff, local policymakers, developers, and residents to the environmental, health, fiscal and aesthetic benefits for compact development, narrow street design and traffic calming.

Village Homes (Figure 4-1) in the City of Davis is a planned unit development of single-family homes, apartments, a community center and office building on a 60-acre site. Davis is located fourteen miles west of the state's capital city, Sacramento. Village Homes features solar water and space heating, natural cooling systems, agricultural areas and greenbelts, cooperative maintenance of common areas, a well-used bicycle and pedestrian path network, and a natural drainage system. The project serves as a national model for environmentally sustainable development, energy-conserving planning, architecture and engineering, and community planning. Energy consumption is one-third to one-half lower than that of neighboring developments.

The concept plan for a major intersection in Citrus Heights, California, an older suburb of Sacramento, offers an innovative solution for repairing the suburbs by creating a mixed-use urban village. The plan proposes to take one of the busiest intersections in Sacramento County underground and, over a twenty-five year period, reclaim the area with office space, housing, open space, retail and transit using regional transportation funds.

Figure 4-1 Village Homes, Davis, California



Resources:

County of Sacramento, Transit-Oriented Design Guidelines, Sacramento County Planning and Community Development Department, 827 7th Street, Room 240, Sacramento, CA 95814.

City of San Diego, Transit-Oriented Design Guidelines, City of San Diego, Planning Department

Local Government Commission and San Joaquin Valley Unified Air Pollution Control

District, Visual Tools to Encourage Compact Development and Walkable Streets in the San Joaquin Valley. Available from the Local Government Commission, 1414 K. Street, Suite 600, Sacramento, CA 95814-3966.

San Diego Air Pollution Control District Tools for Reducing Vehicle Trips Through Land Use Design: Increasing Bicycling, Walking, and Transit Use in the San Diego Region. This document provides guidance and resource for municipalities, citizen groups, and planning practitioners to use in reducing vehicle trips and preserving other scarce resources through the land use planning process. Available from the San Diego Air Pollution Control District, 9150 Chesapeake Avenue, San Diego, CA 92123.

The San Bernardino document referred to above can be obtained from The Planning Center, 1300 Dove Street, Suite 100, Newport Beach, CA 92660.

Policy 38 The City/County of _____ shall plan areas within 1/4 mile of locations identified as transit hubs and commercial centers for higher density development.

Implementation Strategy:

Amend the General Plan and the Zoning Ordinance to designate high-density land uses in areas planned for transit hubs and commercial centers.

Highest density development should be located closest to transit stops and routes

Zone for higher densities in transit corridors

Decrease parking requirements along major transit corridors

Consult with transit providers to determine which transit corridors should be emphasized in planning surrounding land uses

Air Quality Benefits:

Developing high-density residential and commercial uses within walking distance of transit facilities increases the number of potential transit users. With an adequate pool of transit riders, more frequent service becomes feasible. This in turn increases the convenience of the transit option for more people (ARB 1993). The ARB found that significantly increasing walking and transit opportunities along with strategically located moderated to high density development and transit could achieve an annual reduction in VMT of

between 20-30 percent (ARB 1995). It is estimated that people living within 1/4 mile of a transit stop or station are nearly three times more likely to use transit than those who live between 1/4 and 2 miles from a station. In addition, residents living within 2 miles of a transit station are nearly four times more likely to use transit for commuting than those who live greater than 2 miles from a station (ARB 1997). Also see Policy 35.

Programs in Operation:

Similar policies have been adopted in numerous California jurisdictions including Pleasanton, Costa Mesa, Folsom, San Diego, Davis, and Sacramento County. Also see Policy 36 and Policy 38.

Resources:

See Policy 36

Policy 39 The City/County of _____ shall encourage higher housing densities in areas served by the full range of urban services.

Implementation Strategies:

Designate high and medium-density housing at sites within walking distance of transit, neighborhood commercial services during general plan updates and developer initiated general plan amendments.

Establish minimum housing densities for areas around existing and planned transit nodes.

Award density bonuses for projects furthering transit or pedestrian-oriented amenities

Encourage developers to take advantage of density bonus provisions of the Zoning Ordinance for projects located around transit hubs or nodes on existing or planned transit corridors.

Air Quality Benefits:

Policies 37 and 38 are density strategies for improving air quality. A worldwide survey of travel patterns in 32 major cities found that gasoline consumption was reduced 25 to 30 percent for each doubling of population density (Kenworthy and Newman 1990), while the average annual rate of vehicle travel per person tends to be reduced between 25 and 30% for each

doubling of density (ARB 1997). A study of two Chicago area transit systems indicated that a 24 to 50% increase in transit boardings was associated with a doubling in employment densities near transit stations, while a doubling of residential and employment densities could be associated with a 66% increase in rail boardings (Caltrans 2002). To obtain the greatest trip reduction potential, high-density housing should be oriented to take advantage of public transportation and commercial services within walking distance. California's Density Bonus Law requires local governments to grant 25% density bonus for low income, very-low income, and senior housing, while another state law allows jurisdictions to grant a 25% density bonus for developers of housing within a half-mile of transit stations.

Strategies to increase density must be pursued with caution. Apartment projects adjacent to existing residential development frequently arouse fierce neighborhood opposition. Although traffic generated per dwelling unit is significantly less, the greater number of units may still have adverse traffic impacts. Efforts must be made to inform and educate the public regarding the development of increased density land uses. The ability of public facilities to absorb increased demand for services must also be considered. Strong design standards for multi-family projects can help overcome neighborhood opposition. Requiring project designs that fit into the neighborhood and are attractive promote acceptance.

Another important factor is public safety. High-density housing has gained a negative reputation as a breeding ground for crime. There are proven designs and layouts that can make higher densities safer and attractive.

High-density development should be viewed as a resource to be used to reduce dependence on the private automobile. All large cities in the Valley and some small cities construct significant numbers of high-density housing units; however, most of the units are placed in locations that make residents automobile dependent. Maximizing the number of units within 1/4 mile of public transit and frequently needed goods and services while orienting the development to make walking a pleasant experience will significantly reduce vehicle trips.

Programs in Operation:

The Model Zoning Regulations for the Tri-County Metropolitan Transportation District of Oregon (Portland metropolitan region) provide good examples of zoning regulations that emphasize these planning principles, while the Urban Growth Management Function Plan provides a framework and requirements for regional planning throughout the Portland Metropolitan area. The San Diego Association of Governments approved a Land Use Distribution Element in 1995 that encouraged local governments to specify minimum densities for new development and infill; encourage a mix of land uses; ensure good

pedestrian access; and provide interconnected local circulation systems especially in the vicinity of rail transit stations and major bus corridors. It was also suggested within the Element were that housing and services to meet the needs of a portion of employees be included in the design of major employment centers. In addition, the Element establishes “access standards” that define maximum acceptable travel times for work, shopping, and service-related trips by 2010. In urban areas, these standards are provided for trips made by both transit and automobiles. The City of San Diego has incorporated the Transit-Oriented Design Guidelines into several specific plans and has also revised its zoning code.

Also see Policy 36.

Resources:

See Policy 36

Policy 40 The City/County of _____ shall encourage mixed-use developments that provide commercial services such as day care centers, restaurants, banks, and stores near employment centers.

Implementation Strategies:

Create a mixed-use zone district. Tailor the allowed uses to those best suited for a pedestrian environment.

Designate mixed-use areas during general plan updates.

Air Quality Benefits:

An appropriate mix of land uses at a destination provides people arriving by transit, carpool, or vanpool with a range of activities within walking distance from their point of arrival. Mixed-uses reduce the need to make separate trips to obtain frequently needed goods and services (TRI-MET 1993). The clustering of land uses may reduce vehicle trip generation by up to 45% for residential uses and 65% for non-residential uses (ARB 1997). Also see Policy 35.

Programs in Operation:

The Municipality of Metropolitan Seattle (METRO) encourages jurisdictions within the Puget Sound region to use varied planning tools, such as planned unit developments, floating zoning, incentive zoning, zoning overlays, and

land banking to provide flexibility in their land use planning efforts (METRO 1987).

Portland Metro's Urban Growth Management Function Plan provides a framework and requirements for regional planning throughout the Portland Metropolitan area.

The San Diego Association of Governments have adopted the Land Use Distribution Element, as well as the Congestion Management Plan and Congestion Management System to slow the growth of traffic congestion in the region, and the Regional Energy Plan, which seeks to reduce the dependence on outside energy sources.

Many older areas in the City of Sacramento successfully mix commercial, office and residential uses. These neighborhoods continue to be desirable and vibrant places to live and work.

Resources:

The Mixed-use Development Handbook (Urban Land Institute, 2003) provides examples of mixed-use developments and discusses full range of development issues. ULI, 1025 Thomas Jefferson St., NW Suite 500 West Washington, DC 20007. Available for purchase at <http://www.uli.org/AM/Template.cfm?Section=Search&Template=/Ecommerce/ProductDisplay.cfm&ProductID=636>.

San Diego Air Pollution Control District Tools for Reducing Vehicle Trips Through Land Use Design: Increasing Bicycling, Walking, and Transit Use in the San Diego Region. This document provides guidance and resource for municipalities, citizen groups, and planning practitioners to use in reducing vehicle trips and preserving other scarce resources through the land use planning process. Available from the San Diego Air Pollution Control District, 9150 Chesapeake Avenue, San Diego, CA 92123.

Building Livable Communities with Transit. A Policymaker's Guide to Transit-Oriented Development. This document provides guidance, tools, and examples of transit oriented development. Available from the Local Government Commission, 1414 K St, Suite 600, Sacramento, CA 95814. http://www.lgc.org/freepub/land_use/articles/buildcomm.html.

Also see Policy 36.

Policy 41 The City/County of _____ shall promote the downtown (or village centers) as the primary pedestrian-oriented, commercial and financial center(s) in the city/community.

Implementation Strategies:

Designate a central core of the city for high-density and mixed-use development. Discourage high intensity office and commercial uses from locating outside of designated centers or downtown.

Provide financial incentives and density bonuses to entice development within the designated central core of the city.

Cities with declining downtown areas should consider recycling underutilized and abandoned uses with new uses that compliment the area. Avoid designating competing uses on the edge of the city and in unincorporated areas.

Air Quality Benefits:

A healthy downtown business district provides a concentration of activities that increase potential transit use for commute trips and, in some cases, shopping trips. High employment densities help support retail and service businesses, allowing people working downtown to walk for daytime errands and lunch trips. In a study of employee travel, mixing of uses increased the use of nearby facilities by 9% in suburban areas and over 30% in the downtown (ARB 1995).

A survey of suburban office workers found that about half left their building during the day. In an area with mixed-use high-density development and pedestrian facilities, 25 percent of the trips were made on foot, compared to 6 percent in a more homogenous, sprawling area (CEC 1993). A study of a major mixed-use suburban activity center found a 7% transit usage and that 25% of midday trips were walk trips, which is significantly higher than typical suburban centers which had 1% transit and 16% midday walk trips (ARB 1995).

A village center can be the focus of community activity, providing a variety of complimentary destinations within walking or cycling distance of village residences. The Uptown District in San Diego is estimated to result in a reduced rate of driving and associated motor vehicle emissions of about 20% per household annually, compared to typical vehicle travel from the same number of housing units in a lower density and more auto-oriented urban pattern. It is also estimated that the Uptown District results in annual air

pollution savings of about 2.75 tons of reactive organic gas (ROG) and oxides of nitrogen (NOx) per year.

The Crossings development in Mountainview is estimated to result in a reduced rate of driving and associated motor vehicle emissions of about 10% per household annually, compared to typical vehicle travel from the same number of housing units in a lower density and more auto-oriented urban pattern. It is also estimated that The Crossings results in an annual air pollution savings of about 3 tons of reactive organic gas (ROG) and oxides of nitrogen (NOx) per year (ARB 1997).

Programs in Operation:

The City of Orlando, Florida has implemented a similar policy of providing density bonuses for development in their downtown. Most cities in the San Joaquin Valley have policies and programs to support or revitalize their downtown areas.

Development within San Diego's Uptown District has established a pedestrian-oriented, mixed-use development combining a 140,000-square-foot retail/office center, a 3,000-square-foot community center, and 320 attached multi-family residential units. As noted above, it is estimated that the Uptown District results in an annual air pollution savings of about 2.75 tons of reactive organic gas and oxides of nitrogen per year.

The City of Sacramento has been engaged in a program to recycle outmoded industrial areas adjacent to downtown with new office, commercial, and public facilities and providing access to these areas by light rail.

The Metropolitan Bakersfield General Plan promotes a centers concept with downtown as the primary center and several suburban centers based on educational institutions and business centers. The Downtown Association of Fresno, funded in part by the Redevelopment Agency of the City of Fresno, is working to improve, promote, and develop the historic Central Business District. California's Main Street Program has 39 cities participating in a four-point framework of organization, promotion, design, and economic restructuring to redefine participants as the hearts of the communities.

Resources:

"Putting the Urb in the Suburbs: Many Places are Deciding they Need A Real Center After All," *Planning*, June 1997

National Main Street Center, a project of the National Trust for Historic Preservation that supports commercial district revitalization through historic

preservation and economic development. 1785 Massachusetts Avenue, N.W., Washington, DC 20036. Available online at <<http://www.mainst.org>>.

California Main Street Program, a program of the Office of Historic Preservation. <<http://www.californiamainstreet.ca.gov>>.

Redevelopment Agency, City of Fresno. <<http://www.fresno.gov/vision2010/>>.

“Smart growth zoning codes: A resource guide.” Local Government Commission, Steve Tracy. Spring 2003. Available for purchase at <<http://www2.lgc.org/bookstore/detail.cfm?itemId=34>>.

Policy 42 The City/County of _____ shall plan adequate neighborhood commercial shopping areas to serve new residential development.

Note: Neighborhood commercial has different meanings in different jurisdictions. For the purposes of this document, neighborhood commercial includes shops and services now found in supermarket- anchored shopping centers as well as convenience retail found in small strip malls.

Implementation Strategy:

Designate commercial areas during general plan updates and when developers initiate general plan amendments.

Provide materials on successful mixed-use developments to project applicants in areas designated for commercial land uses. Such materials could include the TOD Design Guidelines prepared for Sacramento County (1990).

Adopt zoning regulations that permit upper story residential uses in neighborhood shopping areas. These upper story uses can include residential and office. The City of San Diego Tools for Reducing Vehicle Trips Through Land Use Design (1998) provides a good example of this type of community design.

Air Quality Benefits:

Nationwide, 45 percent of all vehicle trips are for shopping or personal business and the average length is approximately 10 miles (U.S. Department of Transportation 1999 and 2001). By providing the most frequently needed products and services close to residences and by providing direct, safe, and interesting pedestrian or bicycle routes to the commercial area, vehicle travel

can be reduced. Surveys conducted in five US cities indicated that 70 percent of people surveyed would be willing to walk or bicycle for personal business and shopping trips if the trips were reduced to 1/2 mile in length and bicycle paths and pedestrian walkways were provided (CEC 1993).

Programs in Operation:

See Policy 36

Resources:

See Policy 36

Policy 43 The City/County of _____ shall encourage subdivision designs that provide neighborhood parks in proximity to activity centers such as schools, libraries and community centers.

Implementation Strategy:

Designate park sites during general plan updates and when processing large general plan amendments. Require developers to dedicate park sites at the most advantageous locations as a condition of approval of subdivision maps.

Prepare comprehensive community plans or specific plans designating community amenities at sites that are accessible by walking and bicycling.

Air Quality Benefits:

Public parks are often the primary pedestrian amenity for a community or neighborhood. The foot traffic and socializing created by the parks can carry over to adjacent or nearby public and commercial uses. The design and location of the park is very important to its usefulness as a pedestrian destination and activity center. Parks should be visually accessible from the neighborhood and frequently used to encourage a feeling of ownership (Weissman 1992).

Programs in Operation:

See Policy 36

Resources:

See Policy 36

Policy 44 The City/County of _____ shall work closely with school districts to help them choose school site locations that allow students to safely walk or bicycle from their homes.

Implementation Strategies:

When specific plans or subdivisions propose school sites for dedication, accept only sites that allow students to safely walk or bicycle to school.

Incorporate school sites into larger neighborhood activity centers, which could include parks, day care facilities, and neighborhood commercial uses.

Air Quality Benefits:

Schools are important centers of community activity and generate numerous trips. Siting and access considerations can make a significant difference in the number of students who would walk or bicycle to school. The same principles of pedestrian friendly design apply to children as they do to adults; however, safety considerations take on greater importance.

Programs in Operation:

The City of Modesto's Village-1 Specific Plan designates all school sites in the plan. The sites emphasize pedestrian and bicycle access.

Laguna West, Transit-Oriented Development, Sacramento County.

For residential and mixed-use developments, Portland Metro's Urban Growth Management Function Plan calls for new local street plans that encourage pedestrian and bicycle travel by providing short, direct public right-of-way routes to connect residential uses with nearby existing and planned commercial services, schools, parks and other neighborhood facilities.

Resources:

The City of San Diego TOD Design Guidelines (1992) provide a good example of this community design principle. Information on this and other TOD areas in California is available at <http://transitorienteddevelopment.dot.ca.gov/Profiles/TOD%20Summaries.pdf>.

See Policy 36.

Policy 45 The City/County of _____ shall plan park and ride lots at suitable locations serving long distance and local commuters.

Implementation Strategies:

Work with Caltrans and the Public Works Department to identify suitable sites. Designate sites on the general plan land use and circulation plans. Consider funding of the park and ride lots as mitigation during CEQA review of residential development projects.

Coordinate with appropriate transportation agencies and major employers to establish express buses and vanpools to increase the patronage of park and ride lots.

Allow developers to reach agreements with auto-oriented shopping center owners to use commercial parking lots as park and ride lots and multimodal transfer sites.

Air Quality Benefits:

The maximum benefits from this policy are achieved by targeting long distance commuters. This is because of the problem of cold start emissions from home to the park and ride lot and back. Park and ride lots for local commuters only achieve significant emission reductions when the route to the destination is heavily congested. See Section III of this document for a more detailed discussion of mobile source emission characteristics.

Park and ride lots in both downtown fringe areas and suburban areas both have fairly minimal trip reduction potential, mainly because there are limited markets for such facilities in the Valley. Fringe parking in the downtown might prevent short trips to different destinations within the downtown area, and this would help localized air quality. But trips to even the largest downtown in the Valley represent only a few percent of total trips made, and fringe parking would eliminate only a fraction of these. Park and ride lots in suburban communities may have moderate effectiveness in intercepting outbound commute trips, thereby eliminating significant VMT but relatively few trips, since most carpoolers would drive to the park and ride lot (EPA 1990). An analysis conducted for this document concludes that San Joaquin Valley communities can reduce trips by 0.5 to 1.5 percent through the use of park and ride lots (TJKM 1993).

Programs in Operation:

Many Valley metropolitan areas have park and ride lots in place.

Resources:

Caltrans District 6, P.O. Box 12616 Fresno, CA 93778-2616.

<<http://www.dot.ca.gov/dist6/>>

Policy 46 The City/County of _____ shall plan for multi-modal transfer sites that incorporate auto parking areas, bike parking, transit, pedestrian and bicycle paths, and park and ride pick-up points.

Implementation Strategies:

Identify locations where transportation systems converge and designate the area as a potential multi-modal transfer site in the general plan.

Apply for funding to construct a multi-modal transfer station. Sources for funding include Federal Highway funds and transit funds.

Air Quality Benefits:

Providing multi-modal transfer sites increases transit's convenience and eliminates cold starts by people who are able to walk or bicycle to the transit stop instead of driving. The best transit system in North America, located in the City of Toronto achieves a 31 percent mode split during commute hours (Kenworthy 1991). In 2000, 1.4% of Kern County workers over age 16 used public transportation, and 18.4% carpooled. 1.7% of Fresno County workers over age 16 used public transport, and 16.7% carpooled (US Census Bureau 2003).

Programs in Operation:

Many of the Bay Area Rapid Transit System's (BART) stations are connected to a bus system and provide bicycle and pedestrian amenities. The cities of Walnut Creek and Pleasant Hill have prepared a specific plan focusing development in a 125-acre area around the Pleasant Hill BART station. Residents of apartments in the plan area use BART for as many as 40 percent of their commute trips (Weissman 1992).

The Portland Metropolitan's TriMet transit service provides a interconnected light-rail and bus services that incorporate park-and-ride lots, auto parking

areas, and pedestrian, bicycle, and transit-oriented high density. It is estimated that Portland's emphasis on TOD-style communities throughout the region has resulted in a 7% decrease in VMT, 5% increase in transit use, and 10% increase in walking trips, and it is estimated that pedestrian travel accounts for 16% of all trips (Caltrans 2002).

Resources:

See Policy 36

San Diego Air Pollution Control District, Tools for Reducing Vehicle Trips Through Land Use Design: Increasing Bicycling, Walking, and Transit Use in the San Diego Region. This document provides guidance and resource for municipalities, citizen groups, and planning practitioners to use in reducing vehicle trips and preserving other scarce resources through the land use planning process. Available from the San Diego Air Pollution Control District, 9150 Chesapeake Avenue, San Diego, CA 92123.

Policy 47 The City/County of _____ shall encourage the development of pedestrian-oriented shopping areas within walking distance of high-density residential neighborhoods.

Note: Commercial development projects near existing residential areas require greater attention to design details to minimize neighborhood opposition.

Implementation Strategies:

Require residential development projects to designate neighborhood commercial areas where appropriate during the general plan amendment process. Re-zone vacant sites in existing high-density areas and areas being redeveloped.

Support organizations that work toward improving the commercial viability of the shopping area, such as local merchants associations and improvement districts.

Plan for city or neighborhood districts with distinct identities and which mesh with the urban fabric. See Figure 4-2.

Air Quality Benefits:

Figure 4-2 Pedestrian-oriented Shopping Area in Santa Clara

See Policy 42

Programs in Operation:

See Policy 36

Resources:

See Policy 36



Policy 48 The City/County of _____ shall protect pedestrian-oriented commercial areas from development that is incompatible in design, scale or use.

Implementation Strategy:

Utilize neighborhood commercial and major/regional commercial zone districts at appropriate locations.

Avoid designating competing commercial uses, especially in automobile oriented strip malls, within one mile of the pedestrian or transit-oriented commercial area.

Encourage all development to incorporate pedestrian- or transit-oriented design and work with the developer, transit agency, and other appropriate parties in the design and approval of development

Policy 49 The City/County of _____ shall discourage new regional auto-oriented commercial uses (such as volume discount stores, auto dealerships and large scale car repair) within areas designated as mixed-use, transit-oriented or pedestrian-oriented.

Implementation Strategy:

Modify the zoning ordinance to include an Auto-Oriented Commercial Zone District. Adopt a mixed-use or transit/pedestrian-oriented commercial zone district that defines the uses that are appropriate for these areas.

Note: Small- scale car repair businesses may be an appropriate neighborhood use in some areas since patrons may drop off their vehicles and walk home or use transit to get to work. The term "mixed-use" refers to urban design strategies that place compatible retail or office uses near to or sometimes in the same building as residential uses. An example is ground floor commercial with residences above. Another example is high or medium density residential adjacent to service retail, public amenities, and office uses.

Policy 50 The City/County of _____ shall encourage regional shopping malls/centers at sites capable of support by a full range of transportation options.

Note: For the purposes of this document, regional centers are retail uses that draw most of their customers on a community wide or regional basis as opposed to drawing them from the immediate surrounding neighborhoods.

Implementation Strategy:

Identify sites with access by freeway or major arterial and potential for light rail access. The site could be a regional transit hub and major pedestrian-oriented activity center to increase transit mode share.

Air Quality Benefits:

Policies 47 and 48 protect commercial areas intended to serve pedestrian and transit-oriented areas from inappropriate development. Allowing auto-oriented commercial uses and high traffic generating uses like regional shopping centers in neighborhood areas reduces the walkable destinations available to the residents. Air quality benefits are derived from the extent that residents would shop on foot or by bicycle when compared with the use of these modes in conventional areas. See Policy 35 for benefits of pedestrian and transit-oriented development.

Policy 49 encourages cities and counties to locate regional shopping centers at sites that can or will be well served by different transportation modes.

Regional malls and centers are major traffic generators. Every effort must be made to identify sites with good motor vehicle access to avoid traffic congestion and with good transit, bicycle, and pedestrian access to reduce total vehicle trips.

Programs in Operation:

See Policy 36

Resources:

See Policy 36

LAND USE: COMPACT DEVELOPMENT

The policies in this section represent several different approaches to achieving more compact development patterns. These approaches are used in many Valley general plans. The District strongly encourages cities and counties to promote compact development; however, we recognize that each community will have different concerns and may use different strategies.

Issues:

Sprawling, low-density development, and discontinuous development discourage the use of alternative transportation modes and increases travel distances. Infrastructure costs and most environmental impacts are less when development is more compact.

Objective 6b To plan development in a way that makes the most efficient use of the land and thereby causes the least possible impacts to the environment.

Policy 51 The City/County of _____ shall provide for an orderly outward expansion of new urban development so that it is contiguous with existing development, allows for the incremental expansion of infrastructure and public services, and minimizes impacts on the environment.

Implementation Strategies:

Identify areas that can be most efficiently served and cause the fewest environmental impacts and designate those areas for development during major general plan updates.

Ensure that new development finances the full cost of expanding public infrastructure and services to provide an economic incentive for incremental expansion.

Do not consider projects requiring general plan amendments contiguous when they are only adjacent to large vacant parcels designated for urban development.

Policy 52 The City/County of _____ shall encourage infill of vacant parcels.

Implementation Strategies:

Avoid designating more land for urban development when suitable infill parcels are available.

Support projects that infill vacant areas and areas contiguous on at least one side to a developed area.

Encourage growth to occur in and around activity centers, transportation nodes, underutilized infrastructure systems, and redevelopment areas.

Accommodate infill development within existing urban areas as a priority over urban expansion.

Work with landowners to re-designate vacant lands suitable for higher densities or for transit/pedestrian-oriented developments during general plan updates and periodic reviews.

Conduct a survey of vacant lands as part of the general plan update. Develop criteria for determining appropriate sites.

Policy 53 The City/County of _____ shall encourage infill and redevelopment projects within an urban area that will improve the effectiveness of the transit system and will not adversely affect existing development.

Implementation Strategies:

Encourage projects that increase pedestrian activity and mixed-uses.

Encourage commercial uses that are complimentary to urban employment centers.

Strategically locate high-density development to provide good transit access.

Policy 54 The City/County of _____ shall adopt a reasonable urban limit line/urban growth boundary and commit to providing public services only within the urban area.

Note: Urban limit lines and growth boundaries are controversial. If adopted with inadequate land to accommodate projected growth, they may make housing less affordable. Without the cooperation of neighboring jurisdictions, urban limit lines/growth boundaries will be ineffective in promoting compact development.

Implementation Strategy:

Identify potential growth areas and areas to be protected from development during general plans updates.

Work with developers of projects within and adjacent to the urban limit line to purchase development rights from the owner of the adjacent land outside the urban limit line.

Policy 55 The City/County of _____ shall expand public services incrementally to serve contiguous development and will discourage the formation of small sewer and water systems serving fringe urban development.

Implementation Strategy:

Require new developments to extend sewer and water lines from existing systems or to be in conformance with a master sewer and water plan.

Air Quality Benefits:

The ability of compact development to reduce air pollutant emissions is based on two assumptions. First, distances traveled will be lower in compact areas than for sprawling or leapfrog development. Second, by providing the right mix of uses in closer proximity, more trips will be accomplished by transit, on foot, or by bicycle.

The policies in this section use several different strategies to encourage compact development and to discourage discontinuous or sprawling development. The following describes the strategies for each policy or group of related policies.

Policy 50 and 54 promote incremental growth on the urban fringe. By discouraging discontinuous development, the urban fabric is maintained, trip distances are shorter, and infrastructure costs are minimized.

Policies 51 and 52 encourage the development of infill areas or redevelopment areas at densities that are high enough to support effective transit service. The strategic placement of higher densities can also provide frequently needed commercial services within walking distance for more people. The Institute of Transportation Engineers (ITE) suggests that residential densities of 7 to 8 dwelling units per acre and 8 to 20 million square feet of non-residential development are needed to support transit service of one bus every half hour, while residential densities greater than 9 dwelling units per acre and 35 to 50 million square feet of non-residential development are needed to support light rail transit with feeder buses (ARB 1993). Various studies have found that areas with higher overall densities tend to have higher rates of transit use and walking. The results of a study of five neighborhoods in California indicate that there is a significant connection between neighborhood characteristics and residents' travel behavior. In the mixed-use, higher density neighborhoods with good transit service, rates of walking and transit use were found to be three to four times higher than those of standard suburban areas. Residents of these mixed-use, higher density neighborhoods also drove for 10 to 30 percent fewer trips. Areas developed as transit or pedestrian-oriented developments can generate 21 percent less trips than traditional low-density residential development (1000 Friends 1993).

Policies 53, and 54 use local government's control of public services such as sewer and water systems as a tool to direct growth where it is best for air quality and for the community. Limiting sewer and water hookups has been widely used in California to limit growth. Although there is little interest in limiting growth in the San Joaquin Valley, there is widespread interest in directing growth away from prime farmland, and sensitive natural habitat. By defining the future urban areas with an urban limit line or by designating urban service areas that avoid prime farmland and sensitive natural habitats, cities can promote compact development. As part of the overall strategy, it is important for counties to avoid approving urban projects just outside the city's sphere of influence. This can undermine the integrity of the urban limit line and result in sprawling, inefficient development.

Most jurisdictions have adopted urban service areas. The problem is that the boundaries are frequently and routinely amended. The city or county should adopt and enforce strong policies that require certain conditions to be met before service areas may be expanded. Some cities and counties approve urban development projects outside the urban service area as long as the developer pays all costs of providing public services. Under some circumstances, developers are willing to pay the costs of extending services

rather long distances or will develop their own water and sewer systems to take advantage of less expensive land. Decision makers must look beyond just dollar costs. They must consider costs to air quality and to the fabric of the entire community when considering development projects for approval.

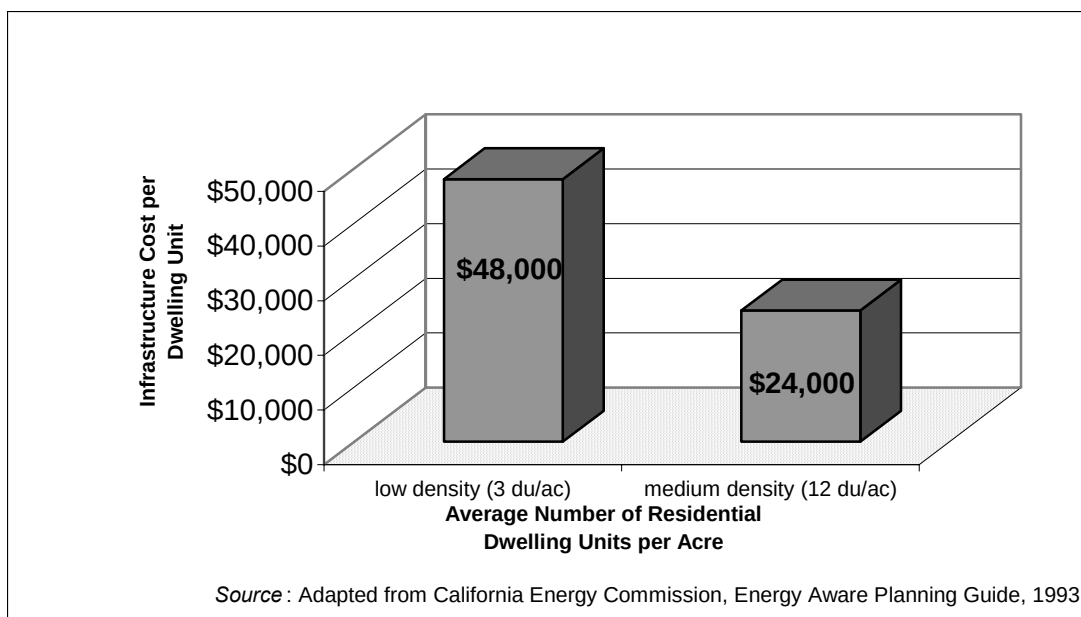
The air quality benefits of compact development cannot be looked at in isolation. It is one of the key components in developing pedestrian and transit-oriented communities. Compact development by itself will not significantly reduce vehicle trips and miles traveled if no transit facilities or pedestrian amenities exist. Conversely, effective transit facilities cannot be provided unless the community is developed in a compact manner. In addition, compact development can provide significant cost savings to local government and developers. Figure 4-3 shows the infrastructure costs in relation to residential densities. Units in areas with densities of 12 units per acres are substantially less costly to serve than residential densities of 3 units per acre.

Programs in Operation:

The City of Davis and the City of Woodland have adopted urban limit lines with a permanent band of open space between the two communities (Weissman 1992).

Contra Costa County has adopted an ordinance requiring 65 percent of the land in the county to be preserved for agriculture, open space, wetlands, parks and other non-urban uses. The ordinance is implemented by establishing urban limit lines beyond which there will be no growth (Weissman 1992).

Figure 4-3 Infrastructure costs and Residential Density



Resources:

Land Use Strategies for More Livable Places, by Steve Weissman and Judy Corbett provides numerous examples of communities implementing strategies to promote compact, livable development.

LAND USE: SITE DESIGNS

For the purposes of this document, the term site design applies to individual subdivisions, multi-family developments, and commercial and industrial site plans. It also includes architectural features of buildings and landscapes.

Issues:

Most places in the Valley are designed to provide the most direct and convenient access by car at the exclusion of other modes of transportation. It is possible to design sites in ways that encourage less- polluting transportation modes and still support access by motor vehicle.

Objective 6c To promote site designs that encourage walking, cycling, and transit use.

Policy 56 The City/County of _____ shall encourage project sites designed to increase the convenience, safety and comfort of people using transit, walking or cycling.

Implementation Strategy:

Prepare Transit-Oriented Design (TOD) or Pedestrian-Oriented Design (POD) Guidelines to help staff planners and developers identify measures that can create a pedestrian and transit-friendly community.

Adopt air quality design standards as part of the zoning ordinance. Design standards must be general enough to apply under all but the most unusual circumstances to avoid the need for numerous zone variances and modifications. Some design measures like sidewalk widths and landscaping requirements are very appropriate for design standards. Design measures dealing with parking lot designs and building facades may be better left as guidelines because of site to site-to-site differences.

- Policy 57** The City/County of _____ shall require an air quality/transportation design analysis for projects exceeding District CEQA significance thresholds.

Note: The design analysis should be prepared by a civil engineer, architect, or urban designer familiar with design measures that can reduce trips. It could be part of the traffic study normally required for large development projects.

This policy is intended to apply to large projects such as regional shopping centers and large subdivisions. Projects consistent with adopted city/county design guidelines or with a previously reviewed specific plan or community plan could be exempt.

Implementation Strategy:

Require the developer to submit a design analysis with the commercial site plan or subdivision map. The analysis could describe the design measures proposed for the site. The site plan or map could show the location and extent of any design features.

Some specific design features include:

- *Subdivision street and lot designs that promote pedestrian, bicycle, and transit use*
- *The location and type of transit improvements such as shelters and bus turn-outs*
- *Pedestrian access improvements and amenities (sidewalks, benches, water fountains, landscaping, etc.)*
- *Parking lot designs that enhance rather than detract from pedestrian access*
- *The location and type of bicycle improvements (bicycle parking/lockers, relation to bike paths or routes serving the site)*

- Policy 58** The City/County of _____ shall review all subdivision street and lot designs, commercial site plans, and multi-family site plans to identify design changes that can improve access by transit, bicycle, and walking.

Note: This policy could apply to projects of all sizes. The review would be done by local planners or by a design review committee.

Figure 4-4 A canopy of trees encourages walking



Implementation Strategy:

Modify design review procedures to cover features that affect access and internal circulation by alternative transportation modes. Develop design guidelines that illustrate preferred designs.

Just a few examples of design measures that could be recommended during design review include:

- *Intra-development designs that incorporate integrated street patterns rather than the "pod" design, which limits ingress and egress options to the development and restricts traffic to a limited number of arterials*
- *Primary ground floor commercial building entrances must orient to plazas, parks, or pedestrian-oriented streets, not to interior blocks or parking lots*
- *Promote the use of trees and plants in travelway landscaping and residences*
- *Building facades should be varied and articulated to provide visual interest to pedestrians*
- *Street trees should be spaced no further than 30 feet on center in planter strips or tree wells. Tree species should be selected to create a unified image for the street and provide an effective canopy (see Figure 4-4)*
- *Sidewalks must provide an unobstructed path at least five feet wide. Larger sidewalk dimensions (up to 10 feet) are desirable in core commercial areas where pedestrian activity will be greatest*

Policy 59 The City/County of _____ shall require all development projects proposed within 2,000 feet of an existing or planned light rail transit, commuter rail, express bus, or transit corridor stop, to incorporate site design measures that enhance the efficiency of the transit system.

Implementation Strategy:

Identify all transit facilities on the Circulation Element Map. Analyze existing land use patterns and constraints around transit facilities to identify appropriate design measures.

Air Quality Benefits:

The design and layout of individual development projects is critical to the success of the entire land use, transportation, and air quality strategy. By providing destinations where people feel comfortable walking (as in Figure 4-5), where access to transit is convenient, and where bicycles can be safely ridden and parked, the effectiveness of all other programs to reduce trips and improve air quality will be much greater.

The first policy in this section states the overall requirement for future development to be designed to encourage walking, cycling, and transit use. The other policies provide the methods and situations where the design requirements would apply. Policy 56 establishes size and type thresholds for design review. Policy 57 promotes an internal review of plans to identify features that can enhance the use of alternative modes. Policy 58 identifies sites where the city or county would require special transit-oriented design criteria.

One source of evidence for the impact of urban design on trip generation and VMT is provided by a study that compared VMT in different Bay Area communities (Parker 1995). The study used actual VMT measurements as well as a 1981 regional transportation survey. One overall finding was that a doubling in overall density is generally associated with 20 to 30 percent fewer VMT per household (Parker 1995). Some of the areas with higher densities also provided frequently used commercial services within walking distance, eliminating many of these vehicle trips.

The Land Use, Transportation, and Air Quality (LUTRAQ) study in the Portland, Oregon metropolitan area

Figure 4-5 Pedestrian-oriented Neighborhood



estimates that individual transit-oriented developments will generate 21 percent fewer trips than conventional single family developments and commercial uses (1000 Friends 1993). However, the amount of trip reduction directly attributable to site design measures was not separately addressed.

Programs in Operation:

The cities of San Diego, Sacramento, and Portland, Oregon have all prepared design guidelines that encourage and enhance transit, pedestrian, and bicycle travel. These guidelines incorporate "neo-traditional" design principles that take the best planning practices from 50 to 100 years ago and apply them to new development.

Village Homes in Davis, California provides an example of a bicycle and pedestrian-oriented subdivision. Street access is narrow and somewhat limited and bicycle and pedestrian paths offer the shortest routes to neighborhood destinations such as the school and community center. Many of the houses face bike paths. This provides a sense of safety for the riders and keeps the public spaces in view of the community to prevent crime and vandalism (Weissman 1992). Figure 4-6 illustrates this concept.

Figure 4-6 Village Homes, Davis, California

Source: Local Government Commission



Resources:

Planning and Design for Transit, March 1993, Tri-County Metropolitan Transit District of Oregon (TRI-MET), 4012 S.E. 17th Avenue, Portland, Oregon 97202. This 200-page document provides a comprehensive guide to designs and land use patterns supportive of transit. You may order copies by accessing <<http://www.trimet.org/>>.

Energy Aware Planning Guide, January 1993, California Energy Commission. This document contains extensive sections on design measures to reduce vehicle trips, miles traveled, and energy consumption. Available at <http://www.energy.ca.gov/reports/energy_aware_guide.html>.

The City of San Diego has adopted Transit-Oriented Development Design Guidelines. This document, prepared by Calthorpe Associates, provides thorough discussions and illustrations of design techniques that encourage transit use, walking and bicycling.

SUGGESTED GOALS AND POLICIES FOR CIRCULATION ELEMENTS

The goals and policies in this section are most appropriate for Circulation Elements of the general plan. They provide ways to plan for the transportation needs of the community that can improve air quality.

Principles for Planning Transportation Systems for Improved Air Quality

The Air District strongly encourages cities and counties of the San Joaquin Valley to:

- Plan and construct an innovative, multi-modal transportation system to meet mobility needs and improve air quality
- Plan and construct transit improvements at appropriate locations
- Plan and construct a comprehensive system of bikeways and pedestrian paths
- Determine the feasibility of light rail or other fixed guideway systems and protect appropriate right of ways
- Work to improve intercity and commuter rail service in the Valley
- Promote the Valley route for the high speed rail corridor

Note: The District recognizes that the type of transportation system is dependent on the size of the community. The above principles are directed at communities currently or projected to be of adequate size to support these systems.

TRANSPORTATION INFRASTRUCTURE

Issues:

The transportation infrastructure developed in the San Joaquin Valley supports the automobile at the expense of other modes of transportation. Placing emphasis on transit, bicycling, and pedestrian infrastructure is vital to relieve pressure from the traditional roadway system and improve air quality. The existing transit systems in the Valley serve only small numbers of commuters (approximately one percent of work trips). Transit systems must be improved to provide shorter waits between buses, competitive trip speeds and better network coverage. In the long term, transit systems should expand beyond buses to light rail or even personal rapid transit systems to accommodate the transportation needs of the projected 4.96 million San

Joaquin Valley inhabitants (by the year 2020) (ARB Population and Vehicle Trends Report 2004).

Objective 6d To develop innovative transportation systems that incorporate alternative transportation modes into the system designs.

Policy 60 The City/County of _____ shall plan for a multi-modal transportation system that meets the mobility needs of the community and improves air quality.

Implementation Strategies:

Ensure that updates to the Circulation Element and submittals of regional transportation improvement projects to the Regional Transportation Planning Agency reflect designs and facilities that support a multi-modal system.

Coordinate with transportation providers, planners, agencies, and organizations to develop a complete range of innovative, practicable and cost-effective options. Some options to consider are:

- *Strategic placement and orientation of new transportation or improved facilities*
- *Flexible zoning such as Transportation Overlay Zones to allow for multi-modal coordination*
- *Services using smaller, efficient vehicles to serve low-density areas (jitneys can run on fixed or flexible routes and can use vehicles similar to airport shuttles or smaller)*
- *Personal Rapid Transit (PRT) systems for fixed route systems connecting large activity centers*
- *High Occupancy Vehicle (HOV) lanes or bus only lanes and transit-ways*
- *Congestion pricing measures such as toll roads with electronic toll collection and billing*

Policy 61 The City/County of _____ shall vigorously pursue and use state and federal funds earmarked for bicycle and transit improvements.

Implementation Strategy:

Ensure that Regional Transportation Improvement Plans include alternative transportation mode projects best suited to the community.

Provide information resources, referrals, and guidance on state and federal funding for alternative transportation improvements to developers, employers, and community involvement organizations.

- Policy 62** The City/County of _____ shall encourage the consolidation of transit services within the metropolitan area to maximize the efficiency of transit services while minimizing costs.

Note: This policy would also apply to small transit providers serving special groups like seniors or veterans and to adjacent or nearby cities that act as a single metropolitan area. Consolidating these services can increase ridership per vehicle and reduce miles traveled.

Implementation Strategy:

Include transit consolidation plans in Regional Transportation Plans.

- Policy 63** The City/County of _____ shall ensure to the extent feasible that pedestrian, bicycle, and automobile connections are maintained in existing neighborhoods affected by transportation and other development projects.

Implementation Strategy:

Construct pedestrian bridges and under crossings where appropriate.

Ensure vehicle overpasses and underpasses are constructed at appropriate locations to provide reasonable connections between services and residences.

Include maintenance or improvement requirements for pedestrian, bicycle, and automobile connections as part of the development standards of the Zoning Ordinance or Subdivision Ordinance.

Include the maintenance or modification of existing pedestrian, bicycle, and automobile connections as a part of Building Permit requirements.

Air Quality Benefits:

Providing an innovative, multi-modal transportation system benefits air quality in two ways. First, by providing fast, safe, and convenient alternatives to the personal automobile, the number of vehicle trips would be reduced. Second, because these options increase the efficiency of the entire system, congestion related emissions would be reduced or avoided.

Policy 60 is an overall commitment to developing an efficient transportation system. The economic vitality and future air quality of the Valley will be determined in part by current transportation planning efforts. With the federal ISTEA and state congestion management legislation, transportation plans must support alternatives to the single-occupant automobile. In addition, most jurisdictions are unable to identify funding sources to address all projected road and highway capacity needs. This means that local jurisdictions must identify ways of increasing the capacity of existing roadways and ways of reducing travel demand in order to avoid gridlock and degraded air quality.

Policy 61 states a community's commitment to use available funding for transit, bicycle and pedestrian projects. Because of matching funds requirements for many state and federal transportation funding programs, some jurisdictions do not pursue these sources. The conformity requirements of the federal FCAA amendments and Intermodal Surface Transportation Efficiency Act (ISTEA) may force jurisdictions to spend their transit and bicycle money in order to qualify for highway money. The tendency so far has been for cities and counties to spend funds on congestion relieving roadway improvements such as signalization. Without a change in funding priorities to support alternative modes of transportation, significant changes in mode shares are unlikely.

Policy 62 provides a method to increase the effectiveness of transit resources already available. By consolidating services, it is possible to avoid duplication routes and to increase ridership per vehicle.

Policy 63 is intended to address the need for both retention and creation of pedestrian, bicycle, and automobile connections between areas divided by large-scale transportation projects, or implementation of non-transportation focused development projects.

The Sacramento Regional Transit District's multi-modal transportation system includes bus routes and light rail that covers a 418 square-mile service area and is serviced by 76 electrically-powered light rail vehicles, 258 buses powered by compressed natural gas, and 17 shuttle vans. There are bike racks on the buses and the trains, and 15 light rail stations have bike lockers (SRTD 2005). San Francisco's system is also multi-modal.

TRANSPORTATION INFRASTRUCTURE: TRANSIT

- Policy 64** The City/County of _____ shall require transit improvements at sites deemed appropriate and necessary by the Transportation Department and the transit provider and consistent with long-range transit plans.

Note: Transit improvements should be considered the same as other roadway improvements such as curb, gutter, sidewalks, etc., now provided by developers. Transit improvements should be viewed as an extension of roadway improvements, especially in light of the multi-modal emphasis of all new transportation plans.

Implementation Strategy:

Identify transit improvement needs during CEQA review. Require dedication of sites and improvements as CEQA mitigation. Include dedication requirement as a condition of approval of the subdivision map.

- Policy 65** The City/County of _____ shall work with Caltrans and transit providers to identify park and ride sites with convenient access to public transit.

Implementation Strategy:

Identify appropriate sites during general plan updates, and review of specific plans and major general plan amendments.

- Policy 66** The City/County of _____ shall design all arterial and collector streets planned as transit routes to allow the efficient operation of public transit.

Implementation Strategy:

Work with transit providers to develop a comprehensive long range transit plan that is parallel with the general plan. Revise street and road design standards to include bus turn-out designs and passenger loading area designs.

Air Quality Benefits:

The policies in this section deal exclusively with transit infrastructure in support of bus service. The policies support roadway improvements that

increase the speed and safety of bus operations and they support passenger loading facilities that improve the convenience and comfort of people waiting for the bus. Both of these actions will tend to increase transit ridership, thereby reducing overall vehicle trips and miles traveled.

A study conducted by Shapiro, Hassett, and Arnold (2002) found that moving a person a given distance by public transportation produces about five percent as much carbon dioxide, about eight percent as much VOCs, and about half as much NO_x and CO₂ as moving a person the same distance by private vehicle.

Policy 64 provides a mechanism for cities and counties to reserve the road right of way and land needed for bus turnouts and to construct transit facilities. Bus turnouts remove the buses from the travel lane so that other vehicle traffic is not impeded. This can minimize congestion related emissions. By planning bus turnouts in advance, surrounding development can be designed to benefit from proximity to transit instead of being negatively impacted by the location of the facilities.

Policy 65 encourages cities and counties to locate park and ride lots in places with convenient access to transit. Convenient access is critical in influencing people to choose transit as a commute option. The transit loading area should be close to the park and ride lot and should provide pedestrian amenities to increase the comfort of people waiting.

Park and ride lots that are part of a multi-modal transportation hub can increase the level of activity at the site and improve security. Multi-modal hubs provide better connections with destinations within the community and increase the possibility and probability of using transit.

Park and ride lots can be effective in reducing emissions; however, the trips from home to the park and ride lot and back generate emissions that must be accounted for. Because of the problem of cold start emissions, vehicles produce much of their pollution towards the beginning of the trip (see Section III). Personal vehicle trips avoided by using park and ride must be longer trips to offset the cold start emissions that are still occurring on the commute to the park and ride lot. Growing numbers of people are commuting long distances between Valley cities and to destinations outside the Valley. Park and ride lots can reduce the number of personal vehicles used for long commute trips.

One must also consider the level of congestion en route to the ultimate destination when determining if park and ride lots will benefit air quality. Areas with high levels of congestion may have localized carbon monoxide (CO) problems. It may be beneficial to provide park and ride lots in these areas even though the two legs of the trip may create a net emissions increase for other pollutants such as ROG and NO_x.

Policy 66 requires arterial and collector streets to be designed to accommodate buses. These design measures could include bus only lanes, driver actuated signals, bus turnouts, and bus loading areas. These measures allow buses to improve their average speeds and to reduce conflicts with automobile traffic. Buses in most Valley locations have a large time disadvantage compared to automobile travel. Measures to reduce this disparity will improve transit's viability.

These policies are only components of a comprehensive transit-oriented strategy. Their effectiveness in reducing vehicle trips and miles traveled is dependent on the level of commitment and success in implementing a transit-oriented development strategy. A study conducted in the Portland, Oregon metropolitan area estimates that individual transit-oriented developments will generate 5 percent fewer vehicle trips than conventional single-family developments and commercial uses (Cambridge Systematics et al. 1996).

Programs in Operation:

The City of Portland, Oregon has developed one of the most accommodating and efficient transit systems in the country. Downtown Portland combines frequent service, convenient bus stops and dedicated bus lanes to achieve high transit ridership.

The Southern California Association of Governments has information and maps of park and ride facilities in Los Angeles, Ventura, Riverside, Orange County, and San Bernardino.

Resources:

Southern California Association of Governments.
<<http://www.scaq.ca.gov/parkride.htm>>.

See Resources section for Policies 57 through 60.

TRANSPORTATION INFRASTRUCTURE: BICYCLE AND PEDESTRIAN FACILITIES

Policy 67 The City/County of _____ shall ensure that a comprehensive system of bikeways and pedestrian paths is planned and constructed in accordance with an adopted City/County plan.

Implementation Strategies:

To maximize bicycle use the following actions may be included in street design standards, subdivision ordinances or zoning ordinances:

- *The bikeways should be part of a network that connects major destination points within the community*
- *Provide separate bike paths in areas where motor vehicle speed or volume make on-street bike lanes unsafe or unpleasant to use*
- *Using lower speed limits will enable on-roads cyclists to share the roads with motorists*
- *Provide automatic traffic signal actuators imbedded in the roadway or provide manual signal actuators where cyclists may reach them without leaving the roadway*
- *Provide bicycle paths along greenbelts, linear parks, public easements, and drainage reserved as open space*
- *Provide bicycle and pedestrian bridge crossings for freeways and waterways*
- *Provide adequate paved shoulder on arterial and collectors to keep cyclists and motorist separate*
- *Do not allow on street parking on roadways designated with bike lanes whenever possible*

On-site improvements that can increase bicycle use include:

- *Provide bike racks or enclosed and locked bicycle storage at major activity centers and office and commercial establishments*
- *Provide employee showers, lockers, and dressing areas at employment sites*

Policy 68 The City/County of _____ shall ensure that regional and commuter bikeways are extended to serve new development consistent with the adopted bikeway plan.

Implementation Strategy:

Identify all planned and existing regional and commuter bikeways in a comprehensive bikeways plan. Use targeted state and federal funds along with developer contributions to fund the system.

Policy 69 The City/County of _____ shall ensure that upgrades to existing roads (widening, curb and gutter, etc.) include

bicycle and pedestrian improvements in their plans and implementation where appropriate.

Implementation Strategy:

Through zoning or other means, require bicycle lanes on larger streets.

Through zoning or other means, require pedestrian pathways between existing developments fitting certain criteria to existing and planned transit or multimodal facilities.

Compare Public Works/Roads Department's improvement plans with bikeways plans and ensure they match.

Policy 70 The City/County of _____ shall require new major activity centers, office and commercial development to provide secure bicycle storage and parking facilities.

Note: Consider the type of use when establishing bicycle parking standards. Some uses have limited potential for bicycle use and should have lower parking requirements.

Implementation Strategy:

Change the Zoning Ordinance Special Development Standards to require bicycle storage facilities. Require bicycle facilities as CEQA mitigation measures.

Consider reducing motor vehicle parking standards to acknowledge development with good multi-modal access and facilities.

Policy 71 The City/County of _____ shall preserve abandoned railroad right of ways with no potential for use as light rail lines for use as bikeways and pedestrian paths when feasible.

Implementation Strategy:

Identify potential paths during general plan updates and when the railroad proposes to abandon their right of way.

Air Quality Benefits:

Bicycling is the most efficient form of transportation ever devised. The amount of energy consumed per mile is less than any form of locomotion, including walking. The air quality benefits of bicycling are obvious. The bicycle is a zero exhaust vehicle.

The policies in this section attempt to create "bicycle-friendly" transportation infrastructure. The basic premise underlying these policies is that providing a safe, interconnected system of bikeways and routes will result in greater bicycle use. In Davis, California, which is known as the most bicycle-oriented city in the State, more than 80% of all collector and arterial streets within the city have bike lanes or bike paths (City of Davis 2001).

Although many Valley communities have systems of bikeways and bike lanes, their current use is limited; bicycling accounted for approximately 0.8% of work trips in the City of Fresno in 2000 (2000 Census). The most important factors limiting greater use are lack of continuity and safety considerations. Bicycle routes usually are not continuous. Many routes have unsafe bottlenecks at intersections to accommodate left and right turn lanes. Some routes narrow to one foot wide in places or periodically disappear and reappear. Many traffic signals cannot be actuated by bicyclists without leaving the roadway to press the pedestrian crossing actuator. All but the most serious bicyclists are discouraged by these conditions.

Policy 67 requires the city or county to plan and construct a comprehensive bicycle system. This will be difficult in developed areas, but is very practical for new areas. Nearly all cities in the Valley predict rapid growth. If long-range transportation and land use plans include bicycle facilities, much larger mode shares for bicycles are feasible as build out progresses.

Policy 68 provides a commitment to extend bikeways to serve new development. This commitment must be followed up by developing funding sources to maintain the integrity of the bikeways system.

Roads that are good bicycle routes are frequently made unusable when the road is widened or when intersections are modified. Policy 69 encourages cities and counties to design roadway improvements that include bicycle use. This is where adequate long range transportation planning is critical. Roadways should be planned to their ultimate width from the start. Retrofitting to add improvements invariably results in less than ideal driving conditions and less safe bicycling.

Policy 70 concentrates on making the end of the bicycle trip more convenient. Providing a safe place to lock bicycles eliminates one more reason that people choose not to ride.

Under some conditions, separate bikeways are preferable to sharing the road with motor vehicles. Policy 71 encourages the use of abandoned rail right of ways to provide a low cost place to construct separate bikeways. Ideally, the right of way should connect with commuter destinations or other segments of the comprehensive bikeways system.

The policies in this section are appropriate for all sizes of cities, but are especially effective for small and medium-sized cities. Smaller cities have shorter travel distances to a greater number of destinations, and usually have less traffic and congestion than large cities. This increases bicycle safety.

A rough calculation of the valley-wide emission reduction potential for ROG and CO for just a one percent increase in bicycling mode share for all trips produces the following results:

- ROG - 4.77 tons/day
- CO - 22.27 tons/day

These calculations are based on the 2001 Base Year Inventories for ROG and CO for the San Joaquin Valley (California Air Resources Board 2003). The calculations assume that a one percent increase in the bicycle mode share corresponds to a one percent decrease in on-road mobile emissions.

Programs in Operation:

The City of Davis fully integrates bicycles into the transportation system. The City offers an extensive system of bike lanes, bicycle parking facilities, and slow speed limits on most city streets. According to the 2000 Census, 15% of commuters in the City of Davis bicycle.

The City of Visalia adopted a comprehensive bikeways plan. The plan calls for expansion of the current system of bikeways and provides standards for constructing bike facilities. Visalia provides an example of what a medium-sized city can do to encourage bicycling.

Resources:

Guide to Bicycle Project and Program Funding in California Second Edition, February 2002; California Bicycle Coalition and Planning and the Conservation League Foundation. <<http://www.calbike.org/fed.htm>>.

Bicycle Friendly Cities: Key Ingredients for Success and Selecting and Designating Bicycle Routes: A Handbook; National Center for Bicycling and Walking, 1506 21st St. NW, Suite 200, Washington DC20036.

A Citizen's Guide to Transportation Policy and Planning 2002; 1000 Friends of Oregon and the Oregon Transportation Reform Advocates Network, 534 SW Third Avenue, Suite 300, Portland, OR 97234. <www.bikewalk.org>.

City of Davis Comprehensive Bicycle Plan. City of Davis. 2001. <<http://www.city.davis.ca.us/pw/pdfs/01bikeplan.pdf>>.

Guide to the Development of Bicycle Facilities, 1999; American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St, NW, Suite 249, Washington, DC 20001.

National Center for Biking and Walking has information on how to help create neighborhoods and communities where people walk and bicycle through land use planning, safety, and more. <www.bikewalk.org>

Rails Trails: An Acquisition and Organizing Manual for Converting Rails into Trails; Rails-to-Trails Conservancy, 1400 16th St NW, Washington, DC 20036. <www.railtrails.org>.

A Guide to Transportation Enhancements, June 1999; Rails to Trails Coalition and the Federal Highway Administration, 400 Seventh St SW HEPN-50, Washington DC 20590. <www.fhwa.dot.gov>.

TRANSPORTATION INFRASTRUCTURE: LIGHT RAIL/COMMUTER RAIL

Policy 72 The City/County of _____ shall identify potential light rail corridors during major general plan updates and take action to protect the right of way from incompatible development.

Implementation Strategy:

Work with Caltrans and the Regional Transportation Planning Agency to prepare a comprehensive light rail study. Identify the best routes and develop a community consensus for those routes. Ensure that the general plan designates densities and land use patterns that make light rail feasible.

Policy 73 The City/County of _____ shall preserve specific existing railroad right of ways that have the potential to be used as light rail lines.

Implementation Strategy:

Identify light rail routes during general plan updates and during Regional Transportation Plan preparation.

- Policy 74** The City/County of _____ shall support the use of suitable freeway and expressway right of ways for light rail.

Implementation Strategy:

Plan light rail routes in the Circulation Element and Regional Transportation Improvement Plans.

- Policy 75** The City/County of _____ shall plan the area around new commuter and mainline rail stations to provide convenient and safe pedestrian and bicycle access, and connections to the transit system.

Implementation Strategy:

Identify potential rail stations during general plan updates and designate the surrounding area for pedestrian or transit-oriented development.

Air Quality Benefits:

New rail systems have a smooth, quiet ride and relatively high average speeds. High speed rail systems, one of which is being considered to run through the Valley, can rival air travel for speed and convenience. Several cities in the Valley are considering light rail in their long range transportation plans. The air quality benefits of rail depend on the extent to which they reduce motor vehicles trips and miles traveled.

Implementing the policies in this section will result in the conditions needed to make light rail feasible in the Valley and will allow the most effective use of the planned high speed rail system. A well-used light rail or high speed commuter rail system can absorb a large number of vehicle trips that would otherwise be made by more polluting motor vehicles. Light rail in heavily congested corridors can help reduce congestion related emissions and also can reduce trips when people walk or bicycle to the transit station. High speed rail targets long distance commuters, tourists and business travelers who would normally travel by private car or by air. Rail travel uses less energy and emits fewer pollutants per passenger than cars.

Policies 72, 73, and 74 require cities and counties to identify and preserve light rail corridors. By identifying the corridors early, the odds of actual construction of the system are greatly improved. This is because of two factors that impact feasibility. First, by identifying the corridor you can plan the land uses along the corridor to provide a maximum number of people within walking distance of the transit stations. Second, it is much easier to design a roadway that reserves a portion for the rail line instead of retrofitting a light rail line on an existing street.

Policy 75 promotes multi-modal access to potential rail stations. People arriving at the station by bus, bicycle, or walking avoid a cold start and the running emissions that would have occurred had they driven their cars to the stations.

Programs in Operation:

The cities of Los Angeles, San Diego, San Jose, and Sacramento have light rail systems that have exceeded ridership goals and have proven to be a viable commute alternative for many people.

In November 2004, Denver voters approved a \$4.7 billion expansion of the city's rail system; the largest such project in the country, the measure will add 120 (Paulson 2005).

Resources:

Sacramento Regional Transit, PO Box 2110, Sacramento, CA 95812-2110.
<www.sacrt.com>.

San Diego Association of Governments. <www.sandag.org>.

Santa Clara Valley Transportation Authority.
<http://www.vta.org/services/light_rail_overview.html>.

California Rail News published by the California Rail Foundation and the Train Riders Association of California, 926 J Street, Suite 612, Sacramento, CA 95814. This publication discusses issues facing all forms of transit.
<<http://www.calrailnews.com/>>.

ANALYSIS OF AIR QUALITY BENEFITS OF IMPLEMENTING AIR QUALITY GOALS AND POLICIES

An extensive review of the literature on the effect of land use decisions on transportation and air quality accomplished for this project found a broad consensus that significant long-term emissions reductions are possible by

changing our development practices. The best evidence comes from studies that compare differences in travel behavior in various types of developed areas. These studies have clearly shown that land use patterns favorable to walking, bicycling, and transit use produce less vehicle trips and less emissions. The studies do their best to identify variables responsible for the differences, but it is not possible to develop a precise formula that will apply to any every site anywhere. The emission reduction estimates quoted in this document should be viewed as what is possible. Individual cities and counties may achieve higher or lower reductions depending on local circumstances. A discussion of the travel and trip reduction studies we found most useful and convincing is provided below.

Results of the Literature Search

Perhaps the most widely used source of trip statistics is the Institute of Transportation Engineers (ITE), Trip Generation Manual. The trip generation factors provided in this manual are used in many transportation models, and also in models predicting mobile source air pollutant emissions from development projects. The manual uses travel surveys conducted nationwide to develop trip generation estimates. The ITE manual (6th Edition) lists the single family residential rate as 10 trips per day, and the rate for high density residences as 6 trips per day. This is a 40 percent difference in trips between single family residences and high density residences such as apartments. The surveys do not address the characteristics of sites studied to determine why people living in apartments make less trips than people living in single-family residences.

More detailed travel survey information is available from the U.S. Department of Transportation, *Our Nation's 1995 Nationwide Personal Transportation Study Early Results Report*, *November 1996 Summary of Travel Trends*, *1995 Nationwide Personal Transportation Survey*, and the *2001 National Household Travel Survey*, which is available at <http://nhts.ornl.gov/2001/index.shtml>. These studies examine travel behaviors and factors influencing transit use, such as distance to public transit in influencing transit use. These study and summary documents showed that 10.3 percent of people living within 1/4 mile of transit used public transit to get to work. Only 3.8 percent of people living between 1/4 and 2 miles of a transit station used transit and less than 1 percent living more than 2 miles away used transit to get to work. This information supports the concept of locating the maximum number of people close to transit.

Another widely used source of travel behavior information is the Bay Area Travel Survey published by the Metropolitan Transportation Commission. Studies conducted in California, New York, Washington, Canada, Australia, Europe, and Asia have found that as density increases, the average annual rate of vehicle travel decreases, with each doubling of density resulting in a

reduction of 25 to 30 percent (Cervero 1994, Holtclaw 1990, Holtzclaw 1994, Deakin, Harvey & Skkabordonis 1981, Newman and Kenworthy 1989 in California Air Resources Board 1997).

In an October 2004 memorandum on URBEMIS 2002 mitigation measures, Nelson\Nygaard Consulting summarized literature linking residential density and travel behavior. They found that there is a significant, quantifiable relationship between residential density and automobile use, with a threshold value of 25-30 units per acre below which the travel impacts of increased density are particularly large (Nelson\Nygaard 2004). They also found that higher densities are most beneficial to transit ridership in mixed-use areas.

Effectiveness of Air Quality Goals and Policies

A sub-consultant for this project, TJKM Transportation Consultants, analyzed the literature to arrive at potential reductions in vehicle trips, vehicle miles, and vehicle hours in the types of communities found in the San Joaquin Valley. The consultant relied heavily on studies of the effectiveness of transportation control measures (TCMs). TCMs are defined in the CCAA as "any strategy to reduce vehicle trips, vehicle miles traveled, vehicle idling, or traffic congestion." This broad definition would include the land use measures promoted by the policies of this document.

TCMs are normally thought to apply to existing development rather than new development; however, the land use pattern and transportation infrastructure can enhance the effectiveness of TCMs. The consultant used a 20 to 25 year planning horizon to estimate the long-term effectiveness of TCMs. With population predicted to nearly double in the San Joaquin Valley during that period, close to 50 percent of the Valley's developed land could be developed in ways that support TCMs.

The results of this analysis are presented in Table 4-2. The table provides a range of effectiveness for each measure in each of five different community types found in the San Joaquin Valley. The most important categories for this discussion are Transportation Infrastructure Changes and Urban Design. The consultant predicts trip reductions from 0 to 2 percent and VMT reductions of 0 to 2.5 percent for transportation infrastructure changes. Urban design measures can achieve reductions of 0 to 15 percent. The percentage reductions for each category in this table are not always additive, but rather are "either-or" levels of effectiveness.

A more detailed analysis of TCM effectiveness in the San Joaquin Valley was recently completed. The Councils of Government from the San Joaquin Valley led an effort to quantify the benefits of TCMs proposed for implementation in the Valley. The TCMs are being proposed in order to comply with congestion management legislation and with the District's various

Table 4-2 Effectiveness of TCMs by Area Type – Percent Reductions

Transportation Control Measures	Small Agricultural Town	Diversified Agricultural Towns		Urban/Suburb	
		Bedroom	Non-Bedroom	Bedroom	Non-Bedroom
TRANSPORTATION INFRASTRUCTURE CHANGES					
Traffic Flow Improvements ²	0.0	0.0	0.0	0.0	0.0
Bicycling Program	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.5 - 1.0
Park and Ride Lots: Fringe Area	N.A	N.A	Minimal	N.A	trips: 0.5 - 1.0
Park and Ride Lots: Suburban Area		trips: 0.5 - 1.5		trips: 0.5 - 1.5	trips: 0.5 - 1.5
HOV lanes	Generally Applicable only in Inter-regional corridors				
TRANSIT INFRASTRUCTURE					
Rapid Rail/ Support Facilities	N.A	N.A	N.A	N.A	0.0 - 1.0
Public Transit	<0.5	<0.5	<0.5	<0.5	0.5 - 2.0
Passenger Rail/ Support Facilities	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	1.0 - 2.0
PRIVATE SECTOR -BASED					
Non-employer Trip Reduction Program	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Fleet Operators Program ³	0.0	0.0	0.0	0.0	0.0
Employee Focus					
Rideshare Program	0.0 - 3.0	0.0 - 4.0	0.0 - 4.0	0.0 - 4.0	0.5 – 5.0
Trip Reduction Program (Mandatory)	1.0 - 5.0	1.0-5.0	1.0 - 5.0	1.0 - 5.0	2.5 – 7.5
Telecommunication	1.0 - 5.0	3.0 – 6.0	2.0 – 5.0	3.0 - 6.0	4.0 – 8.0
Alternative Work Schedules	2.5 - 7.5	4.0 - 8.0	2.5 - 7.5	4.0 - 8.0	5.0 – 10.0
PARKING/ROADWAY MANAGEMENT/PRICING					
Parking Management: Supply Limit	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	1.0 - 5.0
Parking Management: Increased Price	0.0 - 5.0	0.0 - 5.0	0.0 - 5.0	0.0 – 5.0	2.5 - 7.5
Market-based Trip Reduction Program	1.0 - 3.0	2.5 - 7.5	2.5 - 7.5	2.5 – 7.5	5.0 – 10.0
URBAN DESIGN					
Job/Housing Balance	VMT: 0.0 - 5.0	VMT: 2.5 - 7.5	VMT: 2.5 - 7.5	VMT: 2.5 - 7.5	VMT: 2.5 - 7.5
Urban Villages	0.0 - 10.0	5.0 - 15.0	5.0 - 15.0	5.0 - 15.0	5.0 - 15.0
¹ Range of potential percent reduction in locally generated VMT and trip (per capita) – assumes 20-25 year planning horizon.					
² Air quality Improvements stem from travel time improvement.					
³ Air quality improvements stem from use of alternative fuels.					

plans. The reductions presented in Table 4-2 are similar to those predicted by the study.

A review was conducted of various TOD projects within the State to identify representative TOD projects that may be built within the SJVAB. Potential emissions and emission reductions resulting directly from the incorporation of TOD features into the project design were then calculated using the URBEMIS2002 model.

URBEMIS is a computer program that can be used to estimate emissions associated with land use development projects in California, such as residential neighborhoods, shopping centers, office buildings; area sources such as gas appliances, wood stoves, fireplaces and landscape maintenance equipment; and construction projects. URBEMIS stands for "Urban Emissions Model." It is a free software program maintained by California Air Districts, and it is available online at <http://www.arb.ca.gov/planning/urbemis/urbemis2002/urbemis2002.htm>.

URBEMIS2002 uses the Institute of Transportation Engineers' Trip Generation Manual version 6.0 along with ARB's vehicle emissions model, EMFAC2002, to calculate motor vehicle emissions. Other components can be used to estimate:

- Construction emissions associated with new development and redevelopment
- Air quality benefits of construction-related mitigation measures
- Emissions from "area sources," such as gas appliances, wood stoves, fireplaces, and landscape maintenance equipment
- Screening level analysis
- Air quality benefits of mitigation measures for area sources

URBEMIS2002 includes several other capabilities related to travel and vehicle emissions. It provides an option to minimize the "double-counting" of trips in mixed-use projects that include residential and non-residential land uses. It also standardizes the estimation of "pass-by" trips (stops made on the way to other destinations). The "Mobile Source Mitigation Component" allows users to estimate the potential vehicle travel and emission reduction benefits of a number of land use and transportation-related strategies, both within the project site and the surrounding area including: pedestrian and bicycle features; public transit facilities and service; the design and mix of land uses; on-site services; and other measures, such as telecommuting and alternative work schedules.

URBEMIS is periodically upgraded to address new information and data.

Table 4-3 summarizes the results of URBEMIS modeling. The data presented in Table 4-3 are development-specific emissions for TOD and non-TOD developments, as well as emissions from a typical single family suburban residence. The emissions reductions resulting from the incorporation of TOD features into the project design are also indicated. The emissions data presented in Table 4-3 are daily emissions per residence. When these emissions are applied to a large development project, emissions reductions can be substantial. For example, the daily emission reduction for NO_x generated from a project similar to Moffet Park in Sunnyvale is 26 pounds per day per 100 residential units.

Table 4-3 Summary of Emissions Reductions per 100 Housing Units from Various TOD Projects

TOD Project	ROG (lbs./day)	NO_x (lbs./day)	CO (lbs./day)	PM10 (lbs./day)
Typical Suburban Development	18	22	229	17
Aspen Neighborhood, West Davis				
Non-TOD design emissions	8	8	93	6
TOD design emissions	7	7	74	5
Emissions reductions	1	1	19	1
Moffet Park, Sunnyvale				
Non-TOD design emissions	14	15	162	12
TOD design emissions	12	12	136	9
Emissions reductions	2	3	26	3
Hollywood/Highland, Los Angeles				
Non-TOD design emissions	24	30	324	23
TOD design emissions	21	23	259	18
Emissions reductions	3	7	65	5
Rio Vista West, San Diego				
Non-TOD design emissions	9	11	110	8
TOD design emissions	8	8	90	6
Emissions reductions	1	3	20	2

County and City Emissions Inventories

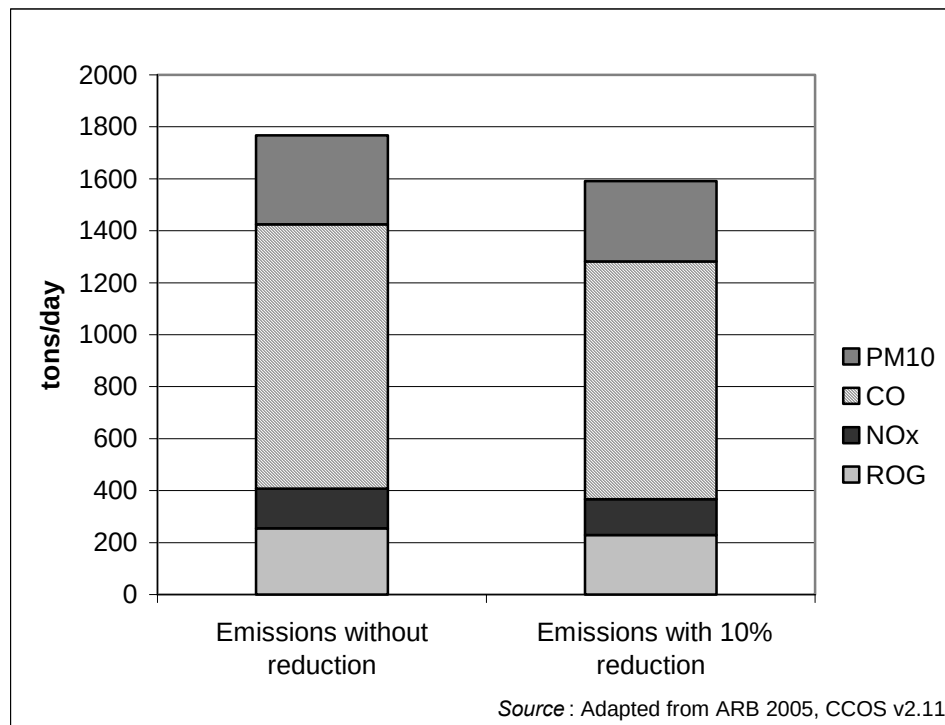
Past plans like the LUTRAQ transportation model in Oregon and the California Energy Commission publication, Energy Aware Planning Guide (CEC 1993), estimate a 10% minimum reduction in number of trips and energy usage, respectively. The results in applying a similar, modest 10%

reduction in emissions to the emissions forecast for 2020 is shown in Figure 4-7, which illustrates the total emissions of ROG, NOx, CO, and PM10 for all sources with and without a 10% reduction in the 2020 forecast. Though the tons/day of emissions that can be saved with a 10% reduction in emissions may seem small, it amounts to approximately 64,500 tons/year fewer emissions than without a 10% reduction.

The emission reductions estimates may seem small, but they are also significant when compared with individual stationary sources. Reductions achieved with the implementation of air quality goals and policies may help relieve some of the burden on stationary sources like manufacturing plants that contribute to economic growth in the San Joaquin Valley.

It is important to keep in mind that as time goes on, the benefits of the policies accumulate. Every year, a greater percentage of the developed area will be in a pedestrian or transit friendly pattern. The sooner a program is implemented, the sooner significant benefits will be seen.

Figure 4-7 Combined Emissions from area-wide, on-road mobile (gasoline and diesel), and other mobile sources



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SECTION V

POLICY MATRIX

V. POLICY MATRIX

The San Joaquin Valley Unified Air Pollution Control District (District) includes eight counties and 59 incorporated cities. Although all of these jurisdictions are linked geographically and are within the same air basin, variations exist between the jurisdictions in terms of physical, demographic, and economic characteristics. As a result, these variations affect the appropriateness and relevance of specific air quality planning goals and policies for each community. In an effort to categorize the jurisdictions by those having similar characteristics; physical, demographic, and economic data were compiled for each of the eight counties and 59 cities as part of the development of the Air Quality Guide.

In the original 1994 *Guidelines* analysis, over two hundred variables from the 1990 U.S. Census were initially reviewed as part of the effort of categorizing the communities within the District. For the *Guidelines* update, 2000 U.S. Census and Population data was used to verify that the categories identified in the 1994 *Guidelines* were still applicable to the present community conditions. The final number of variables selected for in-depth analysis included ten for the counties and thirteen for the cities. These variables are listed in Table 5-1. Means and quartiles were calculated for each variable. In some cases, medians were also calculated because the means (i.e., averages) were significantly skewed by extremely high or low values.

**Table 5-1 1990 Census Characteristics Selected for Analysis
for Counties and Cities in the San Joaquin Valley**

Counties	Cities
Number of Cities in County	Value of Owner-Occupied Housing
Population	Per Capita Income
Persons by Urban/Suburban/Rural Residence	Industry Sectors in Local Economy
Industry Sectors in Local Economy	Race
Per Capita Income	Persons per Household
Type of Household Income	Age of Population
Race	Mode of Travel to Work
Travel Time to Work	Private Vehicle Occupancy during Commute
Mode of Travel to Work	Place of Work
Private Vehicle Occupancy during Commute	Labor Force Participation Rate
	Population
	Type of Household Income
	Vehicles Available per Household
Source: Jan Newton, Consulting Economist.	

As part of the effort to categorize the communities, input was also sought and received from other members of the project team who researched land use patterns and reviewed the general plans for all eight counties and twenty-one selected cities within the District. This input contributed to the selection of variables and a greater understanding of the potential categories of communities within the District. For example, research conducted by planners provided insight into the influence of the Bay Area and the Sacramento metropolitan area on communities in the northern portion of the District and the on-going and future relationships between these metropolitan areas outside the District and individual communities within the District. The review of general plans also provided insight on how specific communities view themselves and their economic and social roles within the District. Of additional value was the knowledge gained by project team members on other environmental review and planning projects previously completed for jurisdictions within the District. This information was used as a “check” on the statistical census data. For example, information provided by other team members included the following:

- the importance of the central business district within larger jurisdictions
- the general availability of public transit within various jurisdictions
- the recognition that some jurisdictions may have a dominant employer (e.g., Avenal, Maricopa, Livingston)
- the areas of the District that are experiencing high growth rates;
- the extent of commuting from communities within the District to the metropolitan areas outside the District
- the location of facilities that serve more than the community in which they are located (e.g., airports, shopping malls, regional recreational facilities, colleges)
- the location of regional transportation corridors (e.g., Highway 99, railroads)
- the economic and social relationship between various communities within the District (e.g., Ceres as a residential suburb of Modesto and Madera as county seat and outlying bedroom community of Fresno)

This information enabled a more informed judgment about refinement of which variables in the census data were appropriate, assisted in a “cross-check” of the census data, and helped to solidify the categories of communities. This screening exercise was intended to answer many of the questions that local officials and planners will have about the census data and its application and translation into goals and policies.

This categorization effort resulted in two categories of counties and five categories of cities. Tables 5-2 and 5-3 present a list of each city and county, respectively, by category. While no jurisdiction completely “fits” the category

in which it is placed, the category is a good indication of the type of characteristics prevalent within the jurisdiction.

Table 5-2 City Groups

Group 1: Agriculture-Based Communities			
Arvin	Avenal	Delano	Farmersville
Firebaugh	Huron	Lindsay	Livingston
McFarland	Mendota	Orange Cove	Parlier
San Joaquin	Wasco	Woodlake	
Group 2: Diversified Farm Towns (Bedroom)			
Atwater	Chowchilla	Dinuba	Exeter
Fowler	Hughson	Kerman	Lemoore
Maricopa	Newman	Patterson	Reedley
Riverbank	Sanger	Selma	Shafter
Waterford			
Group 3: Diversified Farm Towns (Non-Bedroom)			
Coalinga	Corcoran	Dos Palos	Madera
Porterville	Tulare		
Group 4: Urban/Suburban Service-Based Economies (Bedroom)			
Ceres	Clovis	Escalon	Gustine
Kingsburg	Lathrop	Lodi	Manteca
Oakdale	Ripon	Tracy	Turlock
Group 5: Urban/Suburban Service-Based Economies (Non-Bedroom)			
Bakersfield	Fresno	Hanford	Los Banos
Merced	Modesto	Stockton	Taft
Visalia			
Source: Jan Newton, Consulting Economist.			

Table 5-3 County Groups

Group 1: Rural Counties			
Kings	Madera	Merced	Tulare
Group 2: Urban Counties			
Fresno	Kern	San Joaquin	Stanislaus

Table 5-4 presents a matrix of the policies identified in Section IV of this document. This matrix identifies the policies that would be most applicable for each type of community. It is recognized that not all policies indicated for a given city or county group will be applicable for each jurisdiction within the group. This policy matrix is intended to be a guide for jurisdictions to use in determining which policies are most applicable. Similarly, there may be some policies not suggested for a given city or county group in which the jurisdiction is best characterized that may be applicable for that jurisdiction's Air Quality Element. Therefore, it is critical that the planners and officials for each jurisdiction use this policy matrix as a toolbox for "mixing and matching" the policies that will serve them best.

Table 5-4 Policy Matrix

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
ENVIRONMENTAL ASSESSMENT							
1. Determine project air quality impacts using SJVUAPCD analysis methods.	X	X	X	X	X	X	X
2. Ensure that air quality impacts are mitigated fairly and consistently	X	X	X	X	X	X	X
3. Ensure all air quality mitigation measures are feasible, implementable, and cost effective.	X	X	X	X	X	X	X
4. Identify the cumulative transportation and air quality impacts.	X	X	X	X	X	X	X
5. Reduce impacts of projects insignificant by themselves but cumulatively significant.	X	X	X	X	X	X	X
6. Encourage innovative measures to reduce impacts.	X	X	X	X	X	X	X

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
COORDINATION/COOPERATION							
7. Work with neighboring jurisdictions and agencies on transportation/air quality issues.	X	X	X	X	X	X	X
8. Consult with the SJVUAPCD during CEQA review.	X	X	X	X	X	X	X
9. Coordinate with other jurisdictions to establish air quality programs and implement measures.	X	X	X	X	X	X	X
10. Work to reach equitable tax sharing arrangement with city/county.	X	X	X	X	X	X	X
11. Support modeling and geographic information system technology.	X	X	X	X	X	X	X
INTEGRATED PLANNING							
12. Consider air quality when planning land use and transportation systems.	X	X	X	X	X	X	X

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
13. Ensure projects in regional transportation plans are consistent with General Plan.	X	X	X	X	X	X	X
14. Consult with transit providers to determine project impacts.				X	X		X
15. Encourage the construction of low-income housing developments that use transit and pedestrian-oriented design principles.	X	X	X	X	X	X	X
16. Minimize impacts of large transportation projects on existing neighborhoods.	X	X	X	X	X	X	X
EDUCATION							
17. Work to improve understanding of land use, transportation, air quality link.	X	X	X	X	X	X	X
18. Encourage local public and private groups that provide air quality education programs.	X	X	X	X	X	X	X

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
PUBLIC FACILITIES/OPERATIONS							
19. Departments implement innovative employer-based trip reduction programs.				X	X		X
20. Replace or convert conventional fuel fleet vehicles.	X	X	X	X	X	X	X
21. Support the use of teleconferencing.				X	X		X
22. Encourage telecommuting programs.				X	X		X
CONGESTION MANAGEMENT/ TRANSPORTATION CONTROL MEASURES							
23. Increase the capacity of existing road network prior to constructing more capacity.	X	X	X	X	X	X	X
24. Provide employees and residents with transportation alternatives.	X	X	X	X	X	X	X
25. Work to establish satellite and neighborhood work centers for telecommuting.		X		X	X		
26. Encourage state of the art communication infrastructure.	X	X	X	X	X	X	X

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
TOXIC AND HAZARDOUS EMISSIONS							
27. Adequately separate sensitive uses from existing industrial point sources.	X	X	X	X	X	X	X
28. Require new air pollution point sources to be located an adequate distance from sensitive receptors.	X	X	X	X	X	X	X
FUGITIVE DUST/PM10							
29. Require measures to reduce construction particulate emissions.	X	X	X	X	X	X	X
30. Require developers to pave access roads and parking areas.	X	X	X	X	X	X	X
31. Reduce PM10 emissions from paved and unpaved roads.	X	X	X	X	X	X	X
ENERGY							
32. Work with the local energy providers on incentive programs.	X	X	X	X	X	X	X

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
33. Promote enhanced energy conservation standards.	X	X	X	X	X	X	X
34. Reduce air quality impacts from area sources and energy consumption.	X	X	X	X	X	X	X
LAND USE: LAND USE PATTERN							
35. Consider air quality and mobility prime considerations when reviewing any proposed change to the land use pattern.	X	X	X	X	X	X	X
36. Encourage projects proposing pedestrian or transit-oriented designs.		X	X	X	X		X
37. Preserve existing pedestrian and transit-oriented neighborhoods.	X	X	X	X	X	X	X
38. Plan higher density development in areas identified as transit hubs and commercial centers.				X	X		X

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
39. Encourage higher housing densities in urban areas with full services.	X	X	X	X	X	X	X
40. Support mixed-use developments.		X	X	X	X		X
41. Promote the downtown/village centers.	X	X	X	X	X		X
42. Plan adequate neighborhood commercial shopping centers.	X	X	X	X	X	X	X
43. Encourage neighborhood parks in proximity to activity centers.	X	X	X	X	X	X	X
44. Encourage school sites at locations that allow students to safely walk or bicycle.	X	X	X	X	X	X	X
45. Plan park and ride lots at appropriate sites.			X	X	X		X
46. Plan for multimodal transfer sites.				X	X		

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
47. Encourage the development of pedestrian-oriented commercial shopping areas.	X	X	X	X	X		X
48. Protect pedestrian-oriented shopping areas from incompatible development.			X		X		X
49. Discourage new regional auto-oriented commercial uses in pedestrian-oriented areas.			X		X		X
50. Encourage regional shopping centers at sites with a full range of transportation options.			X		X		X
LAND USE: COMPACT DEVELOPMENT							
51. Provide for orderly outward expansion, contiguous development, and incremental infrastructural expansion.	X	X	X	X	X		X
52. Encourage infill of vacant parcels.	X	X	X	X	X	X	X

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
53. Encourage projects that will improve the effectiveness of the transit system.				X	X		X
54. Adopt a reasonable urban limit line or urban growth boundary.	X	X	X	X	X		
55. Expand public services incrementally to serve contiguous development.	X	X	X	X	X		X
LAND USE: SITE DESIGNS							
56. Encourage developers to design project sites to increase transit use, walking, or cycling.	X	X	X	X	X	X	X
57. Require transportation/air quality design analysis for large projects.	X	X	X	X	X	X	X
58. Review site designs and subdivision plans for improved access by alternative modes.	X	X	X	X	X	X	X

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
59. Require projects near major transit to incorporate site design measures that enhance the efficiency of the transit system.				X	X		X
TRANSPORTATION INFRASTRUCTURE							
60. Plan for a multi-modal transportation system.	X	X	X	X	X	X	X
61. Ensure that funds for bicycle and transit improvements are used for those purposes.	X	X	X	X	X	X	X
62. Encourage the consolidation of transit services.	X	X	X	X	X	X	X
63. Maintain transportation connections in neighborhoods divided by major transportation projects to the extent feasible.	X	X	X	X	X	X	X
TRANSPORTATION INFRASTRUCTURE: TRANSIT							
64. Require transit improvements at appropriate sites.		X	X	X	X		X

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
65. Work with Caltrans and transit providers to identify park and ride sites.				X	X		
66. Design arterial and collector streets to allow the efficient operation of public transit.				X	X		
TRANSPORTATION INFRASTRUCTURE: BICYCLE & PEDESTRIAN FACILITIES							
67. Ensure that a comprehensive system of bikeways and pedestrian paths is planned and constructed.	X	X	X	X	X	X	X
68. Extend regional and commuter bikeways to serve new development.	X	X	X	X	X	X	X
69. Include bicycle and pedestrian improvements in road expansions.	X	X	X	X	X	X	X
70. Require bicycle storage and parking at appropriate sites.	X	X	X	X	X	X	X

Table 5-4 Policy Matrix (Cont.)

Policy	City Group 1 Ag-Based Communities	City Group 2 Diversified Farm Towns – Bedroom	City Group 3 Diversified Farm Towns – Non- Bedroom	City Group 4 Urban/Suburban Service-Based Communities – Bedroom	City Group 5 Urban/Suburban Service-Based Communities – Non-Bedroom	County Group 1 Rural	County Group 2 Urban
71. Preserve railroad rights-of-way for use as bikeways and pedestrian paths when feasible.	X	X	X	X	X	X	X
TRANSPORTATION INFRASTRUCTURE: LIGHT RAIL/ COMMUTER RAIL							
72. Identify potential light rail corridors and protect from incompatible development.				X	X		X
73. Preserve specific existing railroad rights-of-way that have the potential to be used as light rail lines.				X	X		X
74. Support the use of freeway rights-of-way suitable for light rail.				X	X		X
75. Plan the area around the rail stations to provide convenient pedestrian and bicycle access.	X	X	X	X	X	X	X

SECTION VI

GLOSSARY AND ACRONYMS

VI. GLOSSARY AND ACRONYMS

Glossary

Acid Rain - rainfall which is especially acidic (pH < 5.2). Principal components of acid rain typically include nitric and sulfuric acid, which may be formed by the combination of nitrogen and sulfur oxides with water vapor in the atmosphere.

Air Basin - an area of the state designated by the ARB pursuant to Subdivision (a) of Section 39606 of the CH&SC.

Air Pollutants - substances which are foreign to the atmosphere or are present in the natural atmosphere to the extent that they may result in adverse effects on humans, animals, vegetation, and/or materials.

Alternative Fuels - fuels such as methanol, ethanol, natural gas, and liquid petroleum gas that are cleaner burning and contribute to the attainment of ARB's emission standards.

Ambient Air - air occurring at a particular time and place outside of structures. Often used interchangeably with outdoor air.

Anthropogenic - of relating to or influenced by the impact of man on nature.

APCD (Air Pollution Control District) - a county agency with authority to regulate stationary sources of air pollution (such as refineries, manufacturing facilities, and power plants) within a given county, and governed by a District Air Pollution Control Board composed of the elected county supervisors. (Compare AQMD and Unified District)

AQAP (Air Quality Attainment Plan) - a plan prepared by a APCD/AQMD designated as a nonattainment area, to comply with the California Clean Air Act for purpose of meeting the requirements of the California Ambient Air Quality Standards.

AQMD (Air Quality Management District) - a group of counties or portions of counties with authority to regulate stationary sources of air pollution within the region and governed by a regional air pollution control board comprised mostly of elected officials from within the region. An AQMD is established by state legislation. (Compare APCD)

ARB (California Air Resources Board) - the State's lead air quality agency consisting of a nine-member Governor appointed board fully responsible for motor vehicle pollution control, and having oversight authority over California's air pollution management program.

Areawide Sources - also known as "area" sources, these include multiple stationary emission sources such as water heaters, gas furnaces, fireplaces, and woodstoves. The CCAA requires districts to include these area sources in the AQMPs.

Attainment - achieving and maintaining the air quality standards (both state and federal) for a given standard.

Atmosphere - the gaseous mass or envelope surrounding the earth.

Attainment Area - an area which is in compliance with the National and/or California Ambient Air Quality Standards.

BACT (Best Available Control Technology) - the most stringent emission limit or control technique that has been achieved in practice (any where in the world). BACT is a requirement of NSR (New Source Review).

BAR (Bureau of Automotive Repair) - an agency of the California Department of Consumer Affairs responsible for the implementation of the motor vehicle inspection and maintenance program (smog check).

BARCT (Best Available Retrofit Control Technology) - an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source.

Biogenic - produced by living organisms.

Burn Day - a day determined by meteorologist and air pollution specialists to have favorable weather conditions for burning of agricultural refuse and good dispersal of smoke.

CAAQS (California Ambient Air Quality Standards) - specified concentrations and durations of air pollutants, recommended by the California Department of Health Services and adopted into regulation by the Air Resources Board, which relate the intensity and composition of air pollution to undesirable effects. CAAQS are the standard which must be met per the requirements of the California Clean Air Act.

CCAA (California Clean Air Act) - a California law passed in 1988 which provides the basis for air quality planning and regulation independent of Federal regulations, and which establishes new authority for attaining and maintaining California's air quality standards by the earliest practicable date. A major element of the Act is the requirement that local APCDs/AQMDs in violation of the CAAQS must prepare attainment plans which identify air quality problems, causes, trends, and actions to be taken for attainment.

CEQA (California Environmental Quality Act) - a state law intended to protect the environment of California. It is codified in Sections 21000 through 21177 of the Public Resources Code. CEQA establishes mandatory ways by which governmental (public agency) decision makers are informed about the potential significant environmental effects of proposed projects. CEQA also mandates the identification of ways to avoid or significantly reduce damage to the environment. After preliminary review or the completion of an Initial Study, the lead agency may decide to prepare an Environmental Impact Report (EIR) for a project. An EIR is an informational document used to inform public agency decision-makers and the public of the significant effects of a project. The EIR also identifies possible ways to eliminate or minimize the significant effects and describes reasonable alternatives to the project. A recent court decision has determined that both alternatives and mitigation measures must be discussed in the EIR.

CO (Carbon Monoxide) - a colorless, odorless gas resulting from the incomplete combustion of fossil fuels. Over 80% of the CO emitted in urban areas is contributed by motor vehicles. CO interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects. CO is a criteria air pollutant.

CO₂ (Carbon Dioxide) - a colorless, odorless, gas that occurs naturally in the earth's atmosphere. Significant quantities are also emitted into the air by fossil fuel combustion. Emissions of CO₂ have been implicated with increasing the greenhouse effect.

Concentration - the amount of an air pollutant present in a unit sample, usually measured in parts per million (ppm) or micrograms per cubic meter (ug/m³).

Criteria Air Pollutant - an air pollutant for which acceptable levels of exposure can be determined and for which a Federal or State Ambient Air Quality Standard has been set. Examples include: Ozone, Carbon Monoxide, Nitrogen Dioxide, Sulfur Dioxide, and PM₁₀ (see individual pollutant definitions).

Emission Offset - (also known as emission-trade-off) actual enforceable emission reductions from existing sources sufficient to offset anticipated

emission increases associated with new or modified stationary sources. A rule-making concept whereby approval of a new stationary source of air pollution or reduction of emissions from an existing source of air pollution is conditional on the reduction of emissions from other existing stationary sources of air pollution. This concept is utilized in addition to reduction in emissions by employing BACT.

Emission Forecasting - utilizing information and growth and control estimates to approximate future emissions.

Emissions Inventory - an estimate of the quantity of pollutants emitted into the atmosphere over a specific period such as a day or a year. Considerations that go into the inventory include type and location of sources, the processes involved, and the level of activity.

Emission Standard - the maximum amount of a pollutant that is permitted to be discharged from a polluting source such as an automobile or smoke stack.

EPA (U.S. Environmental Protection Agency) - the Federal agency charged with setting policy and guidelines, and carrying out legal mandates for the protection of national interests in environmental resources.

Greenhouse Effect - the warming effect of the earth's atmosphere on the earth. Light energy from the sun which passes through the earth's atmosphere is absorbed by the earth's surface and re-radiated into the atmosphere as energy. The heat is then trapped by the air, creating a situation similar to that which occurs in a greenhouse.

FCAA (Federal Clean Air Act) - Federal law passed in 1970 and amended in 1977 and 1990 which sets primary and secondary National Ambient Air Quality Standards for major air pollutants and thus forms the basis for the national air pollution control effort.

Hydrocarbon (HC) - any of a large number of compounds containing various combinations of hydrogen and carbon atoms. They may be emitted into the air as a result of fossil fuel combustion and fuel volatilization, and are a major contributor to smog.

I & M, I/M (Inspection and Maintenance Program) - a motor vehicle inspection program implemented by the BAR. It is designed to identify vehicles in need of maintenance and to assure the effectiveness of their emission control systems on a biennial basis. The program enacted in 1979 and strengthened in 1990 is also known as a "smog check".

ISR (Indirect Source Review) - a rule or regulation that governs entities such as stationary facilities, buildings, structures, properties, and/or roads which,

through their construction to operation, indirectly contributes to air pollution. This includes projects and facilities that attract or generate mobile sources activity (autos and trucks) such as shopping centers, employment sites, schools, and housing developments, that results in the emissions of any regulated pollutant. In June 2005, the proposed rule changed the name from ISR to DESIGN, which stands for Decreasing Emissions' Significant Impact from Growth and New development.

Jitney - a form of public transit using small buses or vans to serve a neighborhood or a transportation corridor. Popular in Asian countries where they provide frequent, low-cost service in congested urban areas.

Mobile Sources - sources of air pollution such as automobiles, motorcycles, trucks, off-road vehicles, boats, and airplanes. (Contrast with stationary sources)

Monitoring - the periodic or continuous sampling and analysis of air pollutants in ambient air or from individual pollutant sources.

NAAQS (National Ambient Air Quality Standards) - are standards set by the Federal EPA for the maximum levels of air pollutants which can exist in the ambient air without unacceptable effects on human health or the public welfare.

NSR (New Source Review) - the mechanism to assure that new and modified stationary sources will not interfere with the attainment or maintenance of any ambient air quality standard, or prevent reasonable further progress towards the attainment or maintenance of any ambient air quality standard. A program used in a non-attainment area to permit or site new permit or site new industrial facilities or modifications to existing industrial facilities which emit non-attainment criteria air pollutants. The two major requirements of NSR are Best Available Control Technology and Offsets.

Nonattainment Area - an area identified by the EPA and/or ARB as not meeting either NAAQS or CAAQS standards for a given pollutant.

Ozone (O₃) - a pungent, pale, blue, reactive toxic gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy. Ozone exists in the ozone layer as well as at the earth's surface. Ozone at the earth's surface causes numerous adverse health effects and is a criteria air pollutant. It is a major component of smog.

Ozone Layer - a layer of ozone 12-15 miles above the earth's surface which helps to filter out harmful ultraviolet rays from the sun. It may be contrasted with ground-level ozone, which exists at the earth's surface and is a harmful component of photochemical smog.

Ozone Precursors - compounds such as hydrocarbons and oxides of nitrogen, occurring either naturally or as a result of human activities, which contribute to the formation of ozone, the principal component of smog.

Pedestrian Oriented Development (POD) - any of a number of design strategies that emphasize pedestrian access over automobile access. They typically provide pedestrian amenities such as sidewalks, street trees, commercial at street frontage, safe street crossings, etc.

PM-10 (Particulate Matter) - a major air pollutant consisting of solid or liquid matter such as soot, dust, aerosols, fumes and mists less than 10 microns in size (one micron = 1/1,000,000 meter = 0.00003937 inch). PM-10 causes visibility reduction and adverse health effects, and is a criteria air pollutant.

ROG (Reactive Organic Gas) - hydrocarbon compounds which are reactive and may contribute to the formation of smog. Also sometimes referred to as Non-Methane Organic Compounds (NMOCs).

SIP (State Implementation Plan) - a document prepared by each state describing existing air quality conditions and measures which will be taken to attain and maintain National Ambient Air Quality Standards. In California, districts prepare nonattainment area plans to be included in the State's SIP.

Smog - a combination of smoke, ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds, which, under various conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects. A primary source of smog is automobiles.

Smoke - the gaseous products of incomplete burning carbonaceous materials made visible by the presence of small particles of carbon.

RACT (Reasonably Available Control Technology) - the most effective emission limits in existing regulation that are currently in effect in any nonattainment district.

Stationary Sources - non-mobile sources such as refineries, power plants, and manufacturing facilities which emit air pollutants. (Contrast with mobile sources)

Sulfur Dioxide (SO₂) - a pungent, colorless gas that is formed by the combustion of fossil fuels. Power plants, which may use coal or oil high in sulfur content, have traditionally been major sources of SO₂. SO₂ is a criteria pollutant.

Sulfur Oxides - acrid, corrosive, poisonous gases produced chiefly when fuel containing sulfur is burned. The principal sources of sulfur oxides are electric generating plants and industrial plants.

Transit Oriented Development (TOD) - mixed use neighborhoods, up to 160 acres in size, which are developed around a transit stop and core commercial area. The entire TOD must be within an average of 2,000 foot walking distance of a transit stop. Secondary areas of lower density housing , schools, parks, and commercial and employment uses surround TODs for up to one mile.

Unified District - two or more contiguous counties may merge their county districts into one unified district. A unified district is formed by action of the member counties. The San Joaquin Valley Unified Air Pollution Control District is a Unified District. (see APCD and AQMD)

Volatile Organic Compounds (VOCs) - any organic compound containing at least one carbon atom except for specific exempt compounds found to be non-photochemically reactive.

Acronyms

AB	- Assembly Bill
APCD	- Air Pollution Control District
AQAP	- Air Quality Attainment Plan
AQMD	- Air Quality Management District
ARB	- Air Resources Board
AVR	- Average Vehicle Ridership
BACM	- Best Available Control Method
BACT	- Best Available Control Technology
BAR	- Bureau of Automotive Repair
BARCT	- Best Available Retrofit Control Technology
CAAQS	- California Ambient Air Quality Standard
CCAA	- California Clean Air Act
CEQA	- California Environmental Quality Act
CNG	- Compressed Natural Gas
CO	- Carbon Monoxide
DESIGN	- Decreasing Emissions' Significant Impact from Growth and New development
EI	- Emission Inventory
EIR	- Environmental Impact Report
EPA	- Environmental Protection Agency
FCAA	- Federal Clean Air Act
FCAAA	- Federal Clean Air Act Amendments of 1990
GAMAQI	- Guide for Assessing and Mitigating Air Quality Impacts
HC	- Hydrocarbons
I&M	- Vehicle Inspection & Maintenance
ISR	- Indirect Source Review
LAER	- Lowest Achievable Emission Rate
LNG	- Liquefied Natural Gas
NAAQS	- National Ambient Air Quality Standard
NAP	- Non-Attainment Area Plan
NO _x	- Oxides of Nitrogen
NSR	- New Source Review
O ₃	- Ozone
PM	- Particulate Matter
PM10	- PM of 10 microns in aerometric diameter or less
POD	- Pedestrian Oriented Development
PZEV	- Partial Zero-Emission Vehicles
RACM	- Reasonably Available Control Method
RACT	- Reasonably Available Control Technology
ROG	- Reactive Organic Gases
RTPA	- Regional Transportation Planning Agencies
SB	- Senate Bill
SIP	- State Implementation Plan
SJV	- San Joaquin Valley

SJVAB	- San Joaquin Valley Air Basin
SJVUAPCD	- San Joaquin Valley Unified Air Pollution Control District
SO _x	- Oxides of Sulfur
TBD	- To be Determined
TOD	- Transit Oriented Development
TOG	- Total Organic Gases
VMT	- Vehicle Miles Traveled
VOC	- Volatile Organic Compounds
ZEV	- Zero-Emission Vehicles

SECTION VII

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APPENDIX A

GOALS AND POLICIES DOCUMENT

APPENDIX A. GOALS AND POLICIES DOCUMENT

This section reprints the policies presented in Section IV without the implementation strategies and the justification. It is a comprehensive listing of the goals and policies that could be incorporated into an Air Quality Element or other general plan elements.

SUGGESTED GOALS AND POLICIES FOR SEPARATE AIR QUALITY ELEMENTS, CHAPTERS, OR SECTIONS

The goals and policies in this section are those most appropriate to include in a separate air quality element, chapter, or section. These are air quality specific policies that most cities or counties can use without major modifications to their existing general plan elements.

COMMUNICATION, COOPERATION, AND COORDINATION

Goal 1: **Effective communication, cooperation, and coordination in developing and operating community and regional air quality programs.**

ENVIRONMENTAL ASSESSMENT

Objective 1a To accurately determine and fairly mitigate the local and regional air quality impacts of projects proposed in this City/County.

Policy 1 The City/County of _____ shall determine project air quality impacts using analysis methods and significance thresholds recommended by the District.

Policy 2 The City/County of _____ shall ensure that air quality impacts identified during CEQA review are consistently and fairly mitigated.

Policy 3 The City/County of _____ shall ensure all air quality mitigation measures are feasible, implementable, and cost effective.

- Policy 4** The City/County of _____ shall identify the cumulative transportation and air quality impacts of all general plan amendments approved during the previous year.
- Policy 5** The City/County of _____ shall reduce the air quality impacts of development projects that may be insignificant by themselves, but cumulatively are significant.
- Policy 6** The City/County of _____ shall encourage innovative mitigation measures to reduce air quality impacts by coordinating with the District, project applicants, and other interested parties.

COORDINATION/COOPERATION

Objective 1b To coordinate local air quality programs with regional programs and those of neighboring jurisdictions.

- Policy 7** The City/County of _____ shall work with neighboring jurisdictions and affected agencies to address cross-jurisdictional and regional transportation and air quality issues.
- Policy 8** The City/County of _____ shall consult with the District during CEQA review for discretionary projects with the potential for causing adverse air quality impacts.
- Policy 9** The City/County of _____ shall coordinate with other jurisdictions and other regional agencies in the San Joaquin Valley to establish parallel air quality programs and implementation measures (trip reduction ordinances, indirect source programs, etc.).
- Policy 10** The City/County of _____ shall work to reach an equitable tax sharing arrangement with the city/county to avoid the fiscalization of land use decisions.
- Policy 11** The City/County of _____ shall support investment in cost-effective multi-use modeling and geographic information system technology.

INTEGRATED PLANNING

Objective 1c To integrate land use planning, transportation planning, and air quality planning to make the most efficient use of public resources and to create a healthier and more livable environment.

- Policy 12** The City/County of _____ shall consider air quality when planning the land uses and transportation systems to accommodate the expected growth in this community.
- Policy 13** All City/County submittals of transportation improvement projects to be included in regional transportation plans (RTP, RTIP, CMP, etc.) shall be consistent with the air quality goals and policies of the General Plan.
- Policy 14** The City/County of _____ shall consult with transit providers to determine project impacts on long range transit plans and ensure that impacts are mitigated.
- Policy 15** The City/County of _____ shall work with the Housing Authority, transit providers, and developers to encourage the construction of low income housing developments that use transit-oriented and pedestrian-oriented design principles.
- Policy 16** The City/County of _____ shall work with Caltrans and the Regional Transportation Planning Agency to minimize the air quality, mobility, and social impacts of large scale transportation projects on existing neighborhoods.

EDUCATION

- Objective 1d** To educate the public on the impact of individual transportation, lifestyle, and land use decisions on air quality.
- Policy 17** The City/County of _____ shall work to improve the public's understanding of the land use, transportation, and air quality link.
- Policy 18** The City/County of _____ shall encourage local public and private groups that provide air quality education programs.

PUBLIC FACILITIES/OPERATIONS

- Objective 1e** For public facilities and operations to provide a model for the private sector in implementing air quality programs.
- Policy 19** City/County Departments shall take the lead in implementing innovative employer-based trip reduction programs for their employees.

Policy 20 City/County fleet vehicle operators shall replace or convert conventional fuel vehicles with clean fuel vehicles as rapidly as feasible.

Policy 21 The City/County of _____ shall support the use of teleconferencing in lieu of employee travel to conferences and meetings when feasible.

Implementation Strategy:

With the expansion of technology capabilities, teleconferencing is a readily available and accessible option for many agencies, companies, and individuals. Video and web-based conferencing options are also viable means of meeting and conferencing. Interested public agencies should invest in infrastructure that would allow for telephone, video, and web-based conferencing options. Possible alternatives include the development of a multi-user teleconferencing center, installation of telephone, video, and web-based conferencing technology at existing facilities, and the upgrade of equipment at City/County offices. Use commercial teleconferencing facilities if they are cost competitive considering travel costs and employee time savings.

Policy 22 The City/County of _____ shall encourage departments to set up telecommuting programs as part of their trip reduction strategies.

CONGESTION MANAGEMENT/TRANSPORTATION CONTROL MEASURES

Goal 2: Reduce traffic congestion and vehicle trips through more efficient infrastructure and support for trip reduction programs.

Objective 2a To ensure that new development provides the facilities and programs that improve the effectiveness of transportation control measures and congestion management programs.

Policy 23 The City/County of _____ shall consider measures to increase the capacity of the existing road network prior to constructing more capacity (additional lanes, new freeways, etc.).

Policy 24 The City/County of _____ shall work with employers and developers to provide employees and residents with attractive, affordable transportation alternatives.

Policy 25 The City/County of _____ shall work to establish public/private partnerships to develop satellite and neighborhood work centers for telecommuting.

Policy 26 The City/County of _____ shall encourage the development of state of the art communication infrastructure linked to the rest of the world.

TOXIC AND HAZARDOUS EMISSIONS

Goal 3: Minimize exposure of the public to toxic air pollutant emissions and noxious odors from industrial, manufacturing, and processing facilities.

Objective 3a To provide adequate sites for industrial development while minimizing the health risks to people resulting from industrial toxic or hazardous air pollutant emissions.

Policy 27 The City/County of _____ shall require residential development projects and projects categorized as sensitive receptors to be located an adequate distance from existing and potential sources toxic emissions such as freeways, major arterials, industrial sites, and hazardous material locations.

Policy 28 The City/County of _____ shall require new air pollution point sources such as, but not limited to, industrial, manufacturing, and processing facilities to be located an adequate distance from residential areas and other sensitive receptors.

FUGITIVE DUST/PM10

Goal 4: Reduce particulate emissions from sources under the jurisdiction of the city/county.

Objective 4a To reduce emissions of PM10 and other particulates with local control potential.

Policy 29 The City/County of _____ shall work with the District to reduce particulate emissions from construction, grading,

excavation, and demolition to the maximum extent feasible.

Policy 30 The City/County of _____ shall require all access roads, driveways, and parking areas serving new commercial and industrial development to be constructed with materials that minimize particulate emissions and are appropriate to the scale and intensity of use.

Policy 31 The City/County of _____ shall reduce PM10 emissions from City/County maintained roads to the maximum extent feasible.

ENERGY

Goal 5: Reduce emissions related to energy consumption and area sources.

Objective 5a To encourage the use of energy conservation features and low-emission equipment for all new residential and commercial development.

Policy 32 The City/County of _____ shall work with the local energy providers and developers on voluntary incentive-based programs to encourage the use of energy efficient designs and equipment.

Policy 33 The City/County of _____ shall cooperate with the local building industry, utilities and the District to promote enhanced energy conservation standards for new construction.

Policy 34 The City/County of _____ shall encourage new residential, commercial, and industrial development to reduce air quality impacts from area sources and from energy consumption.

SUGGESTED GOALS AND POLICIES FOR LAND USE ELEMENTS

This section provides policies that are best suited for the land use element of the general plan. These policies, if adopted, would affect the future development patterns of the community and as such require close examination by each community to determine their acceptability. If a jurisdiction decides to use these policies in a separate air quality element, care should be exercised to avoid conflicts with the land use element. Cities and counties in the San Joaquin Valley are required by California Government Code to include air quality considerations in the development of their General Plans. In general, to encourage land use strategies that promote alternatives to single occupancy vehicle travel, local governments may use zoning and subdivision regulations, monetary incentives (tax breaks, impact fee adjustments), or non-monetary incentives (such as accelerated permit processing or reduced parking requirements).

LAND USE, TRANSPORTATION AND AIR QUALITY

Goal 6: Reduce motor vehicle trips and vehicle miles traveled and increase average vehicle ridership (AVR).

Objective 6a To create a land use pattern that will encourage people to walk, bicycle, or use public transit for a significant number of their daily trips.

Policy 35 The City/County of _____ shall consider air quality and mobility when reviewing any proposed change to the land use pattern of this community.

Policy 36 The City/County of _____ shall encourage projects proposing pedestrian or transit-oriented designs (TOD) at suitable locations. A TOD is defined as a

“Moderate to higher-density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment and shopping opportunities designed for pedestrians without excluding the auto. TOD can be new construction or redevelopment of one or more buildings whose design and orientation facilitate transit use.” (Caltrans 2002)

- Policy 37** The City/County of _____ shall work to preserve and enhance existing neighborhoods and commercial districts having transit and pedestrian-oriented designs.
- Policy 38** The City/County of _____ shall plan areas within 1/4 mile of locations identified as transit hubs and commercial centers for higher density development.
- Policy 39** The City/County of _____ shall encourage higher housing densities in areas served by the full range of urban services.
- Policy 40** The City/County of _____ shall encourage mixed-use developments that provide commercial services such as day care centers, restaurants, banks, and stores near employment centers.
- Policy 41** The City/County of _____ shall promote the downtown (or village centers) as the primary pedestrian-oriented, commercial and financial center(s) in the city/community.
- Policy 42** The City/County of _____ shall plan adequate neighborhood commercial shopping areas to serve new residential development.
- Policy 43** The City/County of _____ shall encourage subdivision designs that provide neighborhood parks in proximity to activity centers such as schools, libraries and community centers.
- Policy 44** The City/County of _____ shall work closely with school districts to help them choose school site locations that allow students to safely walk or bicycle from their homes.
- Policy 45** The City/County of _____ shall plan park and ride lots at suitable locations serving long distance and local commuters.
- Policy 46** The City/County of _____ shall plan for multi-modal transfer sites that incorporate auto parking areas, bike parking, transit, pedestrian and bicycle paths, and park and ride pick-up points.
- Policy 47** The City/County of _____ shall encourage the development of pedestrian-oriented shopping areas

within walking distance of high-density residential neighborhoods.

Policy 48 The City/County of _____ shall protect pedestrian-oriented commercial areas from development that is incompatible in design, scale or use.

Policy 49 The City/County of _____ shall discourage new regional auto-oriented commercial uses (such as volume discount stores, auto dealerships and large scale car repair) within areas designated as mixed-use, transit-oriented or pedestrian-oriented.

Policy 50 The City/County of _____ shall encourage regional shopping malls/centers at sites capable of support by a full range of transportation options.

LAND USE: COMPACT DEVELOPMENT

Objective 6b To plan development in a way that makes the most efficient use of the land and thereby causes the least possible impacts to the environment.

Policy 51 The City/County of _____ shall provide for an orderly outward expansion of new urban development so that it is contiguous with existing development, allows for the incremental expansion of infrastructure and public services, and minimizes impacts on the environment.

Policy 52 The City/County of _____ shall encourage infill of vacant parcels.

Policy 53 The City/County of _____ shall encourage infill and redevelopment projects within an urban area that will improve the effectiveness of the transit system and will not adversely affect existing development.

Policy 54 The City/County of _____ shall adopt a reasonable urban limit line/urban growth boundary and commit to providing public services only within the urban area.

Policy 55 The City/County of _____ shall expand public services incrementally to serve contiguous development and will discourage the formation of small sewer and water systems serving fringe urban development.

LAND USE: SITE DESIGNS

Objective 6c To promote site designs that encourage walking, cycling, and transit use.

Policy 56 The City/County of _____ shall encourage project sites designed to increase the convenience, safety and comfort of people using transit, walking or cycling.

Policy 57 The City/County of _____ shall require an air quality/transportation design analysis for projects exceeding District CEQA significance thresholds.

Policy 58 The City/County of _____ shall review all subdivision street and lot designs, commercial site plans, and multi-family site plans to identify design changes that can improve access by transit, bicycle, and walking.

Policy 59 The City/County of _____ shall require all development projects proposed within 2,000 feet of an existing or planned light rail transit, commuter rail, express bus, or transit corridor stop, to incorporate site design measures that enhance the efficiency of the transit system.

SUGGESTED GOALS AND POLICIES FOR CIRCULATION ELEMENTS

The goals and policies in this section are most appropriate for Circulation Elements of the general plan. They provide ways to plan for the transportation needs of the community that can improve air quality.

TRANSPORTATION INFRASTRUCTURE

Objective 6d To develop innovative transportation systems that incorporate alternative transportation modes into the system designs.

Policy 60 The City/County of _____ shall plan for a multi-modal transportation system that meets the mobility needs of the community and improves air quality.

Policy 61 The City/County of _____ shall vigorously pursue and use state and federal funds earmarked for bicycle and transit improvements.

Policy 62 The City/County of _____ shall encourage the consolidation of transit services within the metropolitan area to maximize the efficiency of transit services while minimizing costs.

Policy 63 The City/County of _____ shall ensure to the extent feasible that pedestrian, bicycle, and automobile connections are maintained in existing neighborhoods affected by transportation and other development projects.

TRANSPORTATION INFRASTRUCTURE: TRANSIT

Policy 64 The City/County of _____ shall require transit improvements at sites deemed appropriate and necessary by the Transportation Department and the transit provider and consistent with long-range transit plans.

Policy 65 The City/County of _____ shall work with Caltrans and transit providers to identify park and ride sites with convenient access to public transit.

- Policy 66** The City/County of _____ shall design all arterial and collector streets planned as transit routes to allow the efficient operation of public transit.

TRANSPORTATION INFRASTRUCTURE: BICYCLE AND PEDESTRIAN FACILITIES

- Policy 67** The City/County of _____ shall ensure that a comprehensive system of bikeways and pedestrian paths is planned and constructed in accordance with an adopted City/County plan.
- Policy 68** The City/County of _____ shall ensure that regional and commuter bikeways are extended to serve new development consistent with the adopted bikeway plan.
- Policy 69** The City/County of _____ shall ensure that upgrades to existing roads (widening, curb and gutter, etc.) include bicycle and pedestrian improvements in their plans and implementation where appropriate.
- Policy 70** The City/County of _____ shall require new major activity centers, office and commercial development to provide secure bicycle storage and parking facilities.
- Policy 71** The City/County of _____ shall preserve abandoned railroad right of ways with no potential for use as light rail lines for use as bikeways and pedestrian paths when feasible.

TRANSPORTATION INFRASTRUCTURE: LIGHT RAIL/COMMUTER RAIL

- Policy 72** The City/County of _____ shall identify potential light rail corridors during major general plan updates and take action to protect the right of way from incompatible development.
- Policy 73** The City/County of _____ shall preserve specific existing railroad right of ways that have the potential to be used as light rail lines.

- Policy 74** The City/County of _____ shall support the use of suitable freeway and expressway right of ways for light rail.
- Policy 75** The City/County of _____ shall plan the area around new commuter and mainline rail stations to provide convenient and safe pedestrian and bicycle access, and connections to the transit system.

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