AIR QUALITY ELEMENT

I. INTRODUCTION

According to the Air Resources Field Research Office in North Carolina, the Sacramento Valley Air Basin has the highest air pollution potential in the United States because the area has over 70 air inversion days per year. The air basin, comprising 13 counties, is classified as being in violation of state ambient air quality standards. A violation of any one standard is termed "nonattainment." The limits of the air basin are determined by meteorological conditions, emission transport, and topography. The State Air Resources Board (ARB) has further divided the basin into two planning units called the Northern Sacramento Valley Planning Area and the Broader Sacramento Area. These divisions are based on the degree of pollutant transport from one area of the basin to another and the varying degrees of emissions within each area. The northern area, which affects seven counties including Shasta County, is classified as "moderately" nonattainment for ozone and particulates. The southern area affects six counties and is classified as being a "serious" nonattainment area. The air pollution districts of each planning area have different state-mandated planning restrictions which must collectively reduce locally produced pollutants to levels of attainment for the planning areas. The map on the next page depicts the air basin and planning areas.[1]

On a local level, air quality in the Redding metropolitan area of Shasta County is a reflection of the population growth of the region and the surrounding counties and the fact that Redding is a central place for urban demands including medical, retail, government, education, employment, housing, and transportation. The metropolitan area also draws customers from well beyond adjoining counties because of the outdoor recreational attractions of the North State. It should also be noted that the northern part of the valley is subject to significant ozone transport from the Broader Sacramento Planning Area. These factors, coupled with the region's climate, topography, and vast hydrocarbon-rich forest, have caused the air quality of the metropolitan area to become "moderately" polluted with ozone (smog) and particulates (dust and smoke).

The "moderate" pollution standard is based on health criteria established by the California Clean Air Act. If nothing is done to decrease pollution levels, then the region will be subject to expensive and punitive mandates of the Federal Clean Air Act including the denial of federal grants and highway funds for transportation, transit, and sewerage projects.

The primary source of ozone pollution is vehicles which account for about 70 percent of the emissions. The remaining 30 percent is due to stationary land-use sources. Another significant County pollutant is particulates. The use of wood heating devices, open burning practices, and road dust all contribute to high particulate levels, especially in the winter months. Based on this, it makes sense to integrate air quality planning from the perspective of the Circulation and Land Use Elements of the City's General Plan.

A. PURPOSE AND SUMMARY OF AIR QUALITY ELEMENT GOALS

This element provides a program to control or reduce emissions associated with *new* and *modified* indirect sources of air pollution. Indirect sources include employment sites, shopping centers, sports facilities, housing developments, airports, places of business, etc.

An indirect source control program or rule incorporates strategies to reduce emissions including goals, policies, standards, and implementation measures related to land use and traffic circulation. This policy is intended as part of a comprehensive emissions reduction program which has a goal of achieving air quality attainment.

Methods of implementation must focus on threshold standards of pollution from land use and the application of *best available mitigation measures* (BAMMs) to reduce emissions. In a larger sense, this air quality policy is part of the regional strategy for improving air

[1] The lower thresholds adopted by amendment to the Clean Air Act for ozone has resulted in a **recommendation** by the Environmental Protection Agency to designate Shasta County nonattainment for ozone.

quality in the northern Sacramento Valley planning area, which includes seven counties. While air quality is often regarded as a regional problem, local land-use and growth decisions by the Cities of Anderson, Shasta Lake, and Redding and the unincorporated area of the County will profoundly affect the success of whatever technology is available regionally to combat air pollution with this in mind:

It is the purpose of this air quality policy to protect the health and welfare of our residents, businesses, and industries by promoting development that is compatible with air quality standards of the policy and the County's AQAP.

This is to be accomplished by the goals, policies, and implementation strategies of Chapter VI, which are summarized below:

- Applying *transportation control measures* (TCMs) and BAMMs through planning to augment the rules of the County's AQAP which are aimed at substantially reducing growth in vehicle miles traveled (VMT) and vehicles trips as required by the California Clean Air Act.
- Ensuring that federal and state entitlement funds and grants for local transportation projects will not be lost, which could happen if the air quality declines to the point where the region becomes nonattainment under the Federal Clean Air Act, and ensuring that industries of the County are not unnecessarily forced to install expensive retrofit equipment to reduce emissions.
- Providing the planning process with necessary guidance to review proposed projects relative to stationary indirect sources of air pollution and guidance in applying mitigation measures to reduce the pollution.
- Planning for advancements in transportation technology so that land use and the transportation systems can more easily adapt to the technology.
- Supporting a communitywide program of the Air Pollution Control District aimed at educating developers and the citizenry regarding the need to modify our behavior in order to improve the air quality.
- Focusing community attention on the need to create a vision of what the metropolitan area should be and look like in the next 45 years relative to air quality, transportation, and land-use patterns.
- The specific standards for measuring the success of the element may be summarized as follows:

1. Strive to achieve 5 percent reduction in emissions per year for NO_x and PM_{10} averaged over a three-year period.
2. Substantially reduce rate of increase in passenger vehicle trips and miles per trip.
3. Achieve state ozone standards to avoid being reclassified to a "serious" category of nonattainment.
4. Avoid mandate of applying emission devices to new sources based on an emissions output of 10 lbs/day. The current standard is 25 lbs/day.
5. Avoid application of expensive retrofit emission technology to existing industries and businesses.
6. Avoid **requirement** of reducing countywide vehicle miles traveled.
7. Avoid federal sanctions by being classified as nonattainment under the Federal Clean Air Act.
8. Avoid federal **requirement** for emission offsets for new industries.
9. Avoid federal **requirement** to achieve a reduction in volatile organic compounds over a six-year period.
10. Avoid the loss of state and federal transportation funds for local projects.
11. Avoid development moratorium caused by noncompliance with County's Nonattainment Plan and California Clean Air Act.
12. Avoid reduction in tourism and sales tax due to deterioration of our air quality.
13. Maintain community health through improved air quality.

14. Provide a strong basis to justify that the County ***not*** be reclassified to a "serious" nonattainment category, even if the County still exceeds state ozone standards. This can be done by demonstrating that the County and its cities have adopted and implemented air quality elements that apply best available mitigations to new projects which reduce vehicle emissions and that continued violation of the state standard is due to ozone transport from Sacramento, which currently is responsible for 90 percent of the days of violation.

B. Air Pollution and Its Significance

There are nine pollutants for which California has established ambient standards. Six of these are also regulated by the federal government, except that the federal standards are less restrictive than the state's standard. For Shasta County, the applicable pollutants are ozone (O_3) and particulates (PM_{10}).

Ozone

Ozone, commonly called smog, is created by a combination of chemical interactions which can concentrate the pollutant low to the ground by the force of inversion or air pressure. Ozone has a slightly pungent, irritating odor. In general, smog may be defined as:

Oxides of Nitrogen + Hydrocarbons + Sun = Smog

The County's Air Quality District monitors ozone at monitoring stations located in South Redding and in Anderson. Ground-level ozone is distinct from the layer of ozone that is seven or more miles above the earth's surface in the stratosphere and protects the earth from the sun's harmful ultra-violet radiation.

Moderate concentrations of ozone can damage materials. For example, it can cause fading in textile materials and will cause rubber products to crack and lose elasticity and strength.

Recent clinical studies show that chronic exposure to smog irreversibly reduces lung capacity, lowers stamina, and leaves people more vulnerable to long-term respiratory problems. Smog is especially harmful for children, senior citizens, and those who suffer from heart or lung disease. At high concentrations, ozone causes significant health and environmental problems. It can irritate the respiratory tract; produce impaired lung function such as inability to take a deep breath; and cause throat irritation, chest pain, cough, lung inflammation, and possible susceptibility to lung infection. Smog aggravates existing respiratory conditions like asthma.

Smog can reduce the yield of agricultural crops and injure forests and other vegetation. Ozone is the most injurious pollutant to plant life, but oddly enough, plants can assist in the production of ozone through the emission of hydrocarbons which interact with NO_x to create smog. The table below illustrates the effects of ozone on selected plants at various concentrations. While Shasta County is not an intense farming region, the table is pertinent because it illustrates the effects of ozone on plant life, which is abundant in the County. For reference purposes, the California standard for ozone is .09 ppm = 176.6 µg/m^3: **phm** = parts per million; **µg/m^3** = micrograms per cubic meter. **The Redding Metro area has exceeded ozone concentrations of 200 µg/m^3 on many occasions in the last six years.** Shasta County has averaged 0.095 ppm for an 8-hour period during 1997, 1998, and 1999.

TABLE 1
POLLUTION EFFECTS OF OZONE ON PLANTS

Amount	Duration	Effect
54 µg/m^3	2 hr	38 percent leaf damage to some sensitive plants
200 µg/m^3	1 hr	Minimal visible injury to spinach, radish, oak, and white pine
400 µg/m^3	4 hr	79 percent leaf injury in pinto bean
560 µg/m^3	4 hr	75 percent leaf damage to some sensitive plants
700 µg/m^3	2 hr	90 percent leaf injury in pinto bean

Source: Jones & Stokes Assoc. Inc., 1980, Volume I, Basic Ecological Concepts, FWS/OBS-80/45.

As noted in the table above, plants have different thresholds of sensitivity to ozone. In general, high and moderately sensitive plants experience visible injury from ozone based on the following concentrations:

TABLE 2
HIGH AND MODERATE
PLANT SENSITIVITY TO OZONE

Exposure Period	High Sensitivity (in ppm)	Moderate Sensitivity (in ppm)
0.5 hour	.25 - .40	4.0 - 5.5
1.0 hour	.10 - .25	2.5 - 4.0
2.0 hours	.07 - .15	1.5 - 2.5
4.0 hours	.04 - .10	1.0 - 2.0
8.0 hours	.03 - .07	0.7 - 1.5

Source: IBID.

California established the health advisory level after medical research showed that ozone posed a health threat at a lower concentration (.09 ppm) than the federal standard (.12 ppm), especially for children, the elderly, persons with heart or lung disease, and during strenuous exercise. California's ozone standard (9 pphm or .09 ppm) has always been more protective of public health than the federal standard of 12 pphm (0.12 ppm) or 100 PSI (Pollutant Standards Index). **The concentration of ozone in the Redding area (attributed to local sources) has met or exceeded with a reading of 0.13 ppm.**

Figure "A" provides some insight into the significance of various levels of pollution based on a standard index. The Pollutant Standards Index (PSI) was developed by the Environmental Protection Agency to standardize reporting and to convert air pollution concentrations to a simpler scale. The figure shows how intervals on the PSI scale relate to the potential health effects of ozone at the measured concentrations.

Particulates (PM_{10})

Suspended particulate matter 10 micrometers (millionths of a meter) or less in diameter is referred to as PM_{10}, which consists of a mixture of manmade and natural substances including wood smoke, dust from unpaved roads, construction, and agricultural activities. It comes from a variety of residential, industrial, and mobile sources and may be emitted directly or formed in the air by transformations of gasses. These tiny particles are a potential cause of significant health effects since they can more easily bypass the respiratory tract's natural filtering system and can lodge deep in the lungs.

The microscopic particles can affect breathing and respiratory symptoms, causing increased respiratory disease and lung damage and possibly premature death. Children, the elderly, and people suffering from heart or lung disease (like asthma) are especially at risk. The particles also damage paint, soil clothing, and reduce visibility.

Federal standard for PM_{10} is 150 micrograms/cubic meter; the state standard is 50 micrograms/cubic meter. **For the Redding area, concentrations of PM_{10} have been as high as 85 micrograms/cubic meter.** These concentrations were attributed to wood smoke from home heating and agricultural burning.

C. URBANIZATION, WEATHER, AND AIR QUALITY

The foregoing discussion focused on the effects of ozone and particulates because Shasta County exceeds the state's threshold standards of these pollutants. In reality, the effects of air pollution on the County ought to include all categories of pollution, even those for which the state and federal governments do not have standards. The idea is to develop programs to reduce emissions and threshold violations while ensuring that other pollutants do not exceed threshold levels. If the rate of emissions remains the same for the County relative to the rate of growth, the County will eventually violate all pollutant thresholds of the state and federal governments. This is because urbanization can increase the volume and concentration of emissions. Table 3 emphasizes how urbanization can affect weather and increase pollution, urban temperatures, etc.

FIGURE "A"
POLLUTANT STANDARDS INDEX FOR OZONE
(PSI scale is a relative number without units)

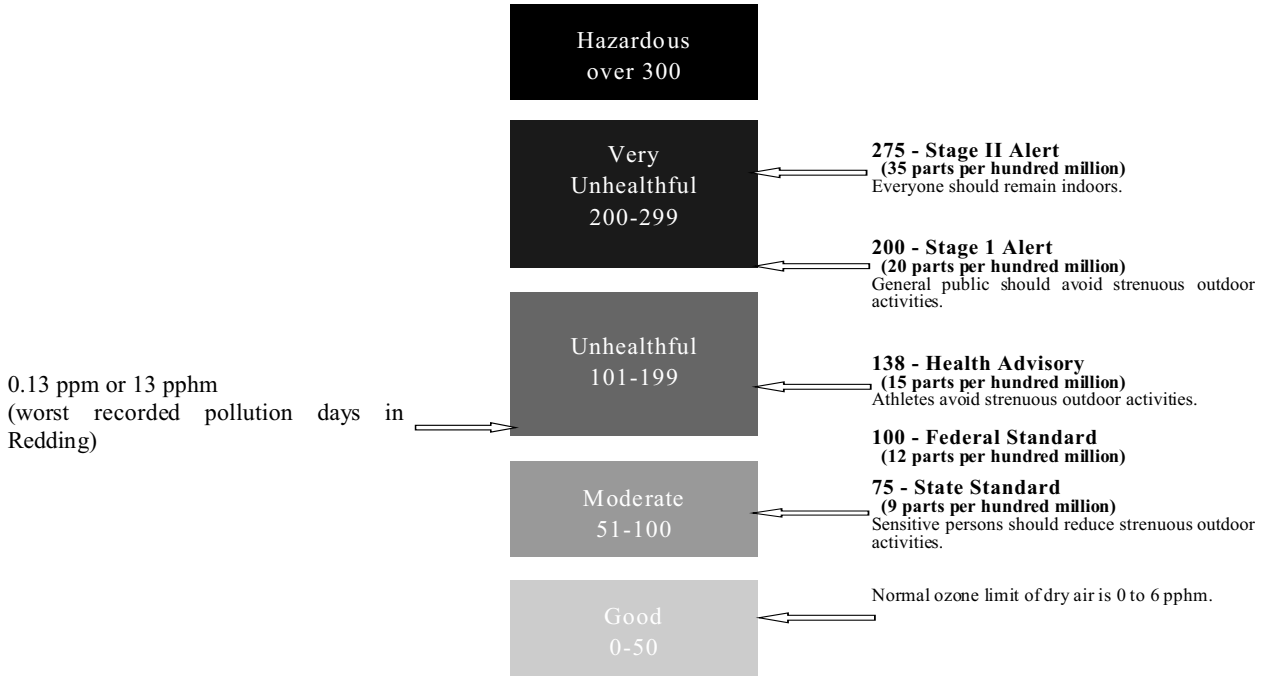


TABLE 3
WEATHER CHANGES CAUSED BY INTENSE URBANIZATION

	Average Changes Expressed as Percent or Magnitude of Rural Conditions		
Weather & Climate Elements	Annual	Cold Season	Warm Season
Contaminants (Volume)	+1000%	+2000%	+500%
Solar Radiation (Langleys)	-22%	-34%	-20%
Temperature (°F)	+2°	+4°	+1°
Humidity (Relative)	-6%	-2%	-8%
Visibility (Frequency)	-26%	-34%	-17%
Fog (Frequency)	+60%	+100%	+30%
Wind Speed (mph)	-25%	-20%	-30%
Cloudiness (Frequency)	+8%	+5%	+10%
Rainfall (Amount)	+14%	+13%	+15%
Snowfall (Amount)	±10%	±10%	---
Thunderstorms (Frequency)	+16%	+5%	+29%

Generalized direct and indirect effects of urbanization are outlined below:

- Effects on meteorology:
  1. Visibility
  2. Cloud/haze/fog formation
  3. Urban heat islands

- Effects on materials:
  1. Corrosion, pitting, and chemical disintegration
  2. Discoloration and fading
  3. Embrittlement, cracking, and reduced tensile strength

- Effects on plants:
  1. Growth and yield reductions
  2. Tissue damage
  3. Increased sensitivity to pathogens
  4. Altered susceptibility to environmental stresses

- Effects on fish, wildlife, and domestic animals:
  1. Direct toxicity and metabolic disruptions
  2. Respiratory problems
  3. Increased susceptibility to disease
  4. Reproductive disruptions or failure
  5. Behavioral changes

- Effects on ecosystems:
  1. Changes in vegetation composition
  2. Changes in fish or wildlife abundance
  3. Changes in successional patterns
  4. Changes in microclimates and geophysical processes
  5. Changes in soil or water chemistry
  6. Changes in litter decomposition rates or products
  7. Changes in productivity, energy flow, and nutrient cycling

- Effects on human health:
  1. Respiratory problems
  2. Eye irritation
  3. Increased susceptibility to bacterial or viral infections
  4. Direct toxicity and metabolic problems
  5. Carcinogenic effects
  6. Reproductive problems

- Economic Effects:
  1. Require industry to retrofit equipment
  2. Influence on technological change
  3. Creation of the air pollution control industry
  4. Influence on site selection and site design for development projects
  5. Unmitigated impacts will cause the City/County to lose State and federal funding for transportation projects.

II. STATUTORY AIR QUALITY STANDARDS AND MANDATED REQUIREMENTS

California began setting air quality standards in 1969 under the provisions of the Mulford-Carrell Act. With the passage of amendments to the Clean Air Act in 1970, the federal government began adopting such standards for the entire country. **As stated by former President Bush, the promise of the 1990 Federal Clean Air Act is "Every American expects and deserves to breathe clean air. . ."**

Air quality standards define the levels of various types of air pollutants that may not be exceeded for certain periods of time in defined areas. There are state and federal ambient air quality standards for ozone, carbon monoxide, oxides of nitrogen, sulfur dioxide, PM_{10}, and lead. If standards are met, eye and throat irritation—and more serious health effects—are not expected to appear among even the most sensitive members of the public. Table 4 provides a comparison of state and federal standards.

TABLE 4

FEDERAL AND STATE AMBIENT AIR QUALITY STANDARDS

POLLUTANT	AVERAGING TIME	CALIFORNIA STANDARD	NATIONAL STANDARDS
Ozone	1-Hour	0.09 ppm (180 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$)
	8-Hour	n/a	0.08 ppm*
Carbon Monoxide	8-Hour	9.0 ppm (10 mg/m^3)	9.0 ppm (10 mg/m^3)
	1-Hour	20 ppm (23 mg/m^3)	35 ppm (40 $\mu g/m^3$)
Nitrogen Dioxide	Annual	n/a	0.053 ppm (100 $\mu g/m^3$)
	1-Hour	0.25 ppm (470 $\mu g/m^3$)	n/a
Sulfur Dioxide	Annual	n/a	80 $\mu g/m^3$ (0.03 ppm)
	24-Hour	0.04 ppm (105 $\mu g/m^3$)	365 $\mu g/m^3$ (0.14 ppm)
	1-Hour	0.25 ppm (655 $\mu g/m^3$)	n/a
Particulate Matter-Fine ($PM_{2.5}$)	Annual Arithmetic Mean	n/a	15 $\mu g/m^3$
	24-Hour	n/a	65 $\mu g/m^3$
Suspended Particulate Matter (PM_{10})	Annual Arithmetic Mean	n/a	50 $\mu g/m^3$
	Annual Geometric mean	30 $\mu g/m^3$	n/a
	24-Hour	50 $\mu g/m^3$	150 $\mu g/m^3$

A. State-Mandated Requirements

The ambient air quality standards of the foregoing section for the California Clean Air Act must be achieved through a variety of actions by local governments. The scope of this air quality policy focuses on two of many requirements of the County's Air Quality Attainment Plan (AQAP) as discussed below.

To assist local governments in meeting ambient air quality standards, the California Clean Air Act of 1988 gave regional air quality management districts new authority to design, adopt, implement, and enforce comprehensive plans for attaining and maintaining both the federal and the more stringent state air quality standards by the earliest practical date. Among its provisions, the California Clean Air Act provides air quality management districts with the authority to establish controls on mobile and stationary sources of pollution.

Each nonattainment district is required to adopt an attainment plan with rules to achieve attainment. For the Northern Sacramento Valley planning area of the air basin, the plans for each of the six counties, including Shasta County, are basically the same and require each district to adopt transportation control measures (TCMs) and an indirect source control program.

The 1988 Clean Air Act requires that the County's air quality district adopt a program or air quality attainment plan that will **strive to achieve a 5 percent reduction in emissions per year for each nonattainment pollutant averaged every consecutive three-year period.**

The second mandated requirement occurred as the result of a 1992 amendment to the Clean Air Act (AB 2783, Sher). The amendment requires areas with moderate air pollution that contain an urbanized area of 50,000 people or more to **"substantially reduce the rate of increase in passenger vehicle trips and miles traveled per trip" by the earliest practicable date** [H&SC 40918(c)]. The State Air Resources Board (ARB) has interpreted this requirement to mean having TCMs sufficient to hold the growth in vehicle miles traveled equal to the population growth rate.

In the 1980s, Shasta County averaged annual growth rates of 5.5 percent for vehicle miles traveled (VMT) (Caltrans). Recent VMT trends indicate that growth in VMT is slowing down, which is probably due to the recession; however, TCMs are still needed to achieve ambient air quality standards.

This requirement is only applicable to the urbanized area of the County, but may be expanded to include the whole County or district later on if standards are not met. For now, the severity of the TCMs necessary to meet this requirement are left to the discretion of the air district, although the state does have performance standards.

The table following this section provides a summary of the various required actions based on the severity of nonattainment. For purpose of this policy, only the required actions dealing with *transportation control measures* and *indirect source control programs* will be addressed with the understanding that the other measures are being addressed on a regional level by enforcement actions of the Air Pollution Control District (APCD) based on the County's AQAP.

Shasta County Air Quality Attainment Plan (AQAP)

The goal of the plan is to achieve the state's ambient air quality standard for ozone at the earliest possible date.

The plan details sources and levels of emissions and provides for control measures in accordance with the 1994 State Implementation Plan and California Clean Air Act.

TABLE 5
CALIFORNIA CLEAN AIR ACT
SUMMARY MAJOR PLANNING REQUIREMENTS

	Ozone Classification			
	Moderate .09-.12 ppm	Serious .13-.15 ppm	Severe .16-.20 ppm	Extreme .20 ppm
Mandated Date to Achieve Attainment	1997	1997	1997	1997
MANDATED ACTIONS:				
Attainment Demonstration Air quality plans must demonstrate attainment of the state standards by the earliest practicable date	X	X	X	X
Transportation Control Measures ‣ TCMs required in urbanized areas with populations of ≥ 50,000 to substantially reduce growth in VMT and vehicle trips ‣ Prescribed average vehicle ridership (AVR) by 1999 and no net increase in vehicle emissions after 1997 if the district contains Standard Metropolitan Statistical Area of ≥ 250,000 population **(see note)**	X N/A	X 1.4 AVR	X 1.5 AVR	X 1.5 AVR
New Source Review No net increase permitting program for new/modified sources with prescribed levels (tons/year) of emissions ‣ Best available control technology (BACT) for new sources with emissions output as prescribed	25 tons/year 25 lb/day	15 tons/year 10 lb/day	10 tons/year 10 lb/day	All sources 10 lb/day
Retrofit Controls (existing stationary sources) ‣ Reasonably available control technology (RACT) for MODERATE areas (sources > 250 tons/year must apply BARCT) ‣ Best available retrofit control technology (BARCT) for SERIOUS and ABOVE areas	RACT	BARCT	BARCT	BARCT
Area and Indirect Source Control Programs (i.e., Air Quality Policy of General Plan)	X	X	X	X

Note: Shasta County is a "moderate" nonattainment area under the California Clean Air Act. State law [Health and Safety Code Section 40918(g)] requires "bump-up" to a serious classification if ozone levels are not reduced (i.e., no more than three exceedances per year at any monitor).

ppm = parts per million
VMT = vehicle miles traveled

III. EMISSION INVENTORY, OZONE TRANSPORT, AND EMISSION REDUCTION SCHEDULE

A. EMISSION INVENTORY (PAST CONDITIONS)

The California Clean Air Act (CCAA) requires that nonattainment districts like Shasta County achieve a 5 percent annual reduction in emissions of nonattainment pollutants until the state ambient air quality standards are met. The benchmark for this reduction standard is the 1990 Emission Inventory, which is documented in the district's Air Quality Attainment Plan.

The table below summarizes 1990 emissions for Shasta County and indicates that about 59 tons of ROG and 63 tons of NO_x were produced each day. During 1993, 1994, 1995, and 1996, the County had 27 days when ozone levels exceeded the state standard of .09 ppm. The federal standard of .12 ppm was not exceeded.
An understanding of how ozone is produced in the northern end of the valley is important. Aside from human-produced hydrocarbons, biogenic hydrocarbon emissions are produced by plants. All of these hydrocarbon emissions are available to react with a small amount of NO_x to form ozone. With vast forested areas of the north valley, emission reductions of NO_x are preferred over reductions in ROG. Table 7 demonstrates that a primary source of emissions (NO_x and ROG) is from vehicles. This is why it is critical to reduce the total number of vehicle miles traveled and cold starts, which can be accomplished through land-use planning and development of a multimodal transportation system.

For PM_{10}, the County had a total of 13 days in the 1993–1996 time period when the state standard was exceeded.

B. OZONE TRANSPORT

The California Clean Air Act requires the state to establish mitigation measures for upwind districts commensurate with the degree of contribution to downwind exceedance of state standards. Since the

TABLE 7
NORTHERN SACRAMENTO VALLEY AIR BASIN SHASTA COUNTY EMISSIONS

Summary of 1990 Emissions by Major Source Category - Tons per Day (TPD)		
Source Category	***ROG***	***NO_x***
Stationary Sources		
Fuel Combustion	2.24	1.63
Waste Burning	1.85	.18
Solvent Use	4.92	0
Petroleum Processes	.3	0
Industrial Processes	.02	0
Miscellaneous Processes	1.08	0
Total Stationary Sources	10.41	1.81
Mobile Sources		
On-Road Mobile	42.85	54.33
Other Mobile	5.54	7.35
Total Mobile Sources	48.39	61.68
Total Shasta County	58.8	63.49

Source: Shasta County Air Quality Attainment Plan.

precise degree of transport contribution is not currently known, the state has adopted three qualitative categories of transport.

"Overwhelming," "Significant," and "Inconsequential." "Overwhelming" transport refers to the impacts of transported pollutants or precursors (ROG and NO_X) which cause the exceedance in the downwind area, (i.e., ozone transport from the Sacramento area to Redding). "Significant" transport refers to the impacts which contribute to the exceedance in the downwind area, (i.e., the exceedance is caused by both upwind and local sources). "Inconsequential" transport refers to the impacts which do not contribute to the exceedance in the downwind area, but are caused by local sources alone.

In 1993, the Bay Area/Broader Sacramento Area to Upper Sacramento Valley Transport working group was formed. The purpose of the group was to analyze transport data in an effort to verify the level of transport-caused exceedances. The working group determined that it is evident that there is transport taking place at the surface and aloft. The transport aloft normally affects the northern upper Sacramento Valley, while surface transport normally affects the southern valley, closer to the metropolitan Sacramento area.

Based on the analysis, the California Air Resources Board (CARB) recommended that the ozone violations be classified as "Significant" transport at Redding, Williams, Yuba City, and Red Bluff on some days and on other days, "Overwhelming" transport at Yuba City, Willows, Colusa, Redding, Chico, and Red Bluff. The transport classification of "Inconsequential" was recommended to be discontinued.

A Shasta County Air Quality Management District-(AQMD) sponsored field study and data analysis indicated that during the 1994, 1995, and 1996 ozone seasons, Shasta County's ozone problems were exacerbated by substantial transport of ozone and ozone precursors from the southern Sacramento Valley.

IV. FUTURE OUTLOOK

The shape that the metropolitan area of Redding will take in the next two to three decades will have an important impact on the future of our air quality and traffic management. Research indicates that land-use strategies can reduce vehicle trips, vehicle miles traveled, and the number of engine cold starts.

A. VEHICLE MILES TRAVELED (VMT)

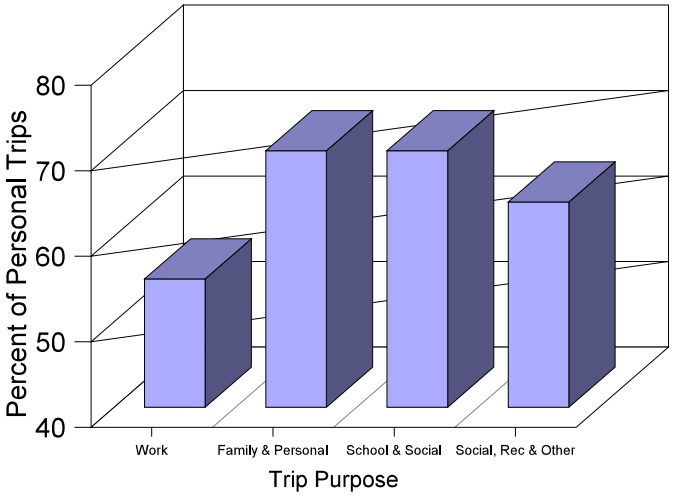
During the past 20 years, total "vehicle miles traveled" have increased twice as fast as the rate of population growth. We are driving more often, longer distances, and we also tend to be driving alone more often. Nationwide, total VMT increased by 82 percent compared to an increase in population of 23 percent between 1969 and 1990.

In California, the total annual VMT more than doubled between 1970 and 1990, increasing from 115 billion to over 250 billion miles of travel per year. During the same period of time, the state's population grew by about 51 percent. (Source: State Air Resources Board.)

Starting a vehicle that has not been driven for about one hour produces a significant amount of tail-pipe emissions because the catalyst in the catalytic converter is not yet warm enough to fully combust the exhaust gases. These are often referred to as "cold start" emissions. **The cold start typically produced more than one-half of the total emissions from a vehicle trip under 20 miles in length and 78 percent of the emissions from a trip of 2 miles or less**. Reducing the number of short vehicle trips can thus help reduce emissions from cold starts. (Source: IBID).

The following figure indicates the percentage of personal trips in the state that are five miles or less. The location and configuration of land use in part determines the distances people travel to reach employment sites, stores, houses, and other destinations. These factors also influence which mode of transportation they chose–car, vanpool, bus, walking, or bicycling. (Source: IBID).

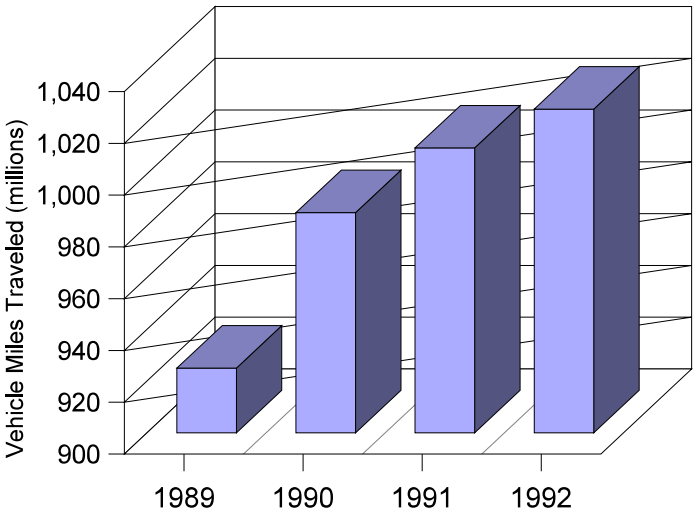
Personal Trips That are Five Miles or Less



Total vehicle miles traveled in Shasta County have steadily increased, but at a declining rate. The following figure shows that the biggest increase for the last four years occurred in 1989-90 with a 6.16 percent increase. The declining rate of increase is probably due to the drought and the recession of the 1990s, which affected tourism.

According to a 1991 report on Shasta County Transportation Control Measures, VMT in Shasta County is expected to increase by 25 percent by the year 2010. The report further concludes that the state is stringent on road vehicle emission standards, and the attrition of older less efficient vehicles will result in a decrease in the average emissions per VMT. This may produce a decrease of 35 percent in ROG between 1992

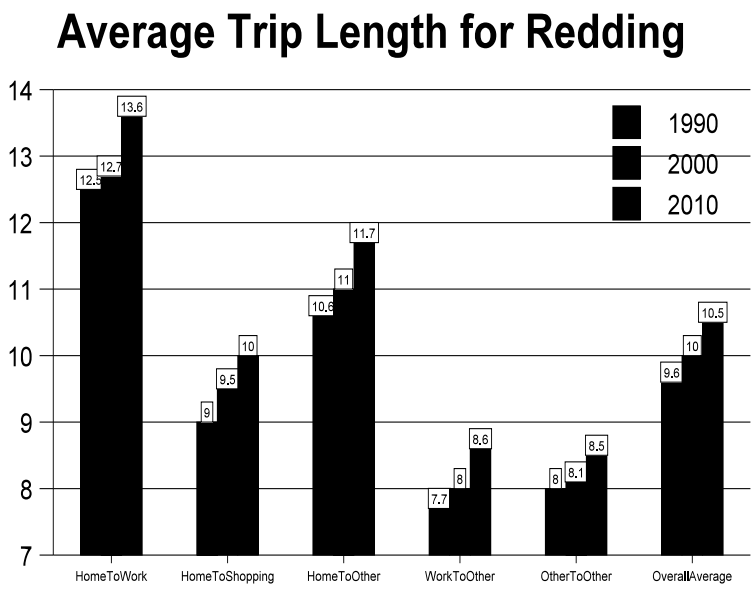
Shasta County-Vehicle Miles Traveled on Highway Network
(in millions)



and 2010, but NO_x emissions are only expected to decrease moderately through the year 2000 when no further technological improvements are expected. (Source: Transportation Control Measures Plan for Shasta County, by Jacobs Engineering Group, Inc., Santa Barbara, 1991).

The State Air Resources Board has suggested that districts categorized as "moderately" polluted with ozone can judge the annual progress toward meeting attainment by reducing the annual growth rate in VMT to 50 percent of the VMT growth in the 1980s. For Shasta County, this means the annual growth in VMT should not exceed 2.8 percent. According to Caltrans, the average rate for VMT over the last three years (1989-92) has been 3.42 percent, which is not within the state's suggested performance standard.

Based on traffic computer modeling of the City's General Plan and growth trends, it is forecasted that the overall trip length for commuters will increase in the years 2000 and 2010. This projection assumes that there is significant investment in transportation infrastructure; otherwise, the trip length will increase dramatically.



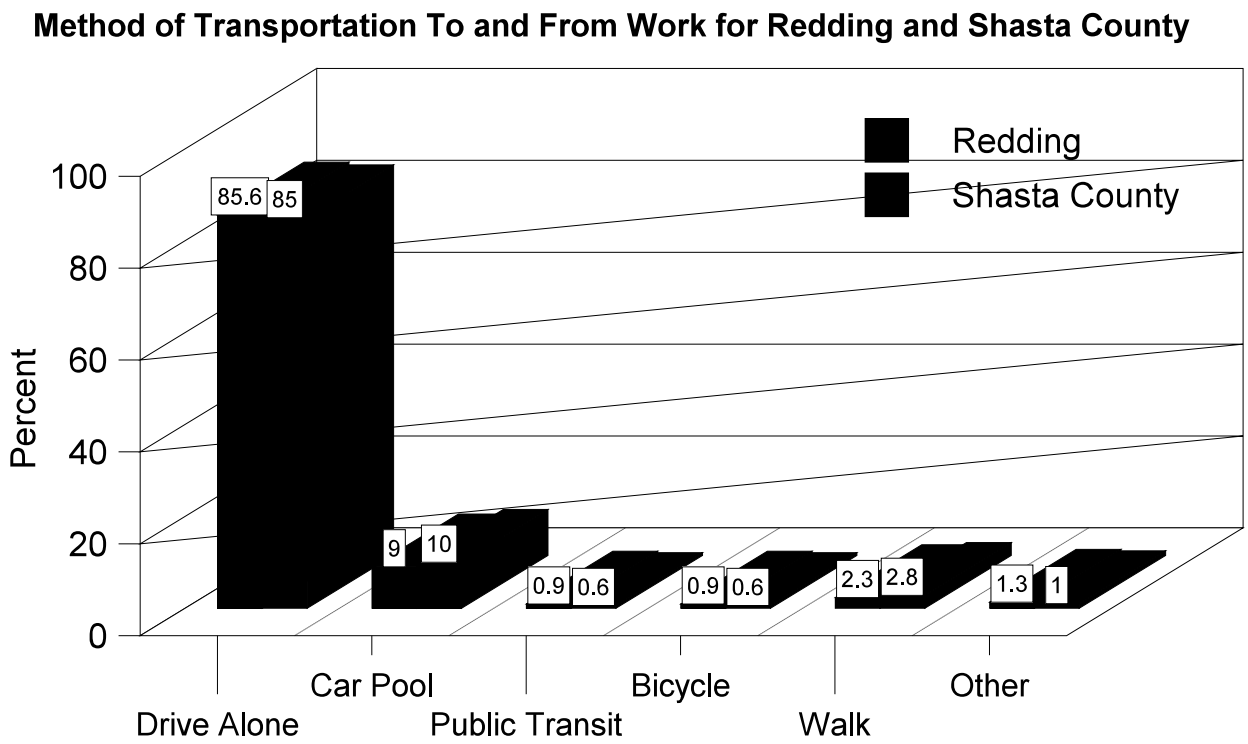
B. Air Quality and The Cost of Sprawl

Less costly land prices in fringe areas of most metropolitan areas, including the fringe areas of Redding, 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 and decreased air quality.

Also, large areas of low-density housing generally cannot justify or support effective levels of transit service. The minimum density threshold for minimal local bus service to residential areas is between four and six dwelling units per acre. At or above seven 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 that average 7 to 15 dwelling units 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 become feasible. (Source: The Linkage Between Land Use, Transportation, and Air Quality; State Air Resources Board, June 1993.)

All this points to the need for local and regional planning that avoids sprawl. Aside from improved air quality and decreased traffic congestion, the benefits of less sprawl mean less cost to City residents. The degree that the County and the metropolitan area of Redding have fostered dependency on the automobile is illustrated by the following chart on transportation modes. The chart also indicates little investment in land-use and multimodal transportation planning.



Development costs vary with lot sizes, distance to central facilities, proximity to existing development, community demographics, existing service capacity, and the requirements of local codes and standards. Yet, numerous studies dating back to 1955 all point toward a similar conclusion—sprawl is a significant burden on both home buyers and taxpayers.

While on-site development costs (sidewalks, sewer laterals) are passed on to buyers by developers as part of the price of the home, sprawl-related costs that are off site (trunk sewers, water mains, schools, fire stations, treatment plants, widening roads) are another story. While the City is charging impact fees to developers for hooking up to community infrastructure, it is frequently the case that the full costs of off-site infrastructure (including ongoing maintenance) go unpaid and, as a result, everybody pays—indirectly. (Source: "The Cost of Sprawl," Pas Memo, American Planning Association, February 1993).

For example, when new developments are built far from the water and sewer treatment plants or schools, they create higher incremental or "marginal" costs for adding new sewer collection system capacity or operating school buses. By contrast, the marginal cost of new development closer to existing services or facilities is lower. However, because costs currently are evenly distributed among all users by average-cost pricing, those who live farther away pay proportionately less. As a result, some users subsidize other users. Also, it should be noted that the funding for road maintenance is from gas tax and the City's General Fund and the long-term availability and adequacy of the funds relative to the expansion of the street system cannot be guaranteed.

C. Future Technological Advancement in Transportation

Potential advancements, clean-burning fuels, and electrical vehicles (EVs) hold great promise in meeting emission-reduction requirements, beginning in about 20 years. Other auxiliary potential improvements include compressed natural gas vehicles; electric buses powered by in-road, guide-rail paths; and light-rail (electric) multiple-unit commuter systems. While the electrical car has the greatest potential for addressing air quality issues, its omnipresence on roads and general public acceptance parallel to that of the combustion vehicle is probably many years away.

Currently, the cost in electrical vehicles is about $20,000 to $60,000 and the range is about 50 miles (top speed 65 mph) with five to eight hours for a recharge. It is anticipated that EVs could have a range of 150 miles on a single charge by the year 2013. Even if the cost through mass-production is lowered, the

infrastructure requirements for nationwide service would have to be in place. In the meantime, EV research is being done on a flywheel as an electro-mechanical device, on EV fuel cells, and on advanced EV batteries.

Motorists take for granted the infrastructure that supports the nearly 190 million gasoline-powered cars on the road today. There is a gas station at almost every major commercial intersection; mechanics armed with hi-tech equipment can fix problems; and if they want, owners can change their own oil in the driveway.

This sophisticated system did not happen over night. It evolved over many years. It is believed that motorists are not going to abandon their current combustion vehicles and this support system without just cause.

The electrical-vehicle operator must have the assurance that the infrastructure to support the operation, maintenance, and servicing of electric vehicles is in place when the transition to electrical vehicles is made. Broadly defined infrastructure for electrical vehicles includes techniques and equipment used to recharge the electric vehicle, service and maintenance training for mechanics, and development of safety protocols for rescue personnel responding to accidents involving electrical vehicles. (Source: "Parking Magazine, The Electrical Car: The Next Transportation Revolution," July/August 1993).

If market forces respond favorably to zero-emission vehicles, then most households in California and Shasta County could have at least one EV for short (day-long) commuter trips totaling 30 to 50 miles by the year 2013, which would solve much of the pollution problem caused by cold combustion engine starts. The problem is that there will be significant traffic gridlock caused by too many combustion vehicles and EVs unless the approach to traffic and land-use planning changes.

All of this points to the long-term need to reduce VMTs for any type of vehicle including combustion vehicles and possibly EVs, to reduce the number of cold engine starts, to increase the occupancy of commuter vehicles, and to increase development of multimodal transportation–none of which can occur without proper land-use planning, funding for infrastructure, and public acceptance.

V. ISSUES, GOALS, POLICIES, AND IMPLEMENTATION

A. Communication, Cooperation, And Coordination

Issue:

Air pollution is a complex problem with many potential inequities. 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. The problem of cooperation in the areas of land-use and transportation planning is hampered by the concern that adjoining jurisdictions will not commit to mutual restraints which may restrict lifestyle choices, economic growth, and urban expansion.

GOAL 1
EFFECTIVE COMMUNICATION, COOPERATION, AND COORDINATION IN DEVELOPING AND IMPLEMENTING COMMUNITY AND REGIONAL AIR QUALITY PROGRAMS.

(Discussion: 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 the importance of air quality impacts of development. Strong and consistent application of CEQA can make a significant difference in project level air quality impacts. Each jurisdiction is responsible for ensuring that CEQA is mutually complied with.)

Objective 1a: ***To accurately determine and fairly mitigate the local and regional air quality impacts of proposed projects.***

Implementation Strategy:

- The goals and objectives of this element can only be achieved if there is adequate funding for the increased responsibilities of the Planning Department imposed by the California Clean Air Act, congestion management legislation, and the County's Air Quality Attainment Plan.

Policy 1 Air Quality Analysis

The City will require an air quality impact analysis using the recommended methods promulgated by the Air Quality Management District (AQMD) for all projects that are subject to CEQA review and which exceed emissions thresholds established by the AQMD.

Implementation Strategy:

- The City will follow the air quality analysis processing procedure illustrated in the flow chart at the conclusion of the element and as discussed in Chapter VI.

- Participate with the AQMD in developing and refining existing countywide emission thresholds and procedures for performing air quality impact analysis. These methods are set forth in Chapter VI of this element.

- To meet emission thresholds of Chapter VI, the following standards shall apply to each proposed project as explained in Section I of Chapter VI:

    1. If the proposed use does not exceed Level "A" emission thresholds, then the use must at least reduce emissions by 20 percent by applying BAMM (this standard addresses the need to mitigate the cumulative impacts of individual small projects).

    2. If, after applying BAMM, the use still exceeds Level "A" threshold, then the use must at least achieve a minimum emission reduction of 20 percent with BAMM.

    3. If, after applying BAMM, the use still exceeds Level "B" threshold, then a minimum of 25 percent of the unmitigated emissions exceeding 137 pounds per day must be offset by reducing emission from existing sources of pollution; otherwise, an EIR is required to fully

address air quality impacts, emissions, mitigations, and project alternatives. The EIR must also address the reasons why the emission offsets should be waived based on potential overriding considerations (as permitted) and CEQA.

Since Level "B" threshold will probably only be triggered by large General Plan amendments as opposed to development projects, it is important that programmatic mitigations be made part of the amendment so that the cumulative impacts of discretionary and nondiscretionary projects are mitigated.

4. If, after applying BAMM to the proposed project, the calculated emissions still cannot at least achieve a 20 percent reduction of Level "A" threshold and the City has determined that all feasible and best available mitigations have been applied, then the City may adopt a mitigated negative declaration.

Policy 2 Report on Cumulative Air Quality Impacts

The City Department of Planning and Community Development will submit a report to the Planning Commission for approval which identifies the cumulative transportation and air quality impacts of all General Plan amendments approved during the previous year in the Annual General Plan Status Report.

Implementation Strategy:

- Continue to improve the City's traffic model that tracks changes in land use by traffic analysis zone. Work with the AQMD in performing air emissions modeling on the cumulative land-use changes.

Policy 3 Tracking Program for Cumulative Air Quality Impacts

The City will establish an information program for decision makers that tracks the cumulative emissions of all approved projects so there is a relative understanding of the impacts of small and large projects as well as proposed projects.

Implementation Strategy:

- Work with the County and the AQMD to establish a uniform tracking program similar to the procedure discussed in Chapter VII, Section "I."

Policy 4 Uniform Air Quality Assessment Guidelines

The City will support the development, refinement, and use of uniform air quality impact-assessment guidelines that will provide standard criteria for determining significant environmental effects, that will provide a uniform method of calculating project emissions, and that will provide standard mitigation measures to reduce air quality impacts.

Implementation Strategy:

- Work with the AQMD and other local planning agencies to implement standards that are uniform throughout the County and possibly our air basin as directed by the Air Pollution Control Board.

(Discussion: Coordination and cooperation are embraced by all, but we seldom achieve effective coordination and cooperation in government programs. Competitive and adversarial relationships between agencies have proven counterproductive. Working together for a common interest can multiply the resources available to accomplish air quality goals and preserve federal and state transportation funds.)

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

Policy 5 Uniform Countywide Air Quality Programs

The City will coordinate with other jurisdictions in the County to establish parallel air quality programs, application of CEQA, and implementation measures (trip-reduction ordinances, wood stove ordinance, and indirect source programs, etc.).

Implementation Strategy:

- Be involved in the rule development process by designating a City staff representative to work with the AQMD.

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

Policy 6 Review Projects in Other Jurisdictions

The City will notify and request comments from neighboring cities and the County and affected agencies during review of General Plan amendments involving two acres or more and other significant discretionary projects which may affect the adjoining jurisdiction.

Implementation Strategies:

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

- The City 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 the City of a pending project, the City should examine air quality related issues such as the following:

    1. Congestion on roads (i.e., levels of service) from increased traffic caused by the project.

    2. Projected need for deficiency plans.

    3. Effects on the viability of transit and pedestrian-oriented developments (i.e., approval of a low-density development on the same transit corridor could reduce the ability of the transit provider to provide reasonable headway).

    4. Failure of the other jurisdiction to require the construction of a segment of a bikeway planned in the Regional Bikeway Plan.

    5. Proposed circulation amendments that may restrict traffic flow to or from the City or that increase urban sprawl.

(Discussion: Transportation planning has emphasized the construction of new roadway capacity to reduce congestion and to meet the needs of development. Air quality legislation now mandates all transportation plans to consider air quality. This new emphasis requires land-use and transportation plans to create patterns of development and transportation infrastructure that reduce the need for new capacity and improves air quality.)

Policy 7 Comprehensive Land Use, Transportation, and Air Quality Planning

The City will continue to integrate land use, transportation, and air quality planning to make the most efficient use of public resources and to carry out the policies and goals of this element.

Implementation Strategy:

- Future amendments to the General Plan Diagram will take into consideration the link between land use and circulation and its potential impacts on air quality.

- The City should establish precise zoning districts for property to reflect the long-term policies of the Air Quality, Circulation, and Land Use Elements and other policies of the General Plan.

Policy 8 Regional and Local Plan Consistency

All City submittal of projects to be included in regional transportation plans (Regional Transportation Improvement Plan [RTIP], County's Congestion Management Plan [CMP], etc.) should be consistent with the goals and policies of this General Plan Element.

Implementation Strategy:

- Analyze project submittal 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 CMP process have a profound impact on where development will take place and what its composition will be.)

Policy 9 Transit Planning

The City should consult with transit providers to determine project impacts on long-range transit plans and ensure that impacts are mitigated.

Implementation Strategy:

- Consult with transit providers during the CEQA process to determine the impacts of development projects on the transit system and require developers to mitigate those impacts.

Policy 10 Consolidation of Transit Services

The City should continue to support the upgrading and consolidation of transit services within the metropolitan area to maximize the efficiency of transit services while minimizing the costs of transit services. This policy would also apply to small transit providers serving special groups like seniors. Consolidating these services can increase ridership per vehicle and reduce miles traveled.

Implementation Strategy:

- Encourage the Regional Transportation Planning Agency to include transit consolidation policies in the Regional Transportation Plan, which also calls for the upgrading of services to include comfortable transit stops, express services, and modern equipment to help increase ridership and reduced air emission from transit vehicles.

Policy 11 Transit and Affordable Housing

The City should work with the Housing Authority, transit providers, and developers to accommodate the construction of low-income housing developments that use transit-oriented and pedestrian-oriented design principles.

EDUCATION

(Discussion: Without the understanding and support of the general public, employers, and project developers, 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 1c: To help the public understand the impact of individual transportation and land-use decisions on air quality.

Policy 12 Air Quality Education

The City should support and participate in the air quality education programs of the AQMD. The City should assist in educating developers and the public on the benefits of pedestrian and transit-friendly development.

Implementation Strategy: To be formed.

Policy 13 New Transportation Technology

The City should anticipate new technology in transportation so that opportunities are not foreclosed by relying on old technology.

Implementation Strategy:

- The City will monitor advancements in new technology regarding electric vehicles and cleaner burning combustion vehicles to ensure that future land-use and transportation systems can easily interface with the technology when it is available; and where reasonable, the City will pursue the development of joint-venture projects involving new technology.

PUBLIC FACILITIES/OPERATIONS

(Discussion: City government shall, as much as possible, take a leadership role in implementing employer-based, trip-reduction programs and fleet operator programs to reduce its own emissions and to provide a model for the private sector.)

Objective 1d: City government shall, as much as possible, operate its facilities to serve as a model for the private sector in implementing air quality programs.

Policy 14 Trip-Reduction Programs

The City will, as much as possible, take the lead in implementing innovative employer-based, trip-reduction programs by ensuring that employment

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

Implementation Strategy:

- Work with AQMD transportation specialist in identifying affordable innovative employee-based, trip-reduction programs.

Policy 15 Replacement of Conventional Fuel Vehicles

The City should adopt a schedule to replace or convert conventional fuel vehicles with alternative fuel vehicles as rapidly as feasible based on available funds.

Policy 16 Teleconferencing and Telework Centers

The City should support the development of a teleconference center for the community and small telecommunication work centers in new development. This can be accomplished by working with the telephone company and other interested public and private agencies, developers, and hotel operators in developing a multi-user teleconferencing center and small telework centers.

Implementation Strategy:

- Study committee to be formed provided funding for planning and feasibility studies can be obtained from the AQMD.

B. Land Use, Transportation, and Air Quality

Issue:

Motor vehicle use is the primary cause of exceeding State ozone standards in most of the northern Sacramento Valley. The land-use pattern and transportation system developed over the last 30 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 2
Reduce motor vehicle trips and vehicle miles traveled and increase average vehicle ridership (AVR).

(Discussion: 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

(Discussion: The existing land-use pattern in the City's planning area could be more conducive to walking, bicycling, and transit use. This realization is reflected in the policies of this General Plan and the land use configurations of the General Plan Diagram. Redding cannot possibly match the success that cities like Portland, Oregon, and Davis, California, have had with bicycle and pedestrian systems because of lifestyle choices, extreme season temperatures, and topography, but the City can do more than it has. Most office developments have low employment densities and are often isolated from commercial services, causing people to drive to eat lunch or to complete errands. In some areas, high-density residential projects often have little if any commercial development nearby or discourage pedestrian access to commercial uses with land-use barriers, block walls, and cul-de-sac streets. The most common single-family lot size of 6,000 to 10,000 square feet leads to population densities [3.0 to 4.0 units per acre] too low to support frequent and direct transit service. The predominant suburban development patterns force all local trips for shopping, recreation, and school as well as commute trips onto the arterial street system. This leads to ever wider, more congested arterial streets which in turn discourage people from walking even when the destination is just across the street.)

Policy 17 Transit and Pedestrian-Oriented Design Guidelines

The City shall make air quality and mobility prime considerations when reviewing any proposed change to the land-use pattern. Such consideration shall include, as much as possible, increased transit and pedestrian mobility. This step shall be part of the CEQA process and apply reasonable Best Available Mitigation Measures (BAMM) to projects that exceed the significance thresholds promulgated by the Air Quality Management District.

(Discussion: A comprehensive transit/pedestrian oriented program achieves air quality benefits by creating an environment conducive to the use of alternative modes of transportation. The California Air Resources Board [CARB] estimates that an overall reduction of 10 to 23 percent in regional vehicle travel can be achieved with a combination of land use, transit, and other mode shift strategies. Mixed-use and higher-density strategies can achieve 20 to 50 percent reduction in site specific travel and 4 to 11 percent regionally [CARB 1990]. The wide range of these estimates is due to a large number of factors that can affect travel mode choice at individual sites. The regional reductions are dependent on the extent of implementation throughout a jurisdiction. In addition, as these strategies are implemented throughout the County, potential reductions in site specific travel also become greater.)

Policy 18 High Density and Transit

The City shall, as much as possible, continue to plan high-density development in areas that can be fitted with a transit system.

Implementation Strategy:

- Continue to designate high- and medium-density housing at appropriate sites during General Plan updates and developer-initiated General Plan amendments.

- 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.

(Discussion: The Institute of Traffic Engineers [ITE] Trip Generation Manual assigns approximately 40 percent fewer trips to apartments and condominiums than it does for single-family housing. 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. 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. The ability of public facilities to absorb increased demand for services must also be considered.)

Policy 19 Mixed Use—Bicyclists and Pedestrians

The City shall continue to encourage mixed-use developments near employment centers that provide commercial services such as day-care centers, restaurants, banks, and stores.

Implementation Strategy:

- Maintain the "Mixed Use Village" overlay within the General Plan, which provides significant incentives for developments that permit bicyclists and pedestrians to safely travel between uses and their homes. Tailor the allowed uses to those best suited for a pedestrian environment and designate mixed-use areas on the land-use plan during General Plan updates.

- Adopt zoning regulations that permit upper story residential uses in neighborhood shopping areas. These upper story uses can include residential and office.

Policy 20 Funding for Pedestrian and Bicyclist Mobility

The City should provide funding opportunities and options for the development of pedestrian and bicyclist corridor construction.

Implementation Strategy:

- The City should authorize park development fees to be used to develop pedestrian and bicycle landscape corridors between existing commercial developments. This funding could be augmented by other funding sources. Funding could also come from annual assessment fees provided property owners approve of the formation of a landscape maintenance district pursuant to the 1972 Landscape and Lighting Act or through the use of an "in-lieu" fee system. The corridors could incorporate seating, decorative street furniture and paving material, portable fast-food carts for licensed vendors, newspaper and magazine stands, and some shaded area with drinking fountain and possibly a water fountain incorporated into the landscaping.

(Discussion: Nationwide, 38 percent of all vehicle trips are for shopping or personal business and about 60 percent of these trips are between one-half mile and five miles in length. 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, 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 some personal business and shopping trips if the trips were reduced to one-half mile in length and bicycle paths and pedestrian walkways were provided [CEC 1992].)

Policy 21 Parking and Multi-modal Transfer Sites

The City will work with the Redding Area Bus Authority in planning multi-modal transfer sites that incorporate auto parking areas, bike parking, transit, pedestrian and bicycle paths, and park and ride pick-up points.

Implementation Strategy:

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

LAND USE: COMPACT DEVELOPMENT

(Discussion: Sprawling, low-density development and discontiguous development discourages the use of alternative transportation modes and increases travel distances. Infrastructure costs and environmental impacts are less when development is more compact.)

Objective 2a: ***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 22 Leap-Frog Development

The City shall continue to encourage compact infill development.

Implementation Strategy:

Support infill projects by ensuring that leap-frog projects pay the full cost of the extended infrastructure and the pro rata share of the cost of increased capacity of sewer, water, electricity, and circulation. Encourage growth to occur in and around activity centers, transportation nodes, under-utilized infrastructure systems, and redevelopment areas.

Policy 23 Higher Densities

The City shall consider redesignating vacant lands suitable for higher densities and transit/pedestrian-oriented developments during future General Plan updates and periodic reviews.

Policy 24 Single-Family and Mixed-Use Conflicts

The City shall encourage projects within urban areas that will improve the effectiveness of the transit system and will not adversely affect existing single-family development.

Implementation Strategy:

Encourage commercial uses that are complimentary to urban employment centers and residential areas. Strategically locate high-density development so that it doesn't conflict with single-family uses and so that it provides good transit access. Design pedestrian corridors to serve as buffers between mixed uses.

Policy 25 Sphere of Influence

The City will work with the Local Agency Formation Commission, Cities of Anderson, Shasta Lake, and the County in establishing a hard edge urban limit line for the boundary of the metropolitan area of the County and commitment to providing public services only within the urban areas.

Implementation Strategy:

- City shall continue its policy of designating water and sewer service areas that closely correspond to the land-use plan.
- Ensure that long-range infrastructure development plans accommodate growth in the desired areas.
- Expand public services incrementally to serve contiguous development and encourage the development of services to serve urban densities as opposed to rural fringe areas of the City.

TRANSPORTATION INFRASTRUCTURE: BICYCLE, PEDESTRIAN, AND TRANSIT

(Discussion: The transportation infrastructure developed in the metropolitan area of the County supports the automobile at the expense of other modes of transportation. Placing new emphasis on transit, bicycling, and pedestrian infrastructure can relieve pressure from the traditional roadway system and improve air quality.)

Policy 26 Pedestrian, Bicycle, and Transit Funding

The City should ensure that state and federal funds earmarked for bicycle and transit improvements are used for those purposes and vigorously pursue funds for new bicycle and transit improvements.

Policy 27 Bus Turnouts and Shelters

As a condition of project approval, the City shall require dedication of land for bus turnouts and shelters at sites deemed appropriate and necessary.

Policy 28 Bikeway and Pedestrian Plan

The City shall ensure that the Regional Bikeway Plan and the City's Comprehensive Bikeway Plan include a comprehensive system of bikeways and pedestrian paths, which is planned and constructed in accordance with the adopted plan, based on analysis of existing and future use by the area to be served.

Implementation Strategy:

To maximize bicycle use, the following policies and actions should be included in street design standards, subdivision ordinances, zoning ordinances, and the Circulation Element of the General Plan:

- The bikeways should be part of a network that connects major destination points within the community. The Sacramento River Trail, along with its planned extension, can serve as the arterial for a network of feeder bikeways and pedestrian trails.
- Provide separate bike paths in areas where motor vehicle speed or volume make on-street bike lanes unsafe or unpleasant to use.
- Provide automatic traffic signal actuators embedded 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.
- Use grant and other funds to provide bicycle and pedestrian bridge crossings for creeks and the Sacramento River.
- Provide adequate paved shoulder on arterials and collectors to keep cyclists and motorists separate.
- The City should require developers to provide bicycle racks or enclosed and locked bicycle storage at major activity centers and office and commercial establishments to serve patrons and employees.
- Do not allow on-street parking on roadways designated with bike lanes whenever possible.
- Increase bicycle use by requiring projects to include the provision for bike racks or enclosed and locked bicycle storage at major activity centers and office and commercial establishments.

- The foregoing provisions shall not be applied to projects if there is no likelihood of need, use, or forecasted use by pedestrians or bicyclists.

C. Fugitive Dust/PM_{10}

Issue:

The levels of PM_{10} (dust) and visibility reducing particulates in the City's air basin frequently exceed state standards. Control efforts for sources under the jurisdiction of cities and counties can significantly reduce these emissions.

Goal 3
Reduce particulate emissions from sources under the jurisdiction of the City.

Policy 29 Reduce Particulates

The City will require measures to reduce particulate emissions from construction, grading, and demolition to the maximum extent feasible.

Policy 30 Unpaved Roads and Alleys

The City will develop a priority schedule for paving roads and alleys based on availability of funds, grants, and cooperation of adjoining property owners.

D. Woodburning

Issue:

Residential wood burning contributes to winter carbon monoxide and PM_{10} emissions and exceeding State standards. Fireplace and wood stove technology and products are readily available that can significantly reduce these emissions at a reasonable cost.

Goal 4
Minimize air pollutant emissions from wood burning fireplaces and appliances.

Policy 31 Phase 2 Wood Stoves

The City will only allow developers to install low-emitting, Environmental Protection Agency (EPA) certified Phase 2 or more stringent fireplace inserts and/or wood stoves or pellet stoves.

Implementation Strategy:

- Adopt a local ordinance, promulgated by the AQMD, requiring new wood burning appliances to be EPA certified. Participate in a public education campaign.

Policy 32 Green or Wet Wood

The City should encourage the AQMD to annually advertise the importance of burning only seasoned dry wood.

Implementation Strategy:

- AQMD should utilize radio billboard advertising seasonally to remind and educate residents of the importance of burning only seasoned dry wood as a means to reduce emissions and to educate consumers about the financial and environmental benefits of replacing their old wood heating devices with Phase 2 stoves and fireplace inserts. This program should be coordinated with local wood stove retailers who benefit from such sales.

Policy 33 Changeout

The City should encourage the AQMD to adopt a countywide rule that requires a changeout for existing wood heating devices at the time of change of property ownership. The rule should be proposed if the County continues to exceed state PM_{10} standards. The community needs a minimum of two years lead time before this rule takes effect.

Implementation Strategy:

- Work with the AQMD, the Shasta Board of Realtors, and the Builders Exchange in developing such a rule when needed.

VI. AIR QUALITY ANALYSIS AND BEST AVAILABLE MITIGATION MEASURES

The following guide to mitigating motor vehicle-related impacts for proposed residential, commercial, and industrial projects was prepared by the Shasta County Air Quality Maintenance District (AQMD) as a recommended approach to meeting the goals of the City's Air Quality Element. The California Environmental Quality Act (CEQA) states that a public agency should not approve a project unless feasible alternatives are considered and mitigation measures incorporated that would substantially lessen any significant effects on the environment (unless overriding considerations are made pursuant to CEQA Guidelines Section 15093).

If the impacts cannot be mitigated below the significance threshold, they must nevertheless be reduced. CEQA describes various types of mitigation as follows:

- Avoiding impacts altogether by not taking a certain action or part of an action
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation
- Rectifying impacts by repairing, rehabilitating, or restoring the impacted environment
- Reducing or eliminating the impacts over time by preservation and maintenance operations during the life of the action
- Compensating for the impacts by replacing or providing substitute resources
- Reduce or eliminate impacts by adopting an environmentally superior alternative.

Section 15041 (a) of the state CEQA guidelines states that the lead agency has the authority to require changes in any or all activities involved in a project in order to lessen or avoid significant effects on the environment. The AQMD, as a local responsible CEQA agency, has a duty to recommend mitigation to lessen air quality impacts.

In addition to CEQA requirements, mitigation of impacts is necessary to achieve the goals of the City's Air Quality Element and the state's ambient air quality standards. Specifically, all future sources of emissions, including those associated with land development, must be mitigated to the greatest extent possible to achieve ambient air quality standards expeditiously.

A. CATEGORIES OF MITIGATION MEASURES

The BAMM of this chapter are offered as a guide to stimulate the thinking of developers and the City regarding the need to take advantage of existing and built-in project mitigations which would reduce the need to apply more exotic and expensive emission-reducing mitigations.

The AQMD-recommended sample mitigation measures are divided into two categories: **Standard Mitigation Measures (SMM)** and **Best Available Mitigation Measures (BAMM)**. It should be reiterated that the sample mitigation measures of this chapter are only provided to demonstrate the procedure for applying SMM and BAMM. The AQMD recommends that SMM be applied to **all** projects regardless of the extent of air quality impacts in order to reduce cumulative impacts. The recommended BAMM or equally effective BAMM of the local agency should be applied as appropriate when a project has an impact on air quality above the specified impact threshold levels.

All projects contribute to cumulative air quality impacts and should employ the appropriate SMM at a minimum. (See SMM list below.) Cumulative impacts of projects such as convenience markets, small office developments, residential subdivisions of 100 or less, etc., must be mitigated even where a Negative Declaration is deemed the appropriate environmental document. Not only will this approach reduce overall emissions caused by cumulative impacts, but it will also reduce the likelihood that large projects will need to carry a larger burden of mitigation. Assume for example that several small projects are approved without mitigation. A larger project may subsequently be required to mitigate for cumulative impact regardless of shared responsibility.

B. PROJECT ANALYSIS

The BAMM apply to any residential, commercial, or industrial project which exceeds the above significance thresholds. Determining the mitigation measures that may apply to a specific project requires first operating the URBEMIS model. This model is a California Air Resources Board approved computer program that is

used to quantify emissions resulting from increased automobile traffic from new or modified land uses. The program considers the number of vehicle trips generated, vehicle miles traveled for each type of trip taken, and the associated air emissions.

The computer model shall be used by the planning department at the beginning stages of a land-use project when the initial study is conducted to determine the air quality impacts on the environment. More advanced URBEMIS models may be used if approved by the State Air Resources Board and accepted by the AQMD. The defaults of the model shall be modified as noted in the conclusion of this chapter. These defaults shall be used unless other defaults are authorized by the AQMD. (The flow chart at the conclusion of this chapter illustrates the stages of air quality analysis for projects.) Once the impacts have been identified using the URBEMIS computer model, the appropriate level of BAMM are applied to the project. The BAMM are applied at specific threshold levels, which are the same for commercial/industrial and residential levels.

The following AQMD's thresholds for analysis and mitigation are consistent with the New Source Review Rule 2:1 which the Air Pollution Control Board adopted to comply with the California Clean Air Act:

Threshold for BAMM

LEVEL "A"
1. 25 pounds per day of oxides of nitrogen
2. 25 pounds per day of reactive organic gases
3. 80 pounds per day of inhalable particulate matter (PM_{10})

Threshold for Additional Air Quality Analysis and Mitigation Measures

LEVEL "B"
1. 137 pounds per day of oxides of nitrogen
2. 137 pounds per day of reactive organic gases
3. 137 pounds per day of inhalable particulate matter (PM_{10})

C. Steps for Air Quality Analysis and Project Mitigation

1. Run the URBEMIS computer model prior to or at the time the initial environmental study is conducted to determine the total unmitigated project emissions related to motor vehicle trip generation.

2. If a project has emissions less than the Level "A" threshold noted above, only feasible Standard Mitigation Measures (SMM) are required.

3. If a project has emissions greater than the threshold Level "A" noted above, apply all feasible mitigation measures for construction and/or operation from the lists of recommended Standard Mitigation Measures and appropriate Best Available Mitigation Measures as determined by the City.

4. For large projects to be developed in phases, each phase shall be treated as a separate project in terms of providing emission reduction as noted in Table "I" of this chapter. The requirement for an EIR and offsets is still applicable if all the phases exceed Level "B" threshold.

5. Large, phased projects should receive credit for reduced vehicle emissions based on the regional market they serve; however, the project proponent must submit traffic data that documents the reduced VMT for the regional area relative to the 20-year growth forecast of the area. The forecasted traffic data must consider the growth of the area with and without the project.

6. Only feasible mitigation measures listed and Level "B" of this section shall be applied if project emissions exceed the Level "B" threshold. To determine the degree of emission reduction to be mitigated, the following additional analyses should be completed:

   a. Calculate emission reductions available from each mitigation measure by multiplying the percent efficiency of each mitigation measure by the total unmitigated project emissions. (Reference Emission Tables for the efficiency of each mitigation measure.)

      If project-specific efficiency is unknown, use the mid-range value in the efficiency range given in the Table unless justification is provided by the applicant to use a higher efficiency. The Planning Department, in consultation with the AQMD, shall determine the efficiency of each mitigation measure.

   b. To determine mitigated project emissions, subtract total emission reduction from total unmitigated project emissions.

c. If the project's impacts are reduced below the 137 pound per day threshold for oxides of nitrogen and reactive organic gases and/or the 80 pound per day threshold for inhalable particulate matter (PM_{10}), a Mitigated Negative Declaration (MND) may be appropriate if other impacts are not anticipated.

d. Determine if the project's emissions still exceed the above threshold of significance.

e. If the project emissions remain above the 137 pound per day threshold, emission offsets are required. A minimum of 25% of the unmitigated emissions exceeding the 137 pound per day threshold must be offset by reducing emissions from existing sources of air pollution. The Shasta County AQMD should be contacted to determine appropriate offsets. If the project emissions still exceed the above threshold with emission offsets credited, an Environmental Impact Report (EIR) should be prepared, focusing on air quality, traffic impacts, and project alternatives. (See attached sample calculation.)

f. If air quality impacts are not significant, then a Negative Declaration may be appropriate if other impacts do not exist.

D. Recommended Standard Mitigation Measures (SMM) Applicable to All Projects

1. Provide energy-efficient process systems, such as water heaters, furnaces, and boiler units.

2. Apply nontoxic soil stabilizers according to manufacturer's specification to all inactive construction areas (previously graded areas inactive for ten days or more).

3. Reestablish ground cover on the construction site through seeding and watering prior to final occupancy.

4. All grading operations of a project shall be suspended when winds (as instantaneous gusts) exceed 20 miles per hour as directed by the AQMD.

5. All new wood burning devices shall be EPA Phase II certified.

6. Streets should be designed to maximize pedestrian access to transit stops.

7. Large residential, commercial, and industrial projects should include bus shelters at transit access points.

8. Provide temporary traffic control as appropriate during all phases of construction to improve traffic flow (e.g. flag person).

9. Schedule construction activities that affect traffic flow to off-peak hours.

10. Water active construction sites at least twice daily as directed by the Public Works Department.

11. All truck hauling dirt, sand, soil, or other loose materials should be covered or should maintain at least two feet of freeboard (i.e., minimum vertical distance between top of the load and the trailer) in accordance with the requirements of CVC Section 23114. This provision is enforced by local law enforcement agencies.

12. Sweep streets at the end of the day if visible soil materials are carried onto adjacent public paved roads (recommend water sweeper with reclaimed water).

13. Install wheel washers where vehicles enter and exit unpaved roads onto paved roads, or wash off trucks and any equipment leaving the site each trip.

Note: Additional mitigations may be obtained from the CEQA Air Quality Handbook prepared by the South Coast Air Quality Management District, Diamond Bar, California (April 1993). Copies are available for review in the Redding Department of Planning and Community Development.

E. Residential Projects: Recommended Best Available Mitigation Measures (BAMM)

Level "A" Measures

1. Implement all applicable Standard Mitigation Measures.

2. Contribute to traffic-flow improvements that reduce emissions and are not growth-inducing (e.g., right-of-way, capital improvements, etc.).

3. Install an electrical outlet at the front and back of all residential units for electrical yard equipment.

Level "B" Measures

1. Implement all applicable Standard Mitigation Measures and Level "A" Mitigation Measures.

2. Construct, contribute, or dedicate land for the provision of off-site bicycle trails linking the facility to designated bicycle commuting routes in accordance with an adopted citywide or countywide plan.

3. Synchronize traffic signals along streets impacted by development.

4. Construct on-site and off-site bus turnouts, passenger benches, and shelters.

5. Provide for pedestrian access between bus service and major points within the development.

6. Construct off-site pedestrian facility improvements such as overpasses and wider sidewalks.

7. Include neighborhood retail sales and services within or adjacent to residential subdivisions. (Note, this provision cannot be applied until the City's Land Use Element has been revised to allow mixed use.)

8. Orient building structures and install landscape that takes advantage of passive solar design principles.

RESIDENTIAL PROJECTS
Sample Mitigation Measure Efficiencies for Controlling
Indirect Mobile Source Emissions

Mitigation Measures	Emission Reduction Efficiency		
	ROG	NO_x	PM_{10}
‣ Construct on-site or off-site bus turnouts, passenger benches, and shelters	0.2-1.9%	0.2-2.5%	0.2-2.5%
‣ Construct off-site pedestrian facility improvements such as overpasses and wider sidewalks	0.1-0.3%	0.1-0.4%	0.1-0.4%
‣ Contribute to regional transit system improvements (e.g., right-of-way, capital improvements, etc.)	4.0-8.0%	4.0-8.0%	4.0-8.0%
‣ Synchronize traffic lights on existing streets impacted by development	4.0-8.0%	4.0-8.0%	4.0-8.0%
‣ Construct, contribute, or dedicate land for the provision of off-site bicycle trails linking the facility to designated bicycle commuting routes	0.1-0.6%	0.1-0.8%	0.1-0.8%
‣ Include retail services within or adjacent to residential subdivisions	1.0-4.0%	1.3-6.0%	1.3-6.0%
‣ Provide for pedestrian access between bus service and major points within the development (e.g.,sidewalks, paths, walkways)	0.1-3.0%	0.1-3.0%	0.1-3.0%
‣ Orient buildings for passive solar design	1.0-2.0%	1.0-3.0%	1.0-5.5%
‣ Include neighborhood telecommunication or telework center within residential subdivision	1.0-5.0%	1.0-5.0%	1.0-5.0%
‣ Include residential development within commercial core area or business district	4.0-13.0%	4.0-13.0%	4.0-13.0%

NOTE: The Redding Planning Department, in consultation with AQMD, will determine the degree of efficiency for the mitigations of this table, but generally, the average of the range shall be used.

9. Install solar water heaters for at least 25 percent of the residential units in the development.

10. Incorporate mixed use development in order to achieve a balance of commercial, employment, and housing options within the project site. (Note, this provision cannot be applied until the City's Land Use Element has been revised to allow mixed use.)

11. Provide neighborhood park(s) or other recreational options such as trails within development to minimize vehicle travel to other parks or commercial areas.

12. Provide densities of six units or greater to support transit.

F. Commercial/Industrial Projects: Recommended Best Available Mitigation Measures (BAMM)

Level "A" Measures

1. Implement all applicable Standard Mitigation Measures.

2. Contribute to traffic-flow improvements that are not growth-inducing (e.g., right-of-way, capital improvements, etc.).

3. Provide preferential parking spaces for carpools and vanpools and provide 7-foot 2-inch minimum vertical clearance in parking facilities for vanpool access.

Level "B" Measures

1. Implement all applicable Standard Mitigation Measures and Level "A" Mitigation Measures.

2. Telecommuting programs, alternate work schedules, and guaranteed ride home programs shall be established as appropriate.

3. Provide for transit-use incentives such as subsidized transit passes and accommodation of unusual work schedules to encourage transit use.

4. Convert fleet vehicles to clean-burning fuel as appropriate.

5. Shower/locker facilities shall be provided when appropriate for bicycling and pedestrian commuters.

6. Construct off-site bicycle and pedestrian facility improvements such as trails linking the facility to designated pedestrian/bicycle commuting routes.

7. Provide on-site services such as cafeterias, food vending machines, automatic tellers, etc., as appropriate.

8. Contribute to construction of off-site park-n-ride lots.

9. Provide on-site child care and after-school facilities or contribute to off-site development within walking distance.

10. Construct on-site pedestrian facility improvements such as walk paths and building access which is physically separated from street and parking lot traffic.

11. Implement compressed work-week schedules where weekly work hours are compressed into fewer than five days, such as 9/80, 4/40 or 3/36.

12. Construct on-site and off-site bus turnouts, passenger benches, or shelters.

13. Provide adequate bicycle storage/parking facilities.

14. Implement alternative transportation program such as Caltrans rideshare.

COMMERCIAL/INDUSTRIAL PROJECTS

Sample Mitigation Measure Efficiencies for Controlling
Indirect Mobile Source Emissions

Mitigation Measures	Emission Reduction Efficiency		
	ROG	NO_x	PM_{10}
‣ Implement compressed work-week schedules where weekly work hours are compressed into fewer than five days	1.0-20.0%	1.0-40.0%	1.0-40.0%
‣ Establish telecommuting programs, alternate work schedules, and guaranteed ride home programs	0.1-1.6%	0.1-2.1%	0.1-2.1%
‣ Provide on-site child care and after-school facilities or contribute to off-site development within walking distance	0.1%	0.1-0.2%	0.1-0.2%
‣ Construct on-site or off-site bus turnouts, passenger benches, or shelters	0.1-1.0%	0.1-1.3%	0.1-1.3%
‣ Provide on-site employee services such as cafeterias and ATMs	0.2-3.4%	0.3-4.5%	0.3-4.5%
‣ Provide preferential parking spaces for carpools and vanpools and provide 7'2" minimum vertical clearance in parking facilities for vanpool access	0.1-1.0%	0.1-1.3%	0.1-1.3%
‣ Establish alternative transportation program through Caltrans rideshare	0.1-1.6%	0.1-1.6%	0.1-1.6%
‣ Use low-emission fleet vehicles	See AQMD	See AQMD	See AQMD
‣ Provide for transit-use incentives, such as subsidized transit passes and accommodation of unusual work schedules to allow for transit stops	0.4-1.5%	0.4-1.5%	0.4-1.5%
‣ Contribute to traffic- flow improvements that are not growth inducing	4.0-8.0%	0.4-8.0%	0.4-8.0%
‣ Provide shuttles to major transit stations and multimodal centers	0.1-0.3%	0.1-0.5%	0.1-0.5%
‣ Include residential units with commercial project	3.1-13.7%	4.0-18.0%	4.0-18.0%
‣ Utilize parking in excess of code requirements as on-site park-n-ride lots or contribute to construction of off-site lots	0.1%	0.1-0.2%	0.1-0.2%
‣ Any two of the following:			
- Construct off-site bicycle facility improvements such as bicycle trails linking the facility to designated bicycle commuting routes, or on-site improvements such as bicycle paths	0.2-2.4%	0.3-3.2%	0.3-3.2%
- Include bicycle parking facilities such as bicycle lockers and racks	see above	see above	see above
- Include showers for bicycling employees' use	see above	see above	see above
‣ Any two of the following:			
- Construct off-site pedestrian facility improvements such as overpasses, wider sidewalks	0.2-1.2%	0.2-1.6%	0.2-1.6%
- Construct on-site pedestrian facility such as a building access physically separated from the street and parking lot traffic and walk paths	see above	see above	see above
- Include showers for pedestrian employees' use	see above	see above	see above
‣ Provide video conferencing facilities	5.0-29.0%	5.0-29.0%	5.0-29.0%

NOTE: The Redding Planning Department, in consultation with AQMD, will determine the degree of efficiency for the mitigations of this table, but generally, the average of the two ranges shall be used.

G. URBEMIS COMPUTER PROGRAM ASSUMPTIONS AND DEFAULTS

Estimates of emissions generated by the traffic of a project shall be accomplished by using the latest version of a computer program called URBEMIS. This model contains default values for much of the information needed to calculate emissions. The Air Quality Management District will provide documentation on the latest assumptions and defaults to be used. This documentation shall consider updated information concerning the following:

1. *Project Year.* Select the year nearest to the initial project phase scheduled completion year. If this date is indeterminate, use the year nearest to the date of analysis.

2. *Vehicle Fleet Mix.* Use URBEMIS default values unless project has unusual characteristics and data is available to modify the mix characteristics.

3. *Ambient Temperature.* As specified by the AQMD.

4. *Trip Speeds.* Use URBEMIS default values unless project has unusual characteristics and data is available to modify the speeds. Note, the average trip speeds must consider the time delay at intersection stops and acceleration and deceleration times. A typical trip speed for a residential project is 30 to 35 MPH.

5. *Project Area.* Use RURAL as area selection since this designation more closely corresponds to Shasta County than the other selections available.

6. *Trip Lengths.* Use URBEMIS default values unless other values have been approved by the Air Pollution Control Officer as a result of special traffic surveys or studies.

7. *Percent of Cold Starts and Percent of Trip Types.* Same as above.

8. *Percent PM_{10} and Percent Sulfur in Fuel.* Same as above.

9. *Trip Rates.* The model lists 41 ITE default trip rates for various types of land use. Trips should be modified according to the City's traffic model for the particular trip zone. In any case, the City shall approve the trip rate used.

H. SAMPLE CALCULATION OF EMISSION REDUCTION FROM APPLICATION OF BEST AVAILABLE MITIGATION MEASURES (BAMM)

Project:

500 Single Family Residences
1 Community Shopping Center

The reader should understand that this example, as well as those on page 48, is only provided to illustrate the methodology. The emissions produced by these sample projects should not be interpreted as the level of emissions that would be calculated using the latest approved URBEMIS model. It is also important to understand that each emission reduction factor to be applied must be documented and justified.

1. Total unmitigated project emissions from URBEMIS computer model:

   95.9 #/day TOG
   143.2 #/day NO_x
   18.2 #/day PM_{10}

2. Do project unmitigated emissions exceed Level "A" threshold of 25 #/day NO_x, 25 #/day ROG, or 80 #/day PM_{10}? Yes. (Assume reactive organic gases [ROG] are equivalent to total organic gases [TOG]. Apply all feasible Level "A" measures for both residential and commercial/industrial projects since this project has features of both types of development.

3. Do project unmitigated emissions exceed Level "B" threshold of 137 #/day of the above pollutants? Yes. Apply all feasible Level "B" measures for both residential and commercial/industrial projects since this project has features of both types of development.

4. The following mitigation measures and associated average emission reductions were selected for this project:

   a. Synchronize traffic lights on streets near development:

      TOG Reduction = (95.9 #/day)(.06) = 5.8 #/day
      NO_x Reduction = (143.2 #/day)(.06) = 8.6 #/day
      PM_{10} Reduction = (18.2 #/day)(.06) = 1.1 #/day

b. Include retail service adjacent to subdivision:

TOG Reduction = (95.9 #/day)(.0250) = 2.4 #/day
NO_x Reduction = (143.2#/day)(.0365) =5.2 #/day
PM_{10} Reduction = (18.2 #/day)(.0365)= 0.66 #/day

c. Construct on-site bus turnouts and shelters:

TOG Reduction = (95.9 #/day)(.0105) = 1.0 #/day
NO_x Reduction = (143.2 #/day)(.014) = 2.0 #/day
PM_{10} Reduction = (18.2 #/day)(.014) = 0.2 #/day

5. Mitigated project emissions are determined by subtracting total reductions from unmitigated project emissions:

TOG Emissions = 95.9 - 5.8 - 2.4 - 1.0 #/day = 86.7 #/day
NO_x Emissions = 143.2 - 8.6 - 5.2 - 2.0 #/day = 127.4 #/day
PM_{10} Emissions = 18.2 - 1.1 - 0.66 - 0.2 #/day = 16.2 #/day

6. Determine if project emissions exceed the 137 #/day emission threshold where emission offsets are required. No. All emissions are below the significance level with applied mitigation. Therefore, a Mitigated Negative Declaration (MND) is appropriate.

J. Sources For Other Standard Mitigation Measures (SMM) and Best Available Mitigation Measures (BAMM)

1. Placer County Air Pollution Control District, "Menu of Mitigation Measures" (9/93)

2. San Joaquin Valley Unified Air Pollution Control District, "Model Air Quality Element - Admin. Draft" (8-19-93)

3. South Coast Air Quality Management District, "1992 Revision of CEQA Air Quality Handbook - Chapter 11"

4. South Coast Air Quality Management District, "1992 Revision of CEQA Air Quality Handbook - Appendix 11"

I. Sample List of Projects and Associated Air Pollution Mitigations Using Air Quality Element Procedures

Project Type	Emissions Produced			Does Use Exceed Level "A" Emission Threshold			Does Use Exceed Level "B" Emission Threshold			Suggested Mitigation
	TOG	NO_x	PM_{10}	TOG (25lb/day)	NO_x (25lb/day)	PM_{10} (80lb/day)	TOG (137lb/day)	NO_x (137lb/day)	PM_{10} (137lb/day)	
Single-family subdivision (100 units)	12.5	26.1	3.0	No	Yes	No	No	No	No	1. Standard Mitigation Measures 2. Construct on-site bus bench, passenger turnout, or shelter (1.4% reduction)
Single-family subdivision (20 units)	3.0	6.1	.7	No	No	No	No	No	No	1. Standard Mitigation Measures
Manufacturing building (20,000 sq ft)	1.3	2.6	5.0	No	No	No	No	No	No	1. Standard Mitigation Measures
Manufacturing building (4,000 sq ft)	.3	.5	1.0	No	No	No	No	No	No	1. Standard Mitigation Measures
Contractor storage yard (1,000 sq ft building)	.1	.2	.5	No	No	No	No	No	No	1. Standard Mitigation Measures
Small neighborhood shopping center (20,000 sq ft)	37.8	62.6	25.3	Yes	Yes	No	No	No	No	1. Standard Mitigation Measures 2. Construct on-site bus benches and shelter (1.4% reduction) 3. Provide on-site restaurant (built into project's design) (2.4% reduction) 4. Provide on-site shopping for employees (2.4% reduction) 5. Provide shopping adjacent to residential neighborhood (11% reduction) 6. Provide on-site bike rack (1.5% reduction)

Total Reduction for Small Neighborhood Shopping Center = 20.1% (30.2 TOG, 50.1 NO_x, 20.3 PM_{10}). Since suggested mitigations do not reduce the emissions below Level "A" thresholds for the shopping center, the City must make a finding that all feasible best available mitigations have been applied. This finding would be made part of a mitigated negative declaration. For large projects which are developed over time, each phase of the project shall be treated as a single project in terms of meeting the 20 percent and 25 percent emission reduction standard of this table.

In most cases, Level "B" threshold will only be triggered by large General Plan amendments as opposed to single development projects; therefore, it is important that programmatic mitigations be incorporated in the amendment so that the cumulative effects of discretionary and nondiscretionary projects are addressed.

NOTES:

1. If use does not exceed Level "A" threshold, then use must at least reduce emissions by 20 percent by applying BAMM.
2. If, after applying BAMM, use still exceeds Level "A" threshold, then use must at least achieve a minimum emission reduction of 20 percent with BAMM.
3. If, after applying BAMM, use still exceeds Level "B" threshold, then a minimum of 25 percent of unmitigated emissions exceeding 137 pounds per day must be offset by reducing emissions from existing sources of pollution; otherwise, an EIR is required which must address air quality impacts, mitigations, and project alternatives as well as the basis for adopting any proposed "finding of overriding consideration" pursuant to the California Environmental Quality Act.

VII. TRACKING CUMULATIVE EMISSIONS OF ALL APPROVED PROJECTS

Since the County Air Quality Attainment Plan and this element only "strive" to achieve an annual reduction in emissions by applying Best Available Mitigation Measures (BAMM), not all project emissions will be mitigated. Although the California Clean Air Act permits this approach, the County and its cities should at least track the cumulative contribution of unmitigated emissions for all projects. This will enable decision makers to see how much more unmitigated emission is being added to the cumulative emissions of all approved projects relative to a proposed project. In a way, this measure can serve as a gauge for any future adjustments in the mitigations of the Air Quality Element.

The most obvious gauge to use for annual cumulative impacts is the threshold level of the "New Source Review Rule," which is 25 tons/year or 137 lbs/day. This threshold coincides with Level "B" of the Air Quality Element in determining when an EIR and offsets are needed (see Chapter VII, Section "B"). Basically, the threshold serves as a level of significance for large and cumulative effects of several small projects. The reader is reminded that large projects must address the impacts of exceeding Level "B," but small projects pending consideration of approval should only be examined relative to their contribution to Level "B" threshold as a matter of information.

The annual cumulative contribution of emissions from vehicles and wood heating devices, including fireplaces, should also be traced in accordance with the calculations of this chapter.

The information from the following table should be made part of the initial environmental study for each proposed project. At the end of the year, a report of cumulative emissions for that calendar year should be submitted to the Air Quality Management District (AQMD), the Planning Commission, and City Council as a matter of information.

Table __

AIR QUALITY OZONE AND PM_{10} TRACKING PROGRAM FOR PROPOSED AND APPROVED PROJECTS (Based on Calendar Year)

1.	Vehicle emissions of **proposed** project as quantified by the air quality URBEMIS computer model.	( )
2.	Vehicle emission reductions of proposed project based on proposed mitigations.	( )
3.	Difference in emissions between No. 1 and No. 2 for proposed project.	( )
4.	Annual cumulative emissions of all **approved** projects.	( )
5.	Add No. 3 and No. 4.	( )
6.	Significant project threshold of Air Quality Management District (Level "B").	(25 tons/year)
7.	Difference in emissions between No. 5 and No. 6 is the amount of emissions that Cities and County must offset through emission reductions or offsets being applied to new development or modified and/or existing businesses.	( )

As noted above, the Level "B" threshold is the same threshold used in the permitting process of the AQMD for stationary sources of pollution from individual businesses and manufacturing plants. The permit requirements, including emission offsets for Level "B" exceedances, apply to new and modified businesses of the County's New Source Review Rule. By using the same threshold for development projects or "indirect sources" of pollution, parity is at least recognized between the two types of projects. The idea is, as much as possible, to make sure new and modified businesses do not carry all the burden of mitigating the emission impacts of indirect sources of pollution from other

types of development projects. Another way of justifying this approach is to realize that direct and indirect sources of vehicle and PM_{10} emissions share the same overall emissions budget. It should also be recognized that projects that have direct sources of emissions under the California Clean Air Act already have a double requirement of mitigating stationary and indirect sources of emission.

The tracking program for PM_{10} emissions from approved and pending wood heating devices uses the same threshold of 137 lbs/day or a maximum of 423 devices per year as the threshold of approved units. The emission advantages of Phase II stoves is outweighed by this number of devices as indicated by the formula below:

$$(\text{\# devices})\left(\frac{1.5\text{ cords}}{\text{devices}}\right)\left(\frac{2.22\text{ tons}}{\text{cord}}\right)\left(\frac{14.6\text{ lbs PM10}}{\text{T}}\right)\left(\frac{1\text{ yr}}{150\text{ days}}\right) = (\text{\# lbs/day})$$

\# devices = 423 devices = 137 lbs/day
T = EPA AP-42 emission factor for Phase II stove

Based on this, the significant threshold for PM_{10} relative to No. 6 of the table above, is 137 lbs/day. If the number of approved heating devices exceeds 423 per year, then the cumulative effect is considered significant. **Since this action of approved devices is only a building permit, CEQA clearance does not apply, but the tracking program should still be followed.**

GLOSSARY OF AIR QUALITY TERMS

Introduction

This glossary is intended to help ordinary citizens understand the most commonly used air pollution terms. The glossary is divided into two sections:

1. GOVERNMENTAL SECTION

2. TECHNICAL SECTION

The governmental section gives an overview of the laws, regulations, and government agencies involved in ensuring healthful air quality. The technical section explains some scientific terms used to describe pollutants, the processes that form them, and their effects.

1. GOVERNMENTAL SECTION

Introduction to the Regulatory System

Federal and state governments have laws and agencies that control air pollution. At the federal level, the U. S. Environmental Protection Agency (EPA) is responsible for safeguarding the nation's air quality. Each state must meet the standards set by the EPA. Some states like California have passed standards that are more strict than those set by the EPA, so polluters must also comply with those standards. The EPA works with state and local agencies to make sure that air quality in the state at least meets federal standards. The state and local agencies monitor pollution and enforce both state and federal standards.

In California, the Air Resources Board (ARB) is the lead agency responsible for air quality. Local counties overseen by the ARB develop and implement local air quality management plans. The counties specifically regulate emissions made by local stationary sources (i.e., those that don't come from moving objects like cars and trains). In addition to overseeing local regulatory efforts, ARB has direct authority over mobile sources.

Together, federal, state, and local agencies, in coordination with the regulated and general public, are acting to bring the state into compliance with health and welfare-based air quality standards. Under the current regulatory framework, it is expected that California will meet this goal within the next two decades.

Governmental Terms

Air Toxics "Hot Spots" Information and Assessment Program (AB 2588): A California program (Health and Safety Code Section 44300, et seq.) requiring certain stationary sources to report the type and quantity of specific toxic substances they routinely release into the air. The program identifies high priority facilities and requires facilities posing significant risks to notify all exposed individuals.

APCD (Air Pollution Control District): A county agency with authority to regulate stationary, indirect, and area sources of air pollution (e.g., power plants, highway construction, and housing developments) *within a given county*, and governed by a district air pollution control board composed of the elected county supervisors. (Compare AQMD).

AQMD (Air Quality Management District): A *group of counties or portions of counties, or an individual county specified in law* with authority to regulate stationary, indirect, and area 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. (Compare APCD).

AQMP (Air Quality Management Plan): A plan prepared by an APCD/AQMD for a county or region designated as a nonattainment area for the purpose of bringing the area into compliance with the requirements of the national and/or California Ambient Air Quality Standards. AQMPs are incorporated into the State Implementation Plan (SIP).

Attainment Area: A geographic area which is in compliance with the National and/or California Ambient Air Quality Standards (NAAQS or CAAQS).

BACT (Best Available Control Technology): The most up-to-date methods, systems, techniques, and production processes available to achieve the greatest feasible emission reductions for given regulated air pollutants and processes. BACT is a requirement of NSR (New Source Review) and PSD (Prevention of Significant Deterioration).

CAAQS (California Ambient Air Quality Standard): A legal limit that specifies the maximum level and time of exposure that can occur in the outside air for a given air pollutant and which is protective of

human health and public welfare (Health and Safety Code 39606b). CAAQSs are recommended by the California Office of Environmental Health Hazard Assessment and adopted into regulation by the Air Resources Board. CAAQSs are the standards which must be met per the requirements of the California Clean Air Act.

CARB (California Air Resources Board): The state's lead air quality agency consisting of a nine-member, Governor-appointed board. It is responsible for attainment and maintenance of state and federal air quality standards and is fully responsible for motor vehicle pollution control. It oversees county and regional air pollution management programs.

CCAA (California Clean Air Act): California law passed in 1988 which provides the basis for air quality planning and regulation independent of federal regulations. 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 to attain and maintain California's air quality standards by the earliest practicable date.

CEQA (California Environmental Quality Act): A California law which sets forth a process for public agencies to make informed decisions on discretionary project approvals. The process aids decision makers to determine whether any environmental impacts are associated with a proposed project. It requires that environmental impacts associated with a proposed project be eliminated or reduced and that air quality mitigation measures be implemented.

EPA (Environmental Protection Agency): The United States agency charged with setting policy and guidelines and carrying out legal mandates for the protection of national interests in environmental resources.

FIP (Federal Implementation Plan): In the absence of an approved State Implementation Plan (SIP), a plan prepared by the EPA which provides measures that nonattainment areas must take to meet the requirements of the Federal Clean Air Act.

Indirect Source: Any facility, building, structure, or installation, or combination thereof, which generates or attracts mobile source activity that results in emissions of any pollutant (or precursor) for which there is a state ambient air quality standard. Examples of indirect sources include employment sites, shopping centers, sports facilities, housing developments, airports, commercial and industrial development, and parking lots and garages.

Indirect Source Control Program: Rules, regulations, local ordinances and land-use controls, and other regulatory strategies of air pollution control districts or local governments used to control or reduce emissions associated with *new* and *existing* indirect sources. Indirect source control programs include regulatory strategies such as transportation control measures (e.g., South Coast's Regulation XV for employer-based trip reduction); parking charges; land-use controls that reduce the need for vehicle travel and increase transit, bicycle, and pedestrian access; and source-specific regulations such as truck idling and travel schedule requirements.

Indirect Source Review: A major component of an indirect source control program which applies to *new* and *modified* indirect sources. Strategies for indirect source review include permit programs; review and comment on new and modified indirect source projects through the California Environmental Quality Act (CEQA) process; and coordination of air quality, transportation, and land-use policies through local government general plans. Indirect source review reduces emissions from new and modified sources through best available mitigation measures and additional off-site mitigation such as offsets and mitigation fees.

NAAQS (National Ambient Air Quality Standards): Standards set by the Federal EPA for the maximum levels of air pollutants which can exist in the outdoor air without unacceptable effects on human health or the public welfare.

NSR (New Source Review): A program used to permit new or modified industrial facilities which are in a nonattainment area and which emit nonattainment criteria air pollutants. The two major requirements of NSR are Best Available Control Technology and Emission Offset.

Nonattainment Area: A geographic area identified by the EPA and/or ARB as not meeting either NAAQS or CAAQS standards for a given pollutant.

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 (see AQMP).

Transportation Control Measure (TCM): Any control measure to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions. TCMs could include encouraging the use of carpools and mass transit.

2. TECHNICAL SECTION

Introduction to Technical Terms

Air quality management and regulations are dependent on information gathered from a number of technical disciplines. These include the study of the health and environmental effects of pollutants, air quality sampling and pollutant measurement, data management and analysis, and control technology development. This section of the glossary is intended to give the reader a general understanding of the air-related terms most commonly used in these sciences.

Technical Terms

Acid Rain: Rain which is especially acidic (pH < 5,2). Principal components of acid rain typically include nitric and sulfuric acid. These may be formed by the combination of nitrogen and sulfur oxides with water vapor in the atmosphere.

Air Pollutants: Amounts of foreign and/or natural substances occurring in the atmosphere that may result in adverse effects on humans, animals, vegetation, and/or materials.

BACT (Best Available Control Technology): The most up-to-date methods, systems, techniques, and production processes available to achieve the greatest feasible emission reductions for given regulated air pollutants and processes. BACT is a requirement of NSR (New Source Review) and PSD (Prevention of Significant Deterioration).

CO (Carbon Monoxide): A colorless, odorless gas resulting from the incomplete combustion of fossil fuels. Over 80 percent 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.

CO_2 (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 CO_2 have been implicated with increasing the greenhouse effect.

Fugitive Dust: Dust particles which are introduced into the air through certain activities such as soil cultivation, off-road vehicles, or any vehicles operating on open fields or dirt roadways.

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 heat energy. The heat energy is then trapped by the atmosphere, creating a situation similar to that which occurs in a greenhouse or a car with its windows rolled up. Many scientists believe that the emission of CO_2 and other gasses into the atmosphere may increase the greenhouse effect and contribute to global warming.

Hydrocarbon: 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, fuel volatization, and solvent use, and are a major contributor to smog. (Also see ROG).

Inversion: A layer of warm air in the atmosphere that lies over a layer of cooler air, trapping pollutants.

Nitrogen Oxides (Oxides of Nitrogen, NO_x): A general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO_2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes and are major contributors to smog formation and acid deposition. NO_2 is a criteria air pollutant and may result in numerous adverse health effects.

Ozone: A strong smelling, pale blue, reactive toxic chemical gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy. Ozone exists in the upper atmosphere 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 to 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. A primary concern is that compounds such as

chlorofluorocarbons (CFCs) used in air conditioning systems are depleting the ozone layer. Stringent federal requirements will phase out production of chlorofluorocarbons in the U.S. by the year 2000.

Ozone Precursors: Chemicals such as hydrocarbons and oxides of nitrogen, occurring either naturally or as a result of human activities, which contribute to the formation of ozone, a major component of smog.

PM-10 (Particulate Matter): A major air pollutant consisting of tiny solid or liquid particles of soot, dust, aerosols, fumes, and mists. The size of the particles (10 microns or smaller, about 0.0004 inch or less) allows them to easily enter the air sacs deep in the lungs where they may be deposited to result in adverse health effects. PM_{10} also causes visibility reduction and is a criteria air pollutant.

ROG (Reactive Organic Gas): A reactive chemical gas composed of hydrocarbons that may contribute to the formation of smog. Also sometimes referred to as Non-Methane Organic Compounds (NMOCs).

Smog: A combination of smoke, ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds which, under certain conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects. The primary source of smog in California is motor vehicles.

Smoke: A form of air pollution consisting primarily of particulate matter (i.e., particles). Other components of smoke include gaseous air pollutants such as hydrocarbons, oxides of nitrogen, and carbon monoxide. Sources of smoke may include fossil fuel combustion, agricultural burning, and other combustion processes.

Stationary Sources: Nonmobile sources such as power plants, refineries, and manufacturing facilities which emit air pollutants. (Contrast with mobile sources.)

Toxic Hot Spot: An area where the concentration of air toxics is significantly higher than background levels and where individuals may be exposed to an elevated risk of adverse health effects. Toxic hot spot sources can include landfills, sewage treatment plants, and numerous other operations.

AIR QUALITY ELEMENT ACKNOWLEDGMENTS

ACKNOWLEDGMENTS

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Work on the draft element began in April 1993 with the formation of an advisory committee authorized by the City Council and appointed by Mayor Carl Arness. The Mayor's charge to each committee member set the stage for what was to be several months of meetings and rewrites of the draft document. In brief, the Mayor's charge was:

> *". . .to study the past and present trends, imagine the future, and propose a policy that will maintain our air quality. All of this must be done without sacrificing jobs, and I encourage you to focus on air quality planning as an opportunity to attract industry by touting the quality of life and air quality we enjoy and plan on protecting.*
>
> *As you approach your charge, please keep in mind that planning means little unless the implementation measures are effective, affordable, and equitable. A strong economy that features clean air and good planning is no small challenge and will be a formidable political challenge for members of the City Council, unless there is a reasonably shared community consensus regarding issues, solutions, and an ultimate vision of the future.*
>
> *Whatever policy and shared vision is developed, it must not jeopardize state and federal funds for local transportation projects which are keyed to government mandates for improved air quality.*
>
> *Based on the diverse interests and talents of the advisory committee, I feel confident that the draft recommended policy will be the best that we can produce."*

The following individuals, representing the interests of their affiliated agencies and organizations, accepted this challenge by contributing their time, constructive criticism, and solutions, all of which were sprinkled with many compromises:

ADVISORY COMMITTEE

Shasta Builders' Exchange
Kent Dagg

Greater Redding Chamber of Commerce
Tom Semingson, Frank Strazzarino, Jr., Michael Green

American Association of University Women
Susan Turner, Judy Ceragioli

Shasta Business Council
Lance Fredricksen

Sacramento River Council
Tryg Slettland, John Carr

Citizens at Large
Lou Gerard

Shasta County Board of Realtors
Marie Whitacre

Sierra Club
Kelly Clark, Vi Klasseen

League of Women Voters
Ruth Wingate

Tourism and Convention Commission
Commissioner Warren Lane

Staff of Reviewing Agencies

Shasta County
Jim Cook, Deputy Planning Director

City of Anderson
Tom Hart, Planning Director

City of Shasta Lake
Joe Hunter, Planning Director

Redding Area Bus Authority
Ray Duryee

Redding Public Works Department
Doug Will, Don Curtis

Air Quality Management District
Mike Kussow

Shasta County Department of Resource Management
Russ Mull

Shasta County Regional Transportation Planning Agency
Dick Curry, John Stokes

Caltrans
Jerry Severson

Redding Convention and Visitors Bureau
John Gorman

Redding Housing Authority
Larry Morgon, Sarah Haddox

Economic Development Corporation
Jim Zauher

Redding Planning Department
Jim King, Project Coordinator
Judy Huskey, Joy Gaskey, Secretaries